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# Cyber Security Intelligence and Analytics

2021 International Conference  
on Cyber Security Intelligence and  
Analytics (CSIA2021), Volume 2



Springer

# **Advances in Intelligent Systems and Computing**

**Volume 1343**

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Octavio Loyola-González ·  
Xiaolu Zhang  
Editors

# Cyber Security Intelligence and Analytics

2021 International Conference on Cyber  
Security Intelligence and Analytics  
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Springer

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ISSN 2194-5357

ISSN 2194-5365 (electronic)

Advances in Intelligent Systems and Computing

ISBN 978-3-030-69998-7

ISBN 978-3-030-69999-4 (eBook)

<https://doi.org/10.1007/978-3-030-69999-4>

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This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Welcome Message

CSIA 2021 is an international conference dedicated to promoting novel theoretical and applied research advances in the interdisciplinary agenda of cyber security, particularly focusing on threat intelligence and analytics and countering cybercrime. Cyber security experts, including those in data analytics, incident response and digital forensics, need to be able to rapidly detect, analyze and defend against a diverse range of cyber threats in near real-time conditions. For example, when a significant amount of data is collected from or generated by different security monitoring solutions, intelligent and next generation big data analytical techniques are necessary to mine, interpret and extract knowledge of these (big) data. Cyber threat intelligence and analytics are among the fastest growing interdisciplinary fields of research bringing together researchers from different fields such as digital forensics, political and security studies, criminology, cyber security, big data analytics and machine learning to detect, contain and mitigate advanced persistent threats and fight against organized cybercrimes.

The 2021 International Conference on Cyber Security Intelligence and Analytics (CSIA 2021), building on the previous successes online meeting (2020 due to COVID-19), in Wuhu, China (2019), is proud to be in the third consecutive conference year.

We are organizing the 2021 CSIA conference at Shenyang organized by Shenyang Aerospace University. It will feature a technical program of refereed papers selected by the international program committee and keynote address.

## Conference Program at a Glance

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Friday, March 19, 2021, Shenyang Aerospace University International Academic Exchange Center and online Tencent Meeting

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9:50–10:00	Opening ceremony	Kim-Kwang Raymond Choo
10:00–10:30	Keynote 1	Yong Ding
10:30–11:00	Keynote 2	Cheng Jin
11:00–11:30	Keynote 3	Junchi Yan

(continued)

(continued)

11:30	Best Paper Awards	Zheng Xu
14:00–18:00	Technical tracks 1	Xiaolu Zhang
	Technical tracks 2	Octavio Loyola-González
	Technical tracks 3	Kim-Kwang Raymond Choo
	Technical tracks 4	Ishfaq Ahmad
	Technical tracks 5	Juan Du
	Technical tracks 6	Reza Meimandi Parizi
	Technical tracks 7	Zheng Xu

# Preface

CSIA 2021 is an international conference dedicated to promoting novel theoretical and applied research advances in the interdisciplinary agenda of cyber security, particularly focusing on threat intelligence and analytics and countering cybercrime. Cyber security experts, including those in data analytics, incident response and digital forensics, need to be able to rapidly detect, analyze and defend against a diverse range of cyber threats in near real-time conditions. For example, when a significant amount of data is collected from or generated by different security monitoring solutions, intelligent and next generation big data analytical techniques are necessary to mine, interpret and extract knowledge of these (big) data. Cyber threat intelligence and analytics are among the fastest growing interdisciplinary fields of research bringing together researchers from different fields such as digital forensics, political and security studies, criminology, cyber security, big data analytics and machine learning to detect, contain and mitigate advanced persistent threats and fight against organized cybercrimes.

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We are organizing the 2021 CSIA conference at Shenyang organized by Shenyang Aerospace University. It will feature a technical program of refereed papers selected by the international program committee and keynote address.

Each paper was reviewed by at least two independent experts. The conference would not have been a reality without the contributions of the authors. We sincerely thank all the authors for their valuable contributions. We would like to express our appreciation to all members of the program committee for their valuable efforts in the review process that helped us to guarantee the highest quality of the selected papers for the conference.

Our special thanks are due also to the editors of Springer book series “Advances in Intelligent Systems and Computing”, Thomas Ditzinger, Gowrishankar Ayyasamy for their assistance throughout the publication process.

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# **CSIA 2021 Keynotes**

# **Secure Metering Data Aggregation with Batch Verification in Industrial Smart Grid**

Yong Ding

School of Computer Science and Information Security,  
Guilin University of Electronic Technology, Guilin, China



Yong Ding received the Ph.D. degree from Xidian University. He is a professor with the Guilin University of Electronic Technology. His research interests include cryptography and the blockchain.

# **Sketch-Based Image Retrieval with Deep Visual Semantic Descriptor**

Cheng Jin

School of Computer Science, Fudan University, China

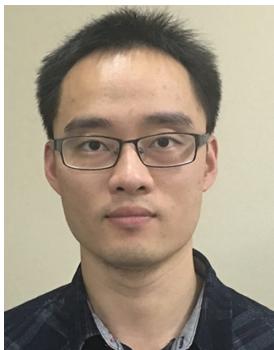


I am currently a full professor in School of Computer Science, Fudan University. I received both my bachelor and Ph.D. degrees in Computer Science from Zhejiang University, and my supervisor is Prof. Chun CHEN. My current research interests are image/video analysis and human-computer interaction. Here is a brief introduction on my research work.

# **STFlow: Self-taught Optical Flow Estimation Using Pseudo Labels**

Junchi Yan

Hainan University, China



Dr. Junchi Yan is currently a tenure track associate professor with Shanghai Jiao Tong University. He is also the program manager for the prestigious SJTU ACM Class (AI direction). Before that, he was a senior research staff member (Principal Scientist for Cognitive IoT) with IBM Research, China, where he started his career since April 2011, and once an adjunct professor with the School of Data Science, Fudan University. His research interests are machine learning, data mining and computer vision. He serves as an associate editor for IEEE ACCESS, (Managing) guest editor for IEEE Transactions on Neural Network and Learning Systems, Pattern Recognition Letters, Pattern Recognition and vice secretary of China CSIG-BVD Technical Committee, and on the executive board of ACM China Multimedia Chapter. He has published 50+ peer-reviewed papers in top venues in AI and has filed 20+ US patents. He has once been with IBM Thomas J. Watson Research Center, Japan NII, and Tencent/JD AI laboratory as a visiting researcher. He won the distinguished young scientist of Scientific Chinese for year 2018 and CCF Outstanding Doctoral Thesis.

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# **Technical Tracks 5: Computational Intelligence, Blockchain, VR, and Their Engineering Intelligence Applications**



# Curriculum Reform and Practice of “UI Interface Design” Based on “Information Visualization”

Pengwen Wang<sup>(✉)</sup>, Yanan Hu, and Jiaofei Huo

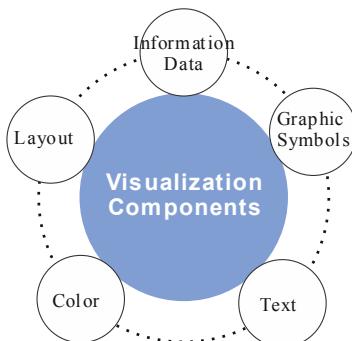
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**Abstract.** Through effective UI design, the design front-end and back-end coding are effectively combined, and the PC and mobile terminals are used as carriers for information visualization interface design research, including interface layout, color, font size, icon graphics, and data information interface vision Design presentation. At this stage, UI interface design has a good development prospect, large social demand, a wide social audience, and a shortage of professional design talents. How to quickly train UI interface design talents is particularly important. This course reform aims to introduce computer talents with programming background into the front-end design concept, and integrate the design of information visualization interface.

**Keywords:** Information · Visualization · UI · Interface design · Curriculum reform

## 1 Preface

Information visualization refers to the comprehensive processing of abstract data, transforming it into visual elements such as graphics and images that are easy for users to understand, so that users can receive and understand data and information in the most intuitive way. The aim is to use visual design methods to accurately and



**Fig. 1.** Elements of information visualization

effectively transmit information and help users obtain better information [1]. Visual design transforms text data and other information into graphics, and presents it to users in a visual form that is easier to read and recognize [2] (Fig. 1).

UI (User Interface) refers to the overall design of software's human-computer interaction, operation logic, and beautiful interface, that is, user interface design. With the rapid development of the domestic software industry, some large domestic IT companies such as Tencent, Baidu, China Mobile, Taobao, etc. have established professional UI design departments [3]. The market demand for UI design talents continues to grow, and the job market is in short supply. Driven by the strong market demand for talents, computer majors in major vocational colleges, such as software technology, computer application, and other majors, have successively opened UI design related courses, injecting new impetus into the training of UI design talents.

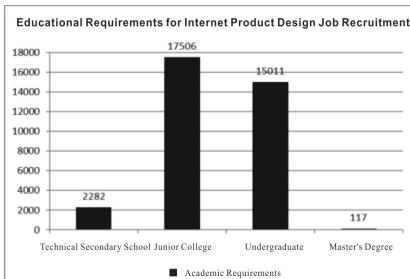
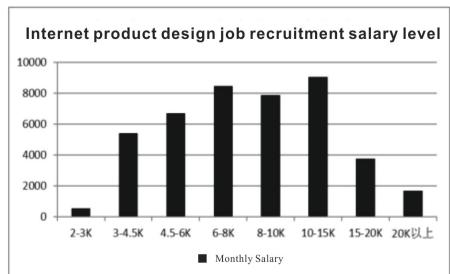
## 1.1 Good Prospects for UI Design Development

Policies led by the “13th Five-Year Plan” will continue to drive the development of the IT industry. The construction of the “One Belt One Road” is also opening up new markets for the IT industry, creating a new pattern, and continuing to build informatization. The “Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries” promulgated by the State Council mentioned that the advancement of industrialization and informatization “integration” has promoted the development of the information service industry [4].

## 1.2 Large Social Demand

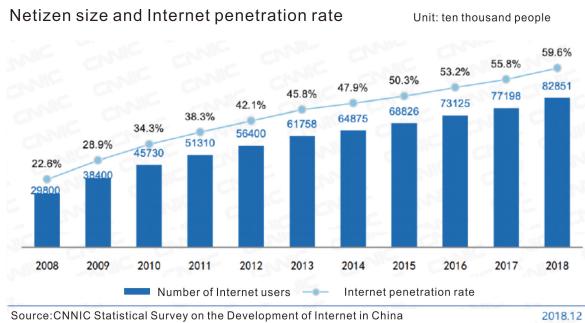
UI design (User Interface) is actually user interface design. This professional course belongs to the category of network design and is an integral part of the high-tech industry. At present, various online platforms, e-commerce platforms are developing rapidly, and many merchants on e-commerce platforms are Has its own user interface, and many large enterprises and Internet companies have set up relevant UI design departments [5].

On 51job, there are currently 44,850 recruitment information for various UI positions nationwide. Among them, the educational requirements of candidates are shown in Fig. 2, which shows that this type of position pays more attention to skills, and higher vocational students will not encounter too many educational thresholds in this field (Fig. 3).

**Fig. 2.** Recruitment requirements**Fig. 3.** Recruitment salary level

### 1.3 Wide Social Audience

In this era of rapid technological development of the Internet, with the continuous progress of Internet infrastructure construction, there are more and more types of mobile devices, and the number of Internet users in my country has grown rapidly. The growth of the number of Internet users and the Internet penetration rate from 2008 to 2018 is shown in Fig. 4 shown.

**Fig. 4.** The scale of Internet users and Internet penetration rate in my country from 2008 to 2018

According to the 43rd “Statistical Report on Internet Development in China” issued by the China Internet Network Information Center, as of December 2018, the number of Internet users in my country reached 829 million. In 2018, there were 56.53 million new Internet users. The rate reached 59.6%. Among them, 83.9% use computers to access the Internet. The number of Internet users using mobile phones to access the Internet is as high as 817 million, accounting for 98.6% of the Internet access ratio [6]. With the increase of netizens, the types of Internet devices are also diversified, and screen sizes and resolutions are quite different. Therefore, the corresponding UI interface design: PC web interface design, mobile interface design-iOS system interface and Android system interface Design is particularly important.

In summary, through effective UI design, this project effectively combines the design front-end and back-end coding, and uses PC and mobile terminals as carriers to conduct information visualization interface design research, including interface layout, color, font size, icon graphics, Visual design presentation of data information interface.

## 2 Research Status

### 2.1 Status of Foreign Research

The concept of web UI design was first proposed by foreign countries and has been developing continuously for a long time. “UI designers were born with the advent of computer systems. In 1963, the world’s first text editing system was born at the Massachusetts Institute of Technology in the United States, pioneering UI design in the form of commands.” But UI design is truly extended to the world is the commercial Macintosh operating system launched by Apple in 1984, and after receiving unanimous praise from users, Microsoft guided this form of UI design, making UI design further into the world Internet.

Foreign countries have developed a professional network platform dedicated to web UI design services. From colors, icons, symbols and basic components, it is more convenient for designers to design work and save a lot of time. Some foreign Internet companies that are well-known in the world, such as Microsoft, Apple, Yahoo, Hewlett-Packard, IBM, etc., also use UI design to improve the competitiveness of their products. Jef Raskin, a representative researcher in the field of web UI design in the United States, put forward the view that “if the interface can affect human needs and take into account human weakness, then it is people-oriented”, this view has become the starting point and important of web UI design Theoretical research support.

### 2.2 Current Status of Domestic Research

UI design started relatively late in our country. At present, most of the Internet industry in my country has just begun to pay attention to web UI design. The domestic market is in the initial stage of development, but it is developing very rapidly. Well-known Internet UI design companies such as Baidu, Tencent, China Mobile, Nokia, Lenovo, Netease, Taobao and many other companies have reached the level of simultaneous development with foreign Internet UI design.

The use of smart phones and mobile smart terminals has become popular, 5G communications have officially entered the stage of commercial operation, and mobile communications have realized the transition from the Internet era to the Internet of Things era [7]. Network interaction is no longer limited by time, space and bandwidth, fragmented time is efficiently used, and the application boundary of the traditional PC era is broken. The application scenarios of the Internet of Things era are diversified. The application fields cover social, shopping, mobile payment, life payment, information retrieval, service booking, travel navigation and other production and life related fields and industries. “Internet +” and life, Production depth integration [8]. UI

has become a part of people's daily life, and UI interface design continues to develop and innovate.

In summary, it is particularly important for UI interface design to combine design front-end and back-end coding for teaching. UI interface design not only improves the website interface, iOS interface and Android interface under the premise of mastering the background coding in computer applications [9]. The aesthetics and rationality of the software also improves the students' aesthetic ability and technical skills, integrates multiple disciplines, and significantly improves the quality of the software.

### **3 Teaching Problems to be Solved**

#### **3.1 Solve the Problem of Weak Front-End Interface Design for Computer Majors**

According to the survey, the web interface design developed by students majoring in computer application technology mainly adopts background programming. Most of the image processing is directly sourced from web photos, and the pictures are combined through code, which lacks the integrity of the design. Therefore, it is necessary to strengthen the integration of knowledge between related disciplines, make timely adjustments to the weak front-end design, and improve the overall structure of the curriculum content.

#### **3.2 Solve the Problem of Module Setting in Course Teaching**

The course content is now re-optimized, and the mobile interface design is combined in the interface design: iOS system interface design, Android system interface design, and PC-side web interface design. Class hours are adjusted to ensure that students master the mobile and PC-side web pages interface design.

#### **3.3 Solve the Problems of Low Interest and Low Initiative of Students in the Process of Practical Teaching**

For computer students, the back-end development is relatively easy, and the front-end design is relatively weak. Through practical teaching, improve students' front-end design ability, and improve students' interest in learning through the creation of web interface design and mobile phone interface design by students, thereby changing the problem of poor learning initiative [10]. Students can choose their own design objects: such as game interface, Taobao shop decoration interface, etc., to guide students in the learning process and improve their practical skills.

#### **3.4 Solve the Traditional Teaching Model, the Teaching Model of Students as the Mainstay and Teachers as the Supplement, and the Combination of Online Resources**

In the practical course setting, the content that should be known and met is taught, such as the basic operation of the software, design specifications, etc. The rest of the content

is led by students, including self-selected directions, self-conceived, and frame construction are all operated by students to address difficulties. The key content teacher provides guidance [11].

Record micro-classes, record important and difficult content and practical skills in advance, require students to study themselves before class, save practical class time, do as many project exercises as possible, and combine online and offline teaching methods to improve students' learning skills and time utilization.

## 4 Research Content

This project starts with UI design front-end and back-end coding, so that computer professionals not only know about back-end programming, but also need to master front-end interface design to improve the design level and a good user experience. Therefore, the practical curriculum reform of UI interface design is mainly conducted from the following aspects:

### 4.1 Study the Workflow of Internet Product Development and Explore the Problem of Combining Design Front-End and Back-End Coding

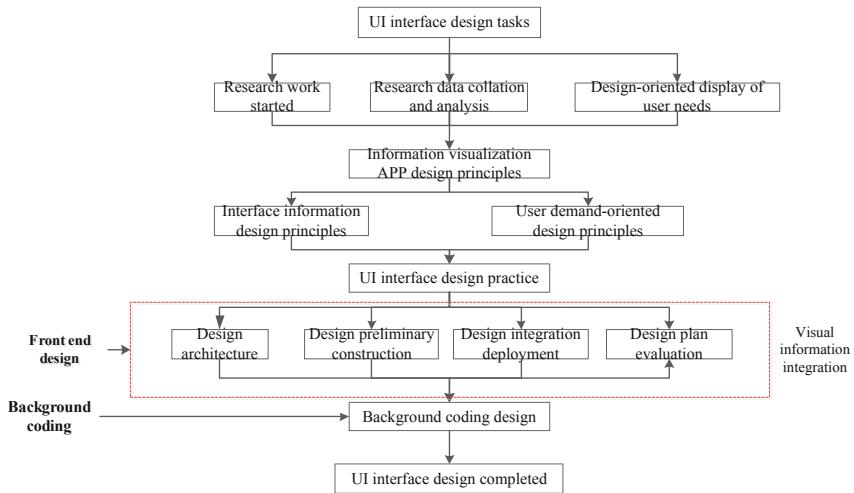
The prototype design, interactive demo production, and visual interface design links belong to the UI design field, and cutting coding is the background coding link. This shows that UI interface design has an important position and role.

### 4.2 Research on the Visual Design of PC and Mobile Interfaces

According to market research, users mainly conduct interface browsing for PC and mobile terminals. Therefore, they are mainly divided into two major modules: mobile APP interface design and PC interface design. The mobile APP interface design includes iOS system interface design and Android system interface design.

The focus is on the integration of information visualization design and the visualization design process (as shown in Fig. 5).

- (1) Optimize the curriculum standard of "UI Interface Design", adjust the curriculum structure, and reasonably divide the teaching modules  
The UI course standard focuses on the cultivation of students' comprehensive practical ability. The course teaching content is reconstructed according to the UI design process and decomposed into several teaching modules. The teaching modules are decomposed into specific typical cases, and the students can explain step by step through cases. Master the basic UI design principles, and at the same time, the practical ability has also been improved, and the unity of knowledge and action.
- (2) Study students' design and innovation ability, and enhance students' innovative thinking ability and learning interest  
Through the combination of online and offline methods, the use of "Internet +" teaching thinking, emphasizes "student-centered", and focuses on cultivating



**Fig. 5.** Information visualization design process

students' independent learning ability and practical ability. The UI course content is reconstructed, and the knowledge points are uploaded to the online teaching platform in the form of videos, PPT, electronic teaching plans, and pictures. Students complete the pre-class autonomous learning tasks according to the course design requirements of the teacher.

- (3) Closely integrate with production practice, job requirements and social services, formulate reasonable projects, improve the efficiency of student learning, and effectively integrate with the enterprise.

Teach cutting-edge technology in the UI field, so that students can master the latest technology of UI without participating in training, so that classroom teaching is truly in line with the needs of the social talent market, and truly professional technical talents are cultivated. The innovation of the UI curriculum system puts forward higher requirements for teachers. First of all, it must be used to break through the limitations of their existing professional thinking, invest in the front line of the enterprise, and bring the latest UI technology and job requirements of the enterprise to the classroom teaching. “School-enterprise cooperation” is more real and effective.

## 5 Conclusions

This curriculum reform is aimed at the reform of the UI interface design curriculum for computer majors. It integrates front-end design and back-end coding, completes information visualization design, and conducts research on visualization processes to form a rapid interface design mode.

- (1) In terms of teaching content: The original interface design is based on back-end coding. This research combines the front-end and back-end coding of UI design to enhance students' comprehensive skills and competitiveness, and improve their ability to do projects.
- (2) Innovations in curriculum arrangement: This research focuses on dividing the curriculum into two mainstream application modules: PC-side web interface design and mobile-side interface design. The mobile interface design includes iOS system interface design and Android system interface design, optimizing the course structure and adjusting the proportion of class hours.
- (3) Introduce information visualization technology, sort out the information visualization interface design process, create a quick interface design mode, save time and improve design efficiency.

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# Research on Agricultural Product Supply Chain Based on Internet of Things and Blockchain Technology

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**Abstract.** Regarding the problem of low customer satisfaction of agricultural products, difficulties in managing agricultural product supply chains, and low trust in the business entities of each link in the agricultural product supply chain, the efficiency of the agricultural product supply chain is not high. Based on the advantages of blockchain technology, the agricultural product supply chain is optimized and reconstructed. The operation mechanism of agricultural product supply chain under blockchain technology, and the development path of agricultural product supply chain under current blockchain technology is analyzed.

**Keywords:** Internet of Things · Blockchain · Agricultural products · Supply chain

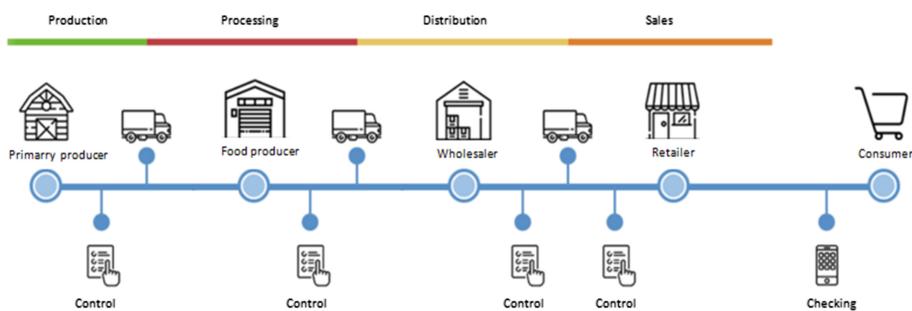
## 1 Introduction

The process of Chinese agricultural products from the origin to the market has many links and involves a range. It is difficult to aggregate and integrate the subjects and their data in the supply chain in a timely manner, which leads to difficulties in the supply chain management process. The degree of mutual trust is not high, and consumers cannot understand the information of agricultural products in the supply chain in time, so it is easy to increase their distrust of agricultural products. Ren Jun and others believe that the establishment of an agricultural product quality traceability system can greatly increase consumers' trust in products, and pointed out the problems existing in the current quality traceability system construction [1]. Through key technologies such as hash function, asymmetric encryption, time stamping, and POS, blockchain technology has achieved the characteristics of subject decentralization, data resource sharing, and data security. It has developed in recent years and gradually become popular in finance and retail [2]. It has been better applied in industries such as transportation and transportation [3]. In order to integrate resources in the agricultural supply chain and improve the efficiency of the supply chain, so that agricultural products can be traced back, blockchain technology can be combined to integrate the supply chain. With the gradual maturity of current blockchain technology, China's

related information technology is constantly improving and perfecting, providing technical support for the blockchain technology. At the same time, the improvement of related digital economy regulatory systems and policies and regulations are all for its agricultural. The application of supply chain provides feasibility [4].

## 2 The Necessity of Blockchain Technology in the Agricultural Product Supply Chain

The supply chain can be basically divided into five links: production site-processing enterprises-distributors-retail-consumers. In the production process, problems such as poor production quality and shoddy products are likely to occur in the manufacturing process. Quality problems caused by processing environment and technical problems, product quality problems caused by the deterioration of agricultural products due to the transportation process, etc. are prone to occur in the distribution link of products from distributors at all levels to consumers. There are many links in China's agricultural product supply chain. As a result of information asymmetry in each link, the degree of distrust among the business entities in the supply chain has increased, which has increased the management difficulty and operational efficiency of the supply chain. For consumers, due to the long distance of agricultural products from the place of production to the market, consumers cannot understand the relevant data of agricultural products in the production process and transportation process, and their trust in the product quality of agricultural products such as vegetables, fruits and fresh fish is decreasing. The degree of concern or doubts about food problems that are easy to appear in the production, processing, circulation and agricultural products is gradually increasing, as shown in Fig. 1.



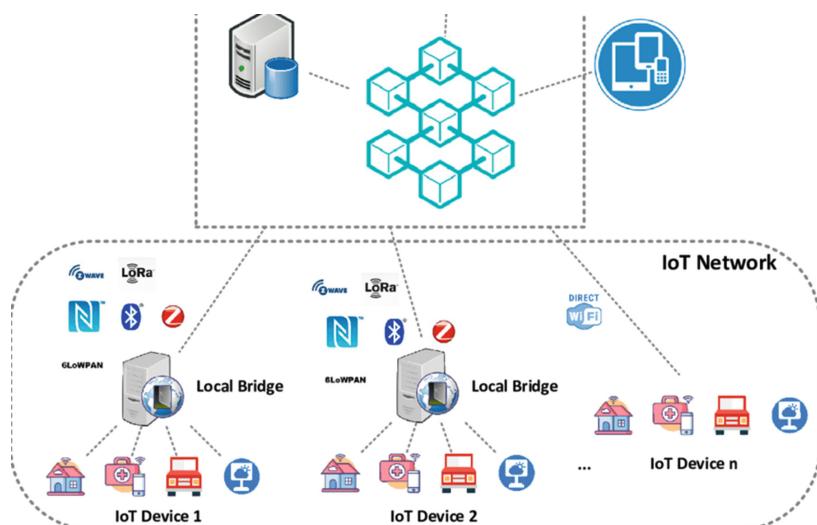
**Fig. 1.** Blockchain technology application in agricultural product supply chain

It has the characteristics of decentralization, data security and transparency, and non-tamperability. The non-tampering feature of the blockchain fundamentally changes the centralized credit creation method, which can effectively solve the problem caused by the mistrust between the subjects in the supply chain. The distributed shared ledger can store the records of digital transactions to ensure the transaction under the premise

of data security [5]; it is ensured that multiple stakeholders in the supply chain can access the records on the chain. Therefore, the characteristics of data information sharing and data security on the chain of blockchain technology can effectively solve the current supply chain of agricultural product [6, 7].

### 3 Supply Chain of Agricultural Product Operation Mechanism Under Blockchain Technology

A supply chain of agricultural is constructed on the basis of blockchain technology. The information flow of agricultural products in this supply chain exists on the entire blockchain, and the corresponding subjects can obtain relevant information according to their own authority, and the specifically constructed supply chain of agricultural product runs the mechanism is shown in Fig. 2.



**Fig. 2.** Operation mechanism supply chain of agricultural product under blockchain technology

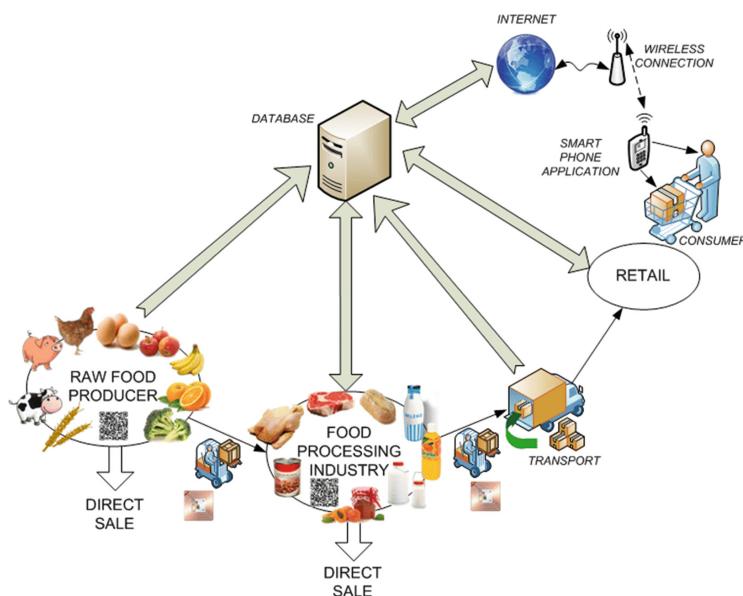
First of all, farmers or farms need to be reviewed by the regulatory authorities and platforms. The review of the identity and qualifications of their suppliers can ensure the authenticity and quality of the products at the source. After the suppliers enter the blockchain platform, their basic information Business products, addresses, and operator information are all stored in the corresponding distributed database, and entities with the authority to view supplier information in the entire supply chain can view their information at any time [8].

In the production agricultural products process, it is necessary to add a QR code or corresponding unique identification electronic label to each object, so that the basic information of each product is stored in the blockchain database, and the subsequent information of the supply chain product will be passed the unique identification

electronic label is matched, so that the information of the agricultural product in the supply chain is complete, so as to realize the traceability function of the product. For agricultural product fertilization, breeding and other operations and the monitoring of its growth process, one is dependent on the on-site monitoring system, and the other is to rely on the IoT technology to monitor the growth of agricultural products in real time, such as the temperature, humidity and soil of the growing environment. All-weather monitoring and appropriate adjustments to the job site based on the growth situation. The relevant information collected is linked to the blockchain, and each subject can view it according to their authority and needs.

In the harvesting, processing, packaging and quality inspection of agricultural products, electronic tags and Internet of Things technology are also used to track and record the information of the entire processing link. The electronic information files such as the materials and quantity of the products, packaging technology, and shelf life are stored in the district. The block chain is updated simultaneously, and the relevant material restrictions and other information of the processing process are verified with the commercial terms on the block chain to ensure the quality and safety of the product.

The processed agricultural products are transported and delivered through professional cold chain logistics. During the entire transportation and delivery process, the logistics data is connected to the blockchain, so that the logistics information of the product is always synchronized with the information in the blockchain. As shown in Fig. 3.



**Fig. 3.** Logistic data access to blockchain

In the distribution link and terminal consumption link, users can download the corresponding blockchain platform application APP, and query the product's situation in the entire supply chain through the unique identification code of the product on the user-side traceability system.

Due to the agricultural product supply chain, a regulatory agency role has been added. It can be a government agency or industry association that supervises the entire supply chain process such as the information flow and logistics of the entire agricultural product in the supply chain. Its responsibilities Including the identification, audit and supervision of agricultural product production enterprises, supervision of production and processing processes, supervision of transportation links, and random inspection of the quality of agricultural products, etc. [9].

In the operation mechanism of the agricultural products supply chain, according to the functional structure of the blockchain and its role scenarios, it is mainly divided into the data layer and the application and interface layer. The data layer centrally stores the information collected in each link in the blockchain, through the hash chain structure to ensure that the data cannot be tampered with [10]; the data layer uses time stamp and digital signature technology [11]; the application and interface layer provides agricultural product management functions and traceability information interfaces, The main body of each link in the supply chain can query information through this platform, and at the same time enter and read information according to the authority.

## 4 Development Path of Agricultural Product Supply Chain Under Blockchain

Due to its unique data immutability and decentralization, the agricultural product supply chain can help record the supply chain process of supervising agricultural products, and provide a traceability system for users in the supply chain. The authenticity and quality reliability of agricultural products are guaranteed to improve consumer satisfaction. However, the particularity of agricultural products and the continuous improvement of blockchain technology make the application of blockchain technology to operate agricultural product supply chains have certain restrictions, which can be mainly attributed to the following aspects:

- (1) The types of agricultural products are many and complex, and the production cycle is inconsistent. In addition, China's agricultural products are distributed in a wide area and involve many regions. The production of agricultural products to retail involves multiple subjects, which increases the complexity of the agricultural product. Establishing different types of agricultural products or building agricultural product blockchains according to different regions is an effective way to improve the operating efficiency of agricultural product blockchains [12].
- (2) Numerous types of agricultural products and wide geographical distribution lead to numerous links in the supply chain, which increases the number of information access nodes on the blockchain, which makes the entire blockchain database store a large amount of electronic data, and adds blockchain technology It is difficult to ensure the non-tamperability and security of data, so it is necessary to further

ensure and improve the operating efficiency of blockchain technology in systems with complex structures and huge data.

- (3) The establishment of the supply chain under blockchain technology involves the application of information technology from the stage of the production merchants entering the blockchain platform, including the later information entry, system use and management, which require certain information technology capabilities. However, the current agricultural product supplies. The main body of each link of the chain, such as farmers, retailers, etc., do not have certain information technology capabilities. At the same time, the use of blockchain technology will increase costs to a certain extent. Application is a huge challenge. Therefore, it is the future application trend of blockchain in the agricultural product industry to help the business entities of each link in the agricultural product supply chain understand and cultivate relevant information technology capabilities [13].

## 5 Conclusion

This article analyzes the current problems in the supply chain of agricultural products, introduces blockchain technology, and uses the advantages of blockchain technology to integrate the operating mechanism of the agricultural product supply chain; product supply chain can realize the functions of information openness, timely update of information, and information traceability. It has improved the problems of asymmetry in the main body information of each link in the supply to trace the source of product quality, thereby improving the operating efficiency of the agricultural product supply chain, and further proposed the development of agricultural product supply chain problems and paths under the blockchain. The decentralization of blockchain technology and non-tampering of data make it possible to improve the operating efficiency in the operation mechanism of the agricultural product supply chain, thereby increasing customer satisfaction. However, the current development of blockchain technology is in its infancy, and it is in the same stage as other industries the integration of innovation also requires more technical support and practical experience.

**Acknowledgments.** “2019 Young Talent Research Scholar Program of Shaanxi Province (2019KJXX-027)”; 2019 Graduate School-Enterprise Collaborative Innovation Fund Project of Northwestern Poly-Technical University (XQ201914); 2020 Program of Major Theoretical and Practical Issues in Shaanxi Province (2020Z388); 2020 School-level Talent Project of Weinan Normal University (20RC03).

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# Research on the Application of Internet + VR Technology in Garden Design

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**Abstract.** With the advent of digital and intelligent era, social life has undergone earth-shaking changes, such as the development of computer-aided technology, which has injected fresh blood into the design industry; especially the application of scientific and technological intelligent methods in landscape planning and design for planning designers Work provided convenience and promoted the modernization process in the field of design. In recent years, it is easier for designers to inspire inspiration by applying Internet + VR technology to the planning and design of landscape architecture. When designing, they can simulate a real scene on the computer, and the designer can intuitively experience the actual scene produced by the design plan. The effect is easy to adjust the design plan at any time according to actual needs. Compared with design drawings, with the assistance of Internet + VR technology, users can be on the scene and understand the designer's design ideas more intuitively. Internet + VR technology makes traditional graphic design three-dimensional, intuitive, efficient and convenient, and provides great convenience for modern landscape garden planning and design.

**Keywords:** Internet+ · VR technology · Gardens · Garden design

## 1 Introduction

As a computer-aided technology, the Internet + VR technology (Virtual Reality, VR) is unique in that it can simulate a lifelike three-dimensional virtual space. People can use some special equipment to interact with objects in the space to gain the realism of the virtual world. Nowadays, VR is widely used in garden planning and design. Its intuitiveness and interactivity make it easier for garden designers to control the entire design process and grasp the space more freely. The design of the scheme tends to be scientific and perfect [1]. Whether it is the decision makers of the scheme or the public, they can go deep into the garden scene in the VR demonstration system and experience the design intent from multiple angles in real time. VR can also simulate the garden construction site and arrange the construction schedule more reasonably, so that the entire construction process can be scientifically guided to ensure project safety [1]. VR has great potential for development and is an innovative direction to realize current construction modernization. The advantages shown by VR can provide more help to garden planning and design.

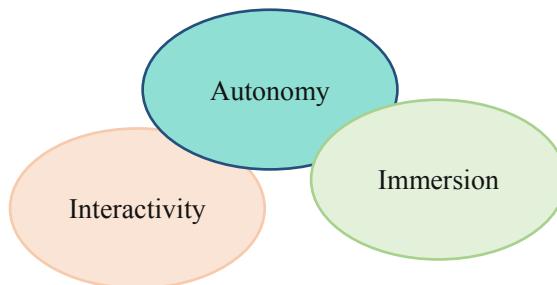
## 2 Internet + VR Technology

### 2.1 Overview

Internet + VR technology belongs to the category of computer processing technology. It mainly uses the user interface to provide users with intuitive feelings such as vision, hearing, and touch, which can reduce the user's workload in design and improve design efficiency [1]. At the same time, in the application of Internet + VR technology, with VR to indicate the operating status of different technologies, it can transparently avoid problems in all aspects of work. In addition, the Internet + VR technology can simulate and adjust the design plan according to the needs of users, and find the problems in the design in time and solve them in time; the Internet + VR technology can also optimize the design plan to meet the actual work requirements and ensure the quality of work completion [2].

### 2.2 Features of Internet + VR Technology

The characteristics of Internet + virtual technology are shown in Fig. 1.



**Fig. 1.** Features of Internet + virtual reality

#### 2.2.1 Immersion

Immersive The immersive nature of the Internet + VR technology means that users can be participatory. Through computer technology and the user's perception ability, they can truly feel the people and things around them in the virtual space. With the advancement and development of technology, users can also believe that people can exist in the virtual world [2]. Mature Internet + VR technology will allow the virtual world to achieve the same effect as the real world.

#### 2.2.2 Autonomy

Autonomy in the virtual reality world, objects are still operated according to the existing laws of physics [2]. For example, when an object is subjected to a force, it will move in the direction of the force, turn to the table or fall from the table to the ground. This is also true in the virtual reality world.

### 2.2.3 Interactivity

Interactivity In the virtual reality world, users can complete work tasks as in the real world, and connect with things in the virtual reality world [3]. Interactivity means that the user can control the objects in the virtual environment through the computer, where the user is the subject of interaction, and the things in the virtual reality world are the objects of interaction, and they are always in the virtual environment during the operation.

### 2.2.4 Simulation

Simulation With the help of Internet + VR technology, the user's sense of presence will be very strong. For example, if a person holds an object in the virtual reality world, the weight and touch of the object are the same as the real world [3]. The ideal degree of vitality makes it difficult for users to distinguish between true and false.

## 3 Types of Internet + VR Technology

### 3.1 Virtual Environment Modeling Technology

The construction of landscape garden scenes is mainly realized by 3DMAX, CAD and other software technologies. CAD is used to complete the plane of the garden scene, and then 3DMAX is used to complete the construction of the garden model, and then these elements are integrated and added to the three-dimensional model to obtain a rich landscape garden scene [4].

### 3.2 Real-Time 3D Image Generation Technology

Larger data is the main feature of designing a virtual environment. This feature will bring certain difficulties to large-scale garden scene modeling, resulting in difficulty in meeting the expected technical requirements [4]. Therefore, it is necessary to configure a high-performance computer to ensure that the quality of the graphics and the complexity of the scene are not reduced, so as to achieve the factual purpose and technical effects of the image.

### 3.3 Interactive Technology

In landscape design, the interactivity of Internet + VR technology should be continuously improved to effectively solve the unsolved problems in the interactive system [5].

### 3.4 System Integration Technology

It is mainly composed of five technologies, namely data conversion technology, information synchronization technology, data management model, model calibration technology and recognition synthesis technology [5].

## 4 Application of Internet + VR Technology in Garden Landscape Design

### 4.1 Before Design

CAD and 3DMAX technology should be reasonably selected according to the scale and characteristics of garden landscape design. Before creating a virtual environment, a computer can be used to construct an effect drawing of a three-dimensional garden landscape model by using Internet + VR technology, so that the designer has a clear understanding of the designed environment [6], as shown in Fig. 2. Therefore, designers should change the traditional detection methods of sand table and renderings, adopt scientific Internet + VR technology, and fully integrate the main elements such as stones, plants, buildings and related models into the three-dimensional model of the computer to construct a three-dimensional landscape garden model to test the effect of landscape garden design [6].

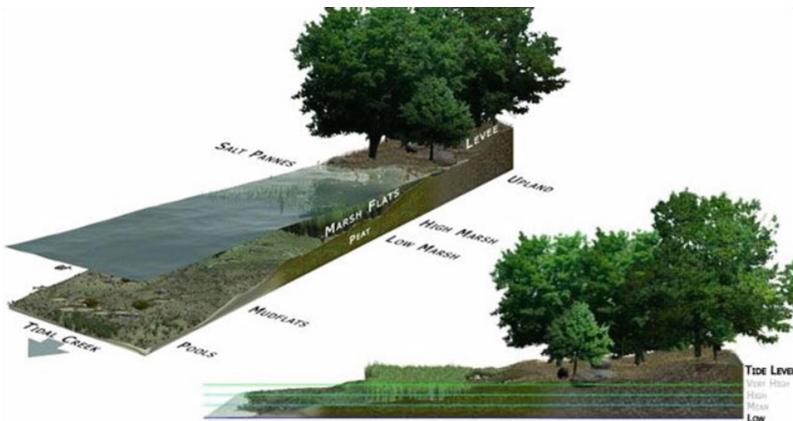


Fig. 2. 3D renderings constructed by virtual technology before design

### 4.2 Virtual Technology for Modeling

In the process of creating a virtual scene, modeling and design should be carried out in strict accordance with the following requirements [7]: 1) On the basis of ensuring a certain visual effect, reduce the number of models as much as possible, and after creating the garden landscape model, use it correctly. The optimization modifier in 3DMAX optimizes the visual effects of the garden scene and appropriately reduces the number of model faces, as shown in Fig. 3. 2) Reasonably use Instances copy, which is associated copy. In the process of establishing the virtual scene of the garden landscape, use the associated copy to form the associated copy object, and then use VRML to define the image surface of the associated copy object [8]. This processing method can also be used multiple times to increase the download time of the file. 3) In the process of creating a virtual scene, ignore the details of secondary objects as much as

possible and use “simulated” geometry as much as possible. For example, the surrounding secondary scenes can be made using the “geometry + texture” method to reduce modeling time. 4) The textures used in the virtual scene can be compressed in JPG format, and the size can be reduced reasonably according to the actual situation, thereby saving download time [9]. 5) As the VRML function searches for a specified texture catalog, in the process of creating a virtual scene, a catalog should be designed to put all the textures used in the virtual scene in the catalog, so as to facilitate VRML image search [7]. 6) Use lights and cameras reasonably to ensure the visual effects of landscape design [9].



**Fig. 3.** Virtual technology optimizes garden scene design

#### 4.3 Application of Virtual Environment Garden Components

In the process of creating a virtual environment, the requirements for the factors that make up the garden landscape plants, buildings, and stones: Because the stones, plants and buildings that make up the garden landscape are constantly changing, the designer first, when making renderings and 3D modeling [10].

A comprehensive simulation should be carried out from the space, time, color, sound and other aspects of the components of the landscape garden model, so as to continuously enrich the content of the three-dimensional garden landscape model. At the same time, the stone, plants, buildings and other things often used in garden design are systematically and comprehensively described using VRML processing methods to create a brand new, systematic and reasonable virtual garden landscape, as shown in Fig. 4. Finally, make full use of the camera to navigate in the virtual three-dimensional garden scene, and use related operations and activities to enrich the browsing map of the garden landscape, thereby improving the effect of landscape garden design [10].



Fig. 4. Virtual technology simulates the panoramic view of the garden landscape

## 5 Conclusion

Overall, Internet + VR technology is used in many scientific and technological fields in China, and the application technology in the field of landscape architecture is becoming more and more mature and the scope of application is getting wider. Internet + VR technology involves many aspects of technology in landscape architecture design, and it plays a key role in landscape architecture design. These key technologies have improved the effect of landscape design to a certain extent, thereby promoting landscape design to achieve certain design goals.

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# Application Research of Power Big Data Decision Based on Artificial Intelligence

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**Abstract.** With the development of artificial intelligence and big data, traditional data computing technology and intelligent analysis technology are undergoing profound changes, and a new platform for intelligent analysis of big data is gradually emerging. The data of power industry is growing rapidly due to the in-depth development of power big data, and the business demand for intelligent analysis of a large number of power data is increasing day by day, so the construction of power big data decision platform is of great significance. Therefore, the purpose of this paper is to study the application of power big data decision-making based on artificial intelligence. In this paper, based on artificial intelligence, big data technology and general big data analysis platform architecture are deeply explored and studied, and the shortcomings and core requirements of big data intelligent analysis platform in power industry are analyzed. Aiming at the existing problems and demands, this paper proposes a power big data decision-making platform. Then, the key technologies are realized in three aspects: high availability, scalability and computing performance, all of which adopt advanced artificial intelligence technology. Based on the platform construction, this paper tests and verifies the usability, correctness and efficiency of the platform through experiments. Finally, combined with the ultrasonic test data of practical units, the ultrasonic partial discharge signal recognition system based on power big data decision-making platform is studied and implemented. In this paper, the validity and accuracy of the recognition system are verified by experiments with ultrasonic test data, and the scalability and efficiency of the platform are further verified. Through experimental research, it is found that the power big data decision-making platform proposed in this paper has good stability and strong preprocessing ability, and the processing time is about 5% faster than the traditional data computing technology on average, so it has good power big data decision-making ability.

**Keywords:** Artificial intelligence · Power big data · Decision platform · Ultrasonic test

## 1 Introduction

As the basis of energy supply for human life and economic development, power grid intelligence has become the theme of power grid development at home and abroad in recent years. The construction of smart grid needs the support of artificial intelligence

technology, power big data processing and original power infrastructure such as transmission and distribution. With the development of smart grid, more data sources have been brought by intelligent power grid. Facing the explosive data growth brought by smart grid construction, the previous data processing technology can no longer meet the demand of fast processing and intelligent analysis of massive data. The power big data decision-making platform based on artificial intelligence is an inevitable demand for informationization of power industry and intelligence of power grid.

Intelligent decision support system originated in the early 1980s. Since its emergence, due to the great potential of expert system technology in the field of management decision-making, researchers at home and abroad have done a lot of research, integrating tools and methods such as computer science and artificial intelligence with human decision-making process, and intelligent decision support systems with various structures and functions have emerged. Goodin summarized the system's ability to support and learn decision-making process, and discussed the decision frequency platform model from the perspective of knowledge system evolution. From the perspective of knowledge, learning and evolution ability, the intelligence of the system is gradually deepening. Domestic experts and scholars have done a lot of research on the connection between artificial intelligence and power big data, and achieved a lot of results [1]. Jin Xiaolong believes that big data is the foundation of artificial intelligence. If there is no massive data, the intelligence of the machine will not be generated out of thin air. It is precisely because of big data and a lot of computing power that the machine can discover intelligence from it and become various products of artificial intelligence [2].

In this paper, aiming at the application research of power big data decision-making based on artificial intelligence, based on artificial intelligence, through in-depth research and comparison of big data technology and related platform architecture, the shortcomings and core requirements of the current power industry big data intelligent analysis platform are analyzed. A power big data decision-making platform is proposed, which can communicate through a unified interface, and theoretically expand the power intelligent analysis business infinitely horizontally. And the problem of repeated calculation is improved, the speed of real-time processing is optimized, and the efficiency of processing massive data is greatly improved. Finally, the effectiveness and accuracy of the recognition system are verified by the ultrasonic test data. It provides effective data for decision-making and application of power big data, and also lays a good foundation for technical research in this area.

## 2 Technical Research on the Application of Power Big Data Decision-Making Based on Artificial Intelligence

### 2.1 Artificial Intelligence

Artificial intelligence is a new technical science that researches and develops theories, methods, technologies and application systems for simulating, extending and expanding human intelligence.

Artificial intelligence is a branch of computer science, which attempts to understand the essence of intelligence and produce a new intelligent machine that can respond in a similar way to human intelligence. The research in this field includes robot, language recognition, image recognition, natural language processing and expert system [3]. Since the birth of artificial intelligence, its theory and technology have become increasingly mature, and its application fields have been expanding. It is conceivable that the scientific and technological products brought by artificial intelligence will be the “container” of human intelligence in the future. Artificial intelligence can simulate the information process of human consciousness and thinking. Artificial intelligence is not human intelligence, but it can think like human beings, and it may surpass human intelligence [4].

## 2.2 Power Big Data

Power big data is a new asset of power companies, which can promote the business management of power companies to develop in a finer and more efficient direction. Big data technology will promote the upgrading and transformation of information technology platforms, including improving the ability of data storage and timely processing; Supplement the ability to analyze and utilize unstructured data; enhance the ability to mine the value of massive data resources.

In the application process of power big data, there are a large number of association analysis needs for energy data, weather data and other types of data inside and outside the industry. Through the interaction and integration with the data outside the industry, as well as comprehensive mining and analysis on this basis, the power big data will play a greater value [5].

Power big data mainly comes from power generation, transmission, substation, distribution, power consumption and dispatching, which can be roughly divided into three categories. Power grid operation, equipment inspection or monitoring data. It mainly includes energy management system, distribution network management system, wide-area measurement management system, production management system, power grid dispatching management system, fault management system and image monitoring system. Marketing data of power enterprises, such as transaction price, electricity sales, electricity customers and other data. Mainly included in the marketing business system, electric energy metering system, electricity consumption information collection system, etc. Management data of electric power enterprises. Mainly included in the collaborative office system, enterprise resource planning system, etc. [6].

## 2.3 Power Big Data Decision Platform

### (1) Extensibility

Scalability refers to the ability of a system to adjust its own computing and processing performance by increasing or decreasing its own resources on the premise of minimal impact on the existing system. On the premise that the underlying infrastructure of the system is basically unchanged, the internal service relevance of the system is low, and it can flexibly respond to changes in demand; And with

the change of the underlying resources, the performance of the system itself can change linearly. To realize the scalability of system architecture design, it must meet the open closed principle of software design pattern, and the intelligent analysis platform of power big data is no exception. Starting from the overall requirements of the above-mentioned platform, to realize the requirements of extensibility, it is necessary to design the “loose coupling” between the five levels, aiming at realizing that the five levels of services of the platform can be flexibly and linearly extended horizontally, and have the ability to provide independent external services to meet the extensible requirements of the platform [7].

## (2) Availability

Availability refers to the characteristic that an existing system can effectively access or continuously provide stable services. The industry usually refers to the unavailability of the system as a system failure, and how many 9s are generally used to measure the availability of the system. For example, the availability of WeChat is four 9s. Availability is an important evaluation index of system architecture design, and the annual availability index of a system is calculated as follows:

$$A = (1 - T_u/T_a) * 100\% \quad (1)$$

Where A is system cycle availability,  $T_u$  is system cycle unavailability time,  $T_a$  is total cycle time [8].

## 2.4 Ultrasonic Partial Discharge Signal Identification System

In order to further verify the availability, correctness and efficiency of the power big data decision-making platform, this paper fits the theme of smart grid, combines the ultrasonic experimental data of distribution switchgear in the actual scene, realizes the ultrasonic partial discharge signal recognition system based on artificial intelligence, and further verifies the availability of all levels of the platform through system operation experiments [9].

Ultrasonic audio signal has the characteristics of short-term stability, and the signal changes relatively little within the frame. The feature extraction module takes the frame as the smallest processing unit to extract the audio signal features, and can get the parameters that reflect the audio characteristics properly and accurately.

In signal processing, VARiance (var) is used to calculate the deviation degree between signal strength and overall mean value, and the calculation formula is as follows:

$$\text{VAR} = \frac{1}{N-1} \sum_{i=1}^N (x(i) - \bar{x})^2 \quad (2)$$

Where  $\bar{x}$  represents the average value of each frame of audio signal, N is the number of sampling points of signal in unit audio frame and x (i) is the sampling signal in unit audio frame.

Kurtosis (BK) is used to characterize the aggregation degree of signal strength, and the calculation formula is as follows:

$$BK = \frac{\sum_{i=1}^N (x(i) - \bar{x})^4}{(N - 1)sd^4} \quad (3)$$

Where sd is signal standard deviation,  $\bar{x}$  is signal average,  $x(i)$  is audio signal, N is the number of sampling points in audio frame [10].

### 3 Experimental Research on the Application of Artificial Intelligence-Based Power Big Data Decision-Making

#### 3.1 Experimental Data

In this paper, about 400 effective partial discharge signals and about 800 effective noise signals were collected, and the total size was 3.5G.

#### 3.2 Experimental Process

A total of about 800 ultrasonic audio samples were divided into training set and test set according to the ratio of 8:2, and then sent to the system data preprocessing module for preprocessing and feature extraction. After pre-processing, the training set is fully read into the batch layer of power big data decision platform for model training of SVM recognizer, and the test set is continuously sent into the flow computing layer of power big data decision platform for recognizer test experiment.

### 4 Experimental Analysis of the Application of Artificial Intelligence-Based Power Big Data Decision-Making

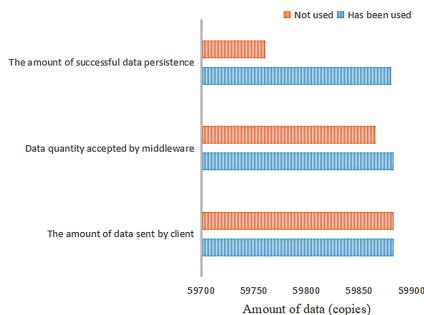
#### 4.1 Stability Analysis of Power Big Data Decision Platform

Whether the application based on power big data decision platform can run stably still needs to be verified. In this section, by monitoring the running status of the PD identification system based on the power big data decision platform under long-term operation, the availability of the whole system and the modules implemented at various architecture levels based on the power big data decision platform is verified. The total time of this experiment is 15 h. The simulation client continuously sends ultrasonic audio data to the system at an average speed of 1 data per second, and automatically triggers batch computing tasks every hour. The experimental results are shown in Table 1 and Fig. 1.

**Table 1.** Stability analysis of power big data decision platform

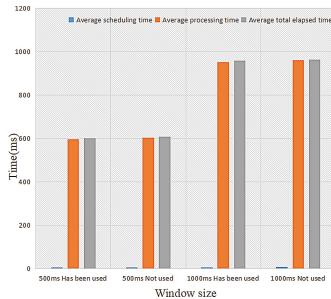
The amount of data sent by client	Data quantity accepted by middleware	Data loss rate of middleware	The amount of successful data persistence	Data persistence success rate	Number of system crashes
59,865 copies	59,865 copies	0.00%	59,860 copies	99.9916%	0

Within 15 h, the local client repeatedly traversed from 800 samples and continuously sent 59,865 ultrasonic audio data to the system. The whole power big data decision platform and local discharge identification system did not collapse. Data middleware does not lose data, which verifies the validity of middleware. The pre-processed data persistence failed twice, resulting in the overall loss of two valid structured data; After analysis, the data loss is caused by GC in Java virtual machine, that is, garbage collection; However, the overall persistence success rate is still 99.9916%, which meets the high availability index and verifies the high availability of data storage layer based on WAL and ECS. To sum up, the experimental results verify that the power big data decision platform can provide highly available data storage services for its applications.

**Fig. 1.** Comparison of processing data volume

#### 4.2 Comparison of Pretreatment Capability of Power Big Data Decision Platform

In this paper, by comparing the data preprocessing capabilities of power big data decision-making platform and traditional data computing technology, the data processing time when the analysis window is 500ms and 1000ms is compared respectively. In the experiment, there are great differences in data processing ability between them. As shown in Fig. 2.



**Fig. 2.** Comparison of pretreatment capacity

In this paper, ultrasonic experimental data samples are taken as data sources, and data are sent to the system at random intervals in the range of 500 ms to 1000 ms for testing. Experimental results show that the two window sizes can meet the real-time processing requirements of second-level processing. From the average total time, the pretreatment time with 500 ms window is shorter and the effect is better; From the difference between the average time and the window size, the difference is smaller with 1000 ms as the window, and the average time of stream processing is closer to the window value, so that the data can be processed within the window time, and the delay accumulation is smaller, which is more suitable for second-level processing scenarios. In addition, whether the window is 500 ms or 1000 ms, the pre-processing capability of the power big data decision platform proposed in this paper is better than the traditional data computing technology, with short time and high efficiency.

## 5 Conclusions

Based on artificial intelligence, this paper studies the application of power big data decision. In this paper, based on artificial intelligence, the existing big data technology and related analysis platform architecture are deeply explored and studied, and the shortcomings and core requirements of the current big data intelligent analysis platform in power industry are analyzed. Aiming at the problems and demands, this paper proposes a decision-making platform for power big data. Then the usability, correctness and efficiency of the platform are tested and verified by experiments. Finally, combined with the ultrasonic test data of practical units, the scalability and efficiency of decision-making platform based on power big data are studied and realized. The power big data decision-making platform proposed in this paper has good stability and strong preprocessing ability, and can provide fast and reliable intelligent data services for power industry, smart grid and other power grid businesses, which is of great significance to the development of power big data.

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# Traffic Safety Early Warning Methods in the Environment of Internet of Vehicles

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**Abstract.** Traffic intersections are hubs in the transportation network, but traffic intersections have become areas with a high incidence of traffic accidents due to their many branch intersections, dense vehicles, and complex traffic conditions. However, the use of Internet of Vehicles related technologies to solve such problems has been considered an effective program. This article mainly introduces the traffic state recognition and traffic safety early warning methods in the environment of the Internet of Vehicles. This paper uses the Internet of Vehicles to detect the real-time dynamic speed of the vehicle, and establishes a potential time-discrete model. The model is solved by the Kalman filtering method, the road conditions are evaluated, and the model is revised using historical data to improve the accuracy of the traffic condition evaluation. The experimental results of this paper show that the safety early warning algorithm reduces the occurrence of traffic accidents by 13%, and reduces the rate of false alarms and false alarms. Finally, the impact of the full early warning system on reducing the severity of the accident is analyzed by comparing the speed of the vehicle when the accident occurs.

**Keywords:** Car networking environment · Traffic safety warning · Dangerous state recognition

## 1 Introduction

At present, the availability of social vehicle on-board data is very low, but the urban traffic control technology based on the vehicle Internet has been very mature. This technology is very convenient for obtaining vehicle identification, local time, location, speed, acceleration and other information [1, 2]. In the Internet of Vehicles environment composed of intelligent systems installed in the vehicle system, the intelligent road edge system and the central monitoring platform system can realize the assessment of road traffic conditions. It can be used as a basis for checking traffic priority and is useful for researching roads. Status and early warning are of great significance [3].

The intelligent vehicle network uses advanced information technology to establish an efficient integrated vehicle transportation system, which has been highly valued by industry and academia [4]. The Internet of Vehicles (IoV) in the urban environment operates in a wireless environment with high bit error rate and interference [5]. Wang Z proposed a reliable routing algorithm with network coding (RR\_NC) [6]. The multi-metric ant colony optimization algorithm (MACO) is used to discover a sequence of

routing nodes in IoV from source to destination, and then clusters are formed around each node in the sequence [7, 8]. By adding linear coding to the data transmission between vehicle clusters, RRNC provides a more reliable transmission and can restore the original message in the event of confusion and message loss. But because the message recovery process is too complicated, the data result is not very accurate [9].

The innovation of this paper is to propose a dangerous state recognition algorithm based on the speed-following distance curve in the road segment scene. Calculate the ideal straight line and the safety threshold range of the following distance according to the driving trajectory of the vehicle, use this as the basis for judging the safe driving of the vehicle, and establish the probability calculation method of the segment function. The probabilistic representation of the vehicle's dangerous state provides a basis for real-time warning [10].

## 2 Traffic Safety Warning Methods in the Environment of the Internet of Vehicles

### 2.1 Road Traffic Safety Situation Assessment Method

#### (1) Weight assignment method

Weight refers to the degree of contribution of the influencing factor index in the evaluation system. It represents the degree of influence of different indexes on the evaluation result under the same degree of index change. The weight coefficient is a comprehensive reflection of the decision-maker's subjective tendency and the physical attributes of the influencing factors, and is the relative importance of each factor in the multi-factor system to the decision goal.

Decision makers play an important role in the evaluation of indicator weights. Decision makers can guide the evaluation results to meet the needs of evaluation. However, if the subjectivity is too strong and the information contained in the data itself is ignored, the objectivity of the evaluation results cannot be guaranteed.

The effects of various factors in the road traffic system are not independent, and the effect of a single factor on the safety situation of the entire road traffic system is also affected by other factors. Therefore, when determining the importance of a certain factor to the road traffic safety situation, the complexity of the system and the influence relationship between the factors should be fully considered. The subjective weight assignment method can accurately reflect the importance of the relationship between the indicators to a certain extent, but it is difficult to rule out personal subjectivity. However, it is difficult to fully consider the complexity of the system, and there is a difference between the result of the assignment and the objective facts.

#### (2) AHP

Analytical Hierarchy Process (AHP) is a multi-level weight analysis method that combines qualitative and quantitative analysis. According to the law of understanding things from easy to difficult, this method divides complex problems into several orderly and reasonable levels. By analyzing each relatively simple level layer by layer, the importance of each index relative to the decision goal is

obtained. Through mathematical methods, the relative importance of each index is converted into weight values, and different decision-making plans are sorted to find the best decision-making plan.

There are  $N$  evaluation indicators,  $a_i$  and  $a_j$  are used to represent the  $i, j$  CCC factor, and  $a_{ij}$  DDD is the relative importance value of  $a_i$  to  $a_j$ . And constitute the judgment matrix D.

$$D = \begin{bmatrix} a_{11} & \dots & a_{1N} \\ \dots & \dots & \dots \\ a_{N1} & \dots & a_{NN} \end{bmatrix} \quad (1)$$

According to the judgment matrix, find the eigenvector  $W$  corresponding to the largest eigenroot  $\lambda$ , the formula is as follows.

$$P_W = \lambda_{\max} W \quad (2)$$

Normalize the required feature range to classify the significance of each evaluation factor, that is, the weight value.

Regardless of whether the above weight distribution is reasonable or not, the consistency test of the crisis matrix is also needed. The test shall use the following formula:

$$CR = CI/RI \quad (3)$$

In the formula, the random consistency ratio of the judgment matrix is represented by CR; the general consistency index of the judgment matrix is represented by CI. It is given by

$$CI = (\lambda_{\max} - N)/(N - 1) \quad (4)$$

RI represents the average random consistency index in the standard table.

## 2.2 Traffic Safety Warning Methods

### (1) Target rapid acquisition of technology

Combining with the current development direction of the latest image processing algorithms, an improved background difference algorithm is used to establish a background model based on the statistical information of color, texture and shadow, so that the background in complex scenes can be better removed; the ant colony optimization target detection method is adopted, It can solve the problem of target detection of vehicles and pedestrians in complex backgrounds. Fast and accurate segmentation of moving vehicles in dynamic video, while removing non-target interference.

## (2) Traffic accident identification technology

During the cumulative time of the event, the system cannot give effective prompts to vehicles entering the area, resulting in a systematic time blind zone, which is likely to cause secondary accidents. For information and events that have a greater impact on vehicle traffic, hidden traffic safety hazards, and easily cause traffic accidents, we can classify typical traffic accident events according to their safety impact levels. For those that have a greater impact on traffic safety (large risk factor) Accident events adopt rapid detection and processing methods, which can ensure the average detection accuracy of the system, and can greatly shorten the detection time of typical event detection, thereby effectively reducing the system time blind zone.

## 3 Traffic Safety Early Warning Experiment

### 3.1 Early Warning Data Collection

The real-time speed of the front and rear cars, the real-time distance between the front and rear cars, the safety distance calculation method, the decision-making and activation method, etc. are the main elements of the collision avoidance function. The performance of functions such as safe distance calculation, decision-making and early warning activation are all processed and integrated through the integrated MCU micro-control terminal unit. Driving speed acquisition usually uses CAN bus data acquisition unit. In some safety systems or products that require a higher data transmission rate, the vehicle speed data collected by the CAN bus must first go through a protocol analysis process, and then the analyzed data is transmitted to the terminal to achieve subsequent related functions. Therefore, when designing systems that require real-time data, such as collision warning, third-party sensor products can also be used to measure driving speed.

### 3.2 Traffic Status Design

Considering the simulation of mixed traffic conditions including conventional vehicles and public transport vehicles, this article will evaluate the performance of different public transport integrity evaluation systems. In order to consider the current and future possible traffic conditions, determine the traffic conditions from low to high traffic volume and from low to high density, and evaluate the traffic condition plan and the completeness of different public transportation vehicles according to the percentage, especially the evaluation and the completion rates of traffic conditions are 0.5%, 1%, 2%, 5% and 10% respectively. Considering that the parameters of a small model (such as demand, destination characteristics, and vehicles) are random, this document aims to simulate the state assessment performance of each completeness percentage under five environmental traffic conditions. The platform parameters are shown in Table 1. It can be seen from the data in the table that the observation noise and the noise of the system process are relatively large. This means that the initial value is far from the actual value, which verifies the effectiveness and accuracy of the algorithm.

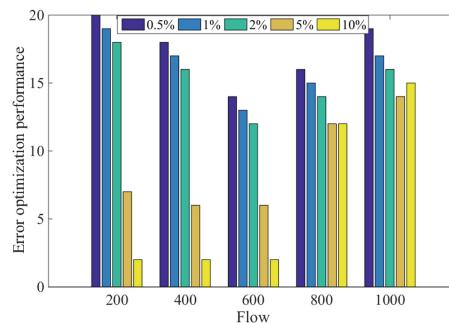
**Table 1.** Traffic platform parameter setting

Parameter	Value	Parameter	Value
Input flow	200, 300, 500	Departure interval	10
Vehicle speed	Measured speed	Error threshold	1
Front and rear flow	Measured speed	Experiment step	100–200
Share	0.5, 1, 2	Noise matrix variance	[10, 9, 20]

## 4 Traffic Safety Early Warning Analysis Under the Environment of Internet of Vehicles

### 4.1 Traffic State Estimation Algorithm in the Networked Car Environment

Perform corresponding simulations and solutions to the state assessment model and the estimation correction model, and compare with the corresponding vehicle assessment results. The result of the situation evaluation should be evaluated by the error indicator. This method is demonstrated through three aspects: traffic conditions, completion rate and efficiency and benefit of error optimization. The results of calculating the error index are shown in Fig. 1:

**Fig. 1.** Error optimization performance of the modified model

From the data in the table, it can be seen that on the same road, under five environmental traffic conditions with a flow of 200 veh/h, 300 veh/h, 500 veh/h, 800 veh/h and 1200 veh/h, the cycle environment is free Flow to saturated flow, the error rate of Kalman filter analysis should not exceed 15%. The results show that the locomotive and rolling stock condition assessment model can achieve good condition assessment performance in all completeness reports. Under different integrity conditions, the flow rate does not exceed 800 vehicles per hour, and the error rate of state assessment does not exceed 11%. This result confirms the accuracy of the assessment of the situation under such traffic conditions. Especially when the traffic volume is

500 vehicles/h, the error rate of the state assessment is significantly reduced, and each completeness percentage decreases by about 1%, which further confirms that the evaluation effect is better in this traffic environment. When the traffic volume exceeds 800 vehicles per hour, the traffic flow will have a large congestion change, causing the error indicator light to start to increase again, but this did not exceed the ideal expectations. When the flow rate reaches 1200 veh/h, the maximum error rate reaches 13%, which still does not exceed the 15% error deviation limit.

This result proves the validity and accuracy of the state evaluation results, and satisfactory results can be obtained even under complicated traffic conditions. Not only that, even if the occupation rate is as low as 0.5%, the result is still satisfactory. It should be noted that with the increase in the share, the efficiency of the system continues to improve. Especially when the completion rate reaches 5%, the improvement of system performance will be more obvious, and the improvement of system performance will be close to the maximum value. After that, the completion rate and the improvement effect of system performance will be flat, until all vehicles on the road are connected vehicles. From the perspective of financial benefits, a completion rate of about 5% is a key completion rate, which can save costs and obtain higher returns.

#### 4.2 Anti-collision Warning Safety Distance

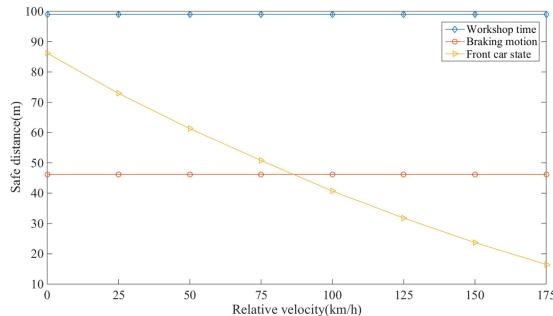
The safety distance of the improved model in the state of the preceding vehicle has nothing to do with the speed of the next vehicle, only the relative speed of the two vehicles, and the safety distance based on the braking process model and the time-to-vehicle model is related to the speed. Suppose the speed of the following car is a uniform speed of 100km/h, and the three models are analyzed through changes in relative speed. The experimental conditions and results are shown in Table 2.

**Table 2.** Experimental data of traffic safety distance

Model	Initial speed (km/h)								
	100	90	80	70	60	50	40	30	
Braking process model	99	99	99	99	99	99	99	99	99
Workshop time model (m)	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2
Improved model (m)	86.2	72.9	61.3	50.8	40.7	31.8	23.7	16.5	

Further analysis of the experimental results shows that when the relative speed of the two vehicles is high, the safety distance calculated by the braking process model is very long, and it is easy to produce incorrect warnings. The safety distance calculated based on the time travel model is too small to guarantee an effective warning; when the relative speed is low, the driving distance of the vehicle will not be relatively reduced, but it will not reduce the safety of the two models. Since the improved vehicle model takes into account the movement of the front and rear vehicles, the distance between the vehicles does not need to be adjusted when the conditions of the vehicle in front are

consistent, which avoids the above situation. The relationship between the safety distance and vehicle speed of the three types of vehicles is shown in Fig. 2.



**Fig. 2.** The correlation curve between safety distance and speed

## 5 Conclusions

Although this article has made some research results on the introduction of the Internet of Vehicles environment and the anti-collision safety early warning model, there are still many shortcomings. The traffic early warning method based on the Internet of Vehicles environment still has a lot of in-depth content worthy of study. There are many steps in the early warning decision-making process that have not been involved due to reasons such as space and personal ability. In addition, the actual application effect of the improved algorithm can only be compared with the traditional model from the level of theory and simulation.

### Acknowledgement.

**Fund Project 1:** This paper is the mid-stage research result of a new generation of information technology project in the key fields of ordinary colleges and universities of the Guangdong Provincial Department of Education “Research and Application of Traffic Safety Early Warning System Based on 5G Internet of Vehicles” (Project No:2020ZDZX3096)from Guangzhou Nanyang Polytechnic College.

**Fund Project 2:** This is the phased research result of the “Research on Security Mechanism and Key Technology Application of Internet of Vehicles” (Project No: NY-2020KYYB-08) from Guangzhou Nan yang Polytechnic College.

**Fund Project 3:** This paper is the research result of the project of “Big Data and Intelligent Computing Innovation Research Team” (NY-2019CQTD-02) from Guangzhou Nan yang Polytechnic College.

**Fund Project 4:** This paper is the research result of “Innovation and Strong School Project” – “Research on Vehicle Collision Warning Method Based on Trajectory Prediction in Internet of Vehicles” (Project No: NY-2020CQ1TSPY-04) from Guangzhou Nan yang Polytechnic College.

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# Construction of Knowledge Graph Corpus Under the Framework of Artificial Intelligence

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**Abstract.** In recent years, artificial intelligence technology has been widely used. With the development of artificial intelligence technology, the traditional corpus building mode has entered the era of knowledge atlas corpus. In this process, artificial intelligence technology plays an important role, but at the same time, the existing construction technology of artificial intelligence knowledge graph corpus is still insufficient. Therefore, this paper establishes the research on the construction of knowledge graph corpus under the framework of artificial intelligence. This paper makes an in-depth study on the characteristics of corpus data under big data. According to the results, the construction of corpus under big data is faced with various types of data and uneven data quality. How to build a corpus under big data needs to be carried out from many aspects. In view of these problems, this paper puts forward the optimization and improvement strategy. The strategy is mainly operated from corpus construction and text preprocessing, optimization of knowledge reasoning algorithm, and knowledge fusion. Through the optimization measures in this paper, we can make up for the shortcomings of the existing knowledge graph corpus construction method. Compared with HanLP algorithm, the accuracy of part of speech tagging is improved by 27.242%, recall rate is increased by 20.364%, and harmonic average value is increased by 23.866%. Moreover, the accuracy of calculation is greatly improved by weighting.

**Keywords:** Artificial intelligence technology · Corpus construction · Knowledge graph · Big data technology

## 1 Introduction

The development of artificial intelligence in China has experienced ups and downs since it was first proposed in 1956. With the improvement of cloud computing capability, the breakthrough of core algorithms, the support of massive Internet big data and the increase of investment, artificial intelligence have entered a new era. In recent years, human beings have made great breakthroughs in the frontier of science and technology. Artificial intelligence has become the focus of global science and technology and a key competitive field of all countries in the world [1–3]. In order to ensure national security, improve international competitiveness and seize strategic opportunities, since 2015, the central government has issued a series of policies, and the development of artificial intelligence has been raised to the national strategic level. In order to better develop

artificial intelligence, we must recognize its current development status, on this basis, make accurate judgment on its future development direction, and help the healthy development of the industry [4–6].

With the development of artificial intelligence, the traditional corpus building mode has entered the era of knowledge graph corpus. Traditional corpora are only static storage of text, audio and video, and lack the relationship between things. However, knowledge atlas is an artificial intelligence corpus based on ontology and semantic network, which has established a wide range of connections, and can better mine the association and hidden information between things [7, 8]. At present, knowledge graph corpus is widely used. It can not only search the knowledge base and return the search results, but also support the reasoning of complex problems. The application of knowledge graph technology in the field of knowledge service can make the service system more intelligent, convenient and personalized, and bring more efficient and accurate services to people [9, 10].

This paper makes a deep research on the characteristics of various types of corpus data. Through comparative analysis, it can be seen that the current corpus data in China mainly have the problems of large quantity, variety, fragmentation, and uneven data quality. As a result, the accuracy of the corpus is not high and its practicability is not strong. To solve these problems, this paper optimizes and improves the traditional construction method of artificial intelligence knowledge graph corpus. The optimization strategies in this paper mainly focus on corpus construction and text preprocessing, knowledge reasoning algorithm optimization, and knowledge fusion. In the optimization of knowledge reasoning algorithm, this paper simplifies the traditional algorithm, reduces the calculation steps and improves the accuracy of calculation. In the process of knowledge fusion, according to the characteristics of different data, targeted steps are optimized. In the related comparative experiments, the experimental results also further show the effectiveness of this paper, especially in the accuracy, recall rate, harmonic average has been greatly improved. The analysis shows that the research in this paper has achieved ideal results and made a contribution to the construction of knowledge graph corpus in China.

## 2 Knowledge Graph and Construction Technology

### 2.1 Knowledge Graph

Knowledge graph is a kind of structured semantic knowledge base, which expresses concepts and their relationships in the real world in the form of symbols. In the aspect of knowledge representation, it mainly adopts triple form. In the real world, entities represent abstract concepts or existing things, and are represented by nodes in the graph. The relationship between two entities is called a relationship and is represented by directed edges between nodes in the graph. For a large number of network data, the knowledge graph can be organized in an orderly way, and the method is “knowledge base + search”. At the same time, the entity or attribute values related to knowledge are presented in the form of graph, so that users can view the results more clearly and intuitively, instead of simply giving the relevant list. It combines information search,

reasoning and semantic information closely, and maps different levels of abstract concepts in the objective world into knowledge, so that the Internet can understand people's ideas to the maximum extent. At present, knowledge graph is mainly used for decision support and knowledge retrieval.

## 2.2 Construction Technology of Knowledge Graph

The construction of knowledge graph is to mine valuable information from structured, semi-structured and even unstructured text, and then integrate the information into knowledge and express it in the form of "graph" which is easy to understand. Knowledge graph is essentially a semantic graph composed of vertices and edges. Vertices represent entities, entities are physical objects in the real world, and edges represent relationships between entities. The construction of knowledge graph mainly includes manual construction, semi-automatic construction and automatic construction. Because the construction of professional domain knowledge graph needs to extract a large number of entities and relationships, if manual annotation is used, it will not only take time and effort, but also lose the significance of building knowledge graph. However, due to the inaccuracy of the calculation results, the expected effect cannot be achieved. At present, the semi-automatic construction of knowledge graph is the best, that is, the combination of manual and automatic. The construction of knowledge graph is a complex process, which needs the help of corpus linguistics, natural language processing, machine learning and other related theories and technologies.

## 3 Analysis of the Characteristics of Corpus Data Under Big Data

With the development of big data, through a variety of data mining, information extraction and knowledge fusion technology, the previously unrelated data are connected and integrated together to form a unified global knowledge base and various extended services based on knowledge base, namely knowledge graph. The data type of corpus presents a kind of knowledge graph. In the form of knowledge graph, massive fragmented and decentralized big data are connected to serve the real-time, dynamic and fragmented micro language requirements. For example, Baidu, Google and other companies have entered the stage of knowledge graph.

This paper sorts out the sources of corpus data, as shown in Table 1. Through the above analysis of corpus data sources, we find that the construction of corpus under big data is faced with the problems of diverse data types and uneven data quality. How to build a corpus under big data needs to start from many aspects. Therefore, we will put forward the construction mode of big data corpus around these aspects.

**Table 1.** Characteristics of corpus data under big data

	Data characteristics	Type	Main data types	Methods of corpus data acquisition
Internet data	Large quantity and diversity	Website, patent, term library	Terminology, text, unstructured data	Grab, auto sort
Enterprise data	Difficult to obtain, low dimension	Text based	Terminology, text	Database access
User generated data	Large amount of noise	Wechat, social platform	Text, unstructured data	Data mining
Machine generated data	Diversity, repeatability limitation	Self-creation	Knowledge graph	Neural network algorithm

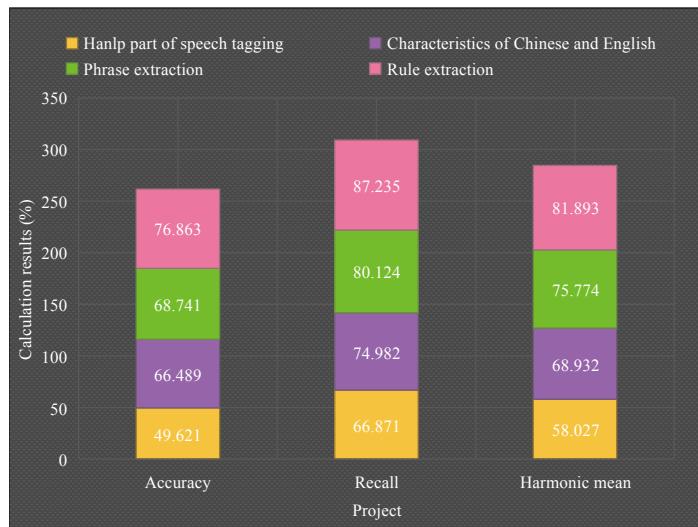
## 4 Discussion

### 4.1 Test Results and Analysis

This paper takes the result of manual annotation as the standard, but the result of manual annotation is subjective. Therefore, this paper improves the specific tagging strategy: firstly, according to the user-defined annotation rules and referring to the current main authoritative standards, the annotation results are more authoritative. Then other people (nonprofessionals and professionals) will check the results of manual labeling, and discuss and check the unreasonable ones. Finally, the final result of part of speech tagging is determined. The part of speech tagging in this part is based on HanLP tagging, and the effect of part of speech tagging is improved by adding a custom dictionary. Therefore, this section takes HanLP's partial speech tagging method as a comparison method, and compares with the improved voice annotation results of each part.

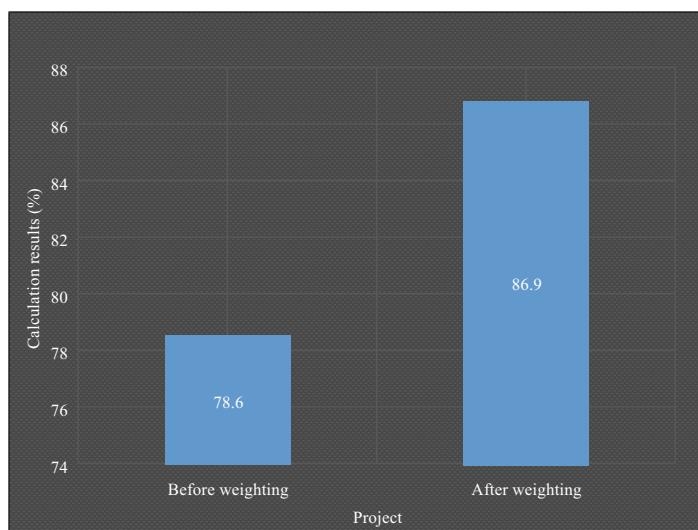
As can be seen from Fig. 1, compared with the original HanLP method, the accuracy, recall rate and harmonic mean of the proposed method are improved to varying degrees. The accuracy rate was increased by 27.242%, the recall rate was increased by 20.364%, and the average harmonic value was increased by 23.866%. The results show that the improved method can improve the results of HanLP part of speech tagging, which is of great significance to the follow-up research.

This experiment evaluates the performance of the model from the perspective of accuracy. According to the results of Fig. 2, the classification accuracy before weighting is 0.786, and the classification accuracy after weighting is 0.869, which is 8.3% higher than that before weighting. In this algorithm, since the vector distance is obtained by linear weighting of five attributes, each attribute feature has different degrees of influence in the process of entity extraction. If the less important attributes



**Fig. 1.** A comparative analysis of part of speech tagging results between this method and HanLP method

are overused, it will affect the classification results and produce a certain misleading effect. Experimental results verify the effectiveness of the algorithm.



**Fig. 2.** Comparative analysis of the algorithm results before and after weighting with accuracy angle

## 4.2 Analysis of the Concept of Information Teaching and Traditional Teaching Mode

Corpus is a database used to store language data. It is the basic resource of language research and application. The ultimate goal of corpus construction is to provide foundation and support for machine translation, intelligent retrieval and semantic indexing. However, there are few open source databases to study, especially in specialized areas. Therefore, self-built corpus is a common method in corpus based scientific research. The construction of small corpora should first consider the significance of corpus construction, the types of corpora to be processed, the specification of corpus sampling, the scale of corpora and the storage format of corpora. The general process is: collecting corpus, sorting, preprocessing, adding retrieval function. However, there are no strict standards for self-built corpora. The only requirement is the authenticity and reliability of corpora, which conform to the basic characteristics of corpora.

## 4.3 Knowledge Reasoning Optimization Algorithm

In this paper, we use the path sorting algorithm based on graph reasoning to realize the knowledge reasoning of knowledge graph and the mining of learning path in knowledge graph. The basic idea is to treat the problem schema of knowledge graph as a graph, in which the problem or task is the node and the association is the edge. Starting from the initial problem-solving state, the target problem-solving state is realized through a certain path, and the learning path of the initial problem-solving state and the target problem-solving state is mined. Suppose the relationship path  $P = R_1 \cdots R_1$ , the seed node  $S \in \text{domain}(P)$  is specified, and the path constraint walking is set as  $h_s, P$ . If  $P$  is an empty path, it is shown in Eq. (1).

$$h_s, p(e) = \begin{cases} 1, & \text{if } e = s \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

If  $P = R_1 \cdots R_1$  is non null, let  $P' = R_1 \cdots R_{1-1}$ , as shown in Eq. (2), be equal to the following equation:

$$h_s, p(e) = \sum_{e' \in \text{range}(P')} h_s, P'(e') \cdot P(e|e'; R_1) \quad (2)$$

Given the path  $P_1, \dots, P_n$ , each node  $e$  is regarded as the path function  $h_s, p(e)$  of the node, and the nodes are sorted as shown in formula (3)

$$\theta_1 h_s, p_1(e) + \theta_2 h_s, p_2(e) + \cdots + \theta_n h_s, p_n(e) \quad (3)$$

## 4.4 Knowledge Fusion

Knowledge merging refers to the need to add existing structured data to other knowledge bases in the process of building knowledge graph. Its core feature is how to play the role of multi-source data system. In a large number of scattered heterogeneous

data, accurate positioning of fusion objects is one of the keys, including merging other knowledge bases or databases.

There are two levels of integration with the knowledge base:

- (1) Data layer fusion, namely the attributes, relationships and categories of entities, mainly solves the conflicts among entities, attributes and relationships.
- (2) Schema level fusion refers to the fusion of two knowledge bases from different sources or different knowledge representation forms, including merging relational databases and integrating data from existing databases into knowledge atlas. Existing databases include relational databases and non-relational databases.

The process of knowledge fusion includes three steps

- 1) Knowledge extraction and storage;
- 2) Knowledge fusion is the purpose of knowledge fusion through knowledge pre-processing and analysis modeling;
- 3) The fusion results were analyzed. Combined with the analysis of experts in this field, relevant rules are formulated to realize the final decision.

## 5 Conclusions

In the research on the construction of knowledge graph corpus under the framework of artificial intelligence, this paper makes an in-depth research and Analysis on the characteristics of the current major big data corpus. Through the results of comparative analysis, this paper believes that the construction of knowledge graph corpus in China is facing the problems of large amount of data, various types, low quality of data and low utilization rate. However, the traditional construction method of artificial intelligence knowledge graph corpus is difficult to adapt to the current data environment. In order to improve the practicability and accuracy of knowledge graph corpus, this paper puts forward the optimization and improvement measures. The improved method clearly defines the goal of corpus construction, and optimizes the method of text preprocessing, which effectively improves the usability of the data text after preprocessing. Aiming at the problem that the accuracy of the existing algorithms is not high, this paper optimizes the traditional artificial intelligence knowledge fusion algorithm. By simplifying the algorithm and optimizing the algorithm structure, the calculation accuracy of the accuracy and recall rate is effectively improved. The analysis shows that with the advent of the era of big data, the characteristics of traditional corpus data will also be changed, and the previous construction method of knowledge graph corpus is no longer applicable. With the development of artificial intelligence technology, a new solution to the construction of knowledge graph corpus is proposed. Artificial intelligence technology also plays a key role in the development of knowledge graph corpus.

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# Information Precision Service Based on Big Data Technology

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**Abstract.** In the era of big data, the mastery of information will determine the development strategy of an enterprise and even the country to a certain extent. Therefore, information service is also born in this context. Information precision service is the development trend of information service in the future, but the research in this field is still insufficient. Therefore, this paper proposes the research of information precision service based on big data technology. This paper makes an in-depth study on the information precision service and the application of big data in this field. It is analyzed that the system development technology for precision information service is relatively backward, and there are technical problems with low quality, and big data technology can better remedy the shortcomings in this respect. According to the actual needs of information precision service, combined with the characteristics of big data technology, this paper optimizes and improves the traditional big data information classification algorithm, making the optimized algorithm more suitable for the application in the field of information precision service. In order to further verify the effectiveness of the proposed method, this paper establishes a corresponding test experiment. In the process of the experiment, the frank and MHR methods are compared with the proposed method, including map and MHR P@k Detection of two indicators. The experimental results show that the proposed method is 10.4% higher than MHR method in map detection, P@k the value increased more, reaching 10.6%. The analysis shows that the performance of information precision service detection method based on big data technology is significantly improved compared with traditional methods.

**Keywords:** Big data technology · Data classification · Information precision service · Information management

## 1 Introduction

With the continuous development of information technology, the total amount of data increases exponentially. With the rapid growth of data type and scale, the importance of data has changed fundamentally [1–3]. The basic data of state-level human resources have been processed from simple computer resources. Deep mining and effective utilization of massive data will improve the production efficiency of different industries and bring unprecedented convenience to consumers. At the same time, it also marks the arrival of a new era [4, 5].

With the vigorous promotion of Chinese governments at all levels, the application of big data information precision service in enterprises has also been in-depth development. For example, telecom companies use big data information services to accurately describe customers and accurately push advertisements to prevent customer churn; financial industry uses big data information precision services to draw a unified view of customers and provide personalized services for customers; TV stations use big data to analyze and interpret hot topics, which improves the quality of CCTV programs and increases the stickiness of viewers [6–8]. Nowadays, from the perspective of data sources, data types are becoming more and more complex; from the perspective of analysis depth, big data information services have developed from the initial report and description analysis to prediction and decision analysis. Integrating big data technology into information service system can guide enterprises to realize data-driven business model change [9, 10].

This paper deeply studies the current application of big data analysis technology in information precision service in China, and understands that in China's information precision service, the application breadth and depth of big data technology are insufficient. Especially in the core algorithm, most information service systems do not optimize and improve according to the actual requirements of information precision service. So, the effect of the service system is not ideal, the advantages are not obvious. Aiming at these problems, this paper puts forward the research on information precision service based on big data technology, hoping to optimize and improve the existing big data mining technology combined with the actual demand of information precision service, so as to achieve the purpose of promoting the development of information precision service field in China. According to the actual needs of the existing information precision service, this paper simplifies the calculation steps and optimizes the algorithm structure of big data analysis algorithm, which further improves the calculation accuracy and robustness of the algorithm. In this paper, the experimental results show that the algorithm has obvious advantages over the traditional algorithm, and the performance is improved significantly. The analysis shows that the research in this paper has achieved ideal results and made a contribution to the research of big data technology in the field of information precision service in China.

## 2 Big Data Technology and Information Service

### 2.1 Information and Information Service

Information is the state and change way of things movement, it can be recognized and used by people, and has a positive impact on human activities and social development. Information is universal, shared, dynamic and valuable. Information is not an exclusive commodity; its value increases with the sharing of information.

Service refers to a series of activities that use certain equipment, knowledge and methods to meet the needs of customers. As a kind of service, information service refers to a kind of social and economic behavior that service providers help information users to meet their information needs with unique strategies and contents. The characteristics of information service mainly include the following aspects:

(1) High user participation

Only on the basis of more communication with information users, can we better understand the needs and provide information services that meet the needs.

(2) Demand diversification

Information users query the latest and most accurate information through various channels, create new knowledge, and promote the rapid progress of society.

(3) The income is relatively independent

For information service enterprises, obtaining users and realizing sales revenue are two relatively independent aspects.

## 2.2 Big Data Information Service

Big data information service refers to the use of big data technology to provide users with massive data, or to process massive data according to the processing results, so as to meet the needs of users for specific information in specific fields. The big data information service here has two meanings: (1) providing services to users directly with massive data; (2) providing services to users by using the results of massive data analysis and mining. To provide big data information services, in addition to providing external raw data, it is often necessary to analyze and process massive data. We need to use relevant analysis and processing technology, through the mining and analysis of these technical means, we can find valuable information, and use it to guide various social and human economic activities, improve the operational efficiency of all walks of life, and enhance the strength of the whole society.

## 2.3 Data Mining Process of Precise Information

The data mining process of precise information can be summarized as business analysis, calculation transformation, pattern evaluation and knowledge representation. The data mining process of precise information should follow the steps of data conversion, preprocessing, algorithm mining and decision output. Due to the characteristics of large capacity and complex structure of metadata information, it is necessary to conduct business analysis first, determine the objects and specific indicators of data mining, and then collect and store the data according to the analysis results. The integrity, format and validity of the mining data group obtained from the preliminary transformation cannot be guaranteed, and further preprocessing is needed before the subsequent operations. Therefore, it is necessary to calculate and transform according to the previously set mining indicators, and get the cleaned data suitable for the data mining algorithm through data generalization and specification constraints. The selection of data mining algorithm should be based on business requirements to ensure the correctness of subsequent pattern evaluation and knowledge expression.

## 2.4 Vector Space Model

Vector space model implements the binary weight restriction of Boolean retrieval model, and proposes a framework suitable for local matching. Vector space model is

the most widely used model in the field of information retrieval. The main reason is that it has the advantages of simple concept and convenient application.

The weight of feature words is usually obtained by  $TF \times IDF$ , that is,  $\omega_{ik} = TF_{ik} \times IDF_{ik}$  and  $TF$  are the frequency of feature words appearing in the document, and the  $TF$  value of all feature words is normalized to  $[0, 1]$ , as shown in formula (1) and formula (2).

$$TF_i \leftarrow 0.5 + 0.5 \times \frac{TF_i}{Max(TF_i)} \quad (1)$$

$$TF_i \leftarrow \frac{TF_i}{\sqrt{\sum_i TF_i^2}} \quad (2)$$

$IDF$  is the inverse frequency, the reciprocal of frequency  $DF$ , and the information number of feature words in all sets.

$$IDF \leftarrow \log \frac{N}{DF} \quad (3)$$

The higher  $DF$  is, the more common the feature words are; conversely, the higher the discrimination is.

### 3 Experimental Data and Methods

#### 3.1 Experimental Data

The data is a free public test set of Microsoft Research Asia. In this open dataset, the characteristics of information and the correlation between information and query have been given.

This data set contains 362284 records, including title, abstract, and index term, author, and information source and publication type. At the same time, there are 125 queries in this data set. For each query, there are dozens or hundreds of documents associated with it, and the correlation degree is given, which is convenient for training and testing performance evaluation.

#### 3.2 Evaluating Indicator

- (1) This paper uses the average precision value (MAP) to measure the ranking performance of information retrieval. MAP has a high degree of differentiation and stability.
- (2) Because most Internet users can only browse the top page returned by the information retrieval system, the accuracy of the calculation results is needed to measure the ranking algorithm P@k Performance.

## 4 Discussion

### 4.1 Experimental Results and Analysis

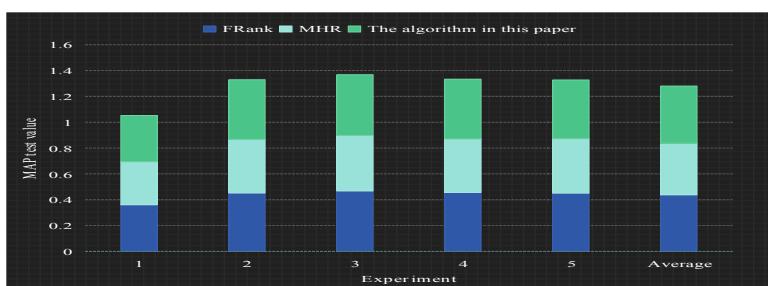
This paper constructs an information retrieval ranking model based on rule mining. In this experiment, the number of clusters is set to 5, which is mainly to facilitate the transplantation of the algorithm to other test data sets, but when using the algorithm, we only need to set the number of classes  $k > 3$ . In the experiment, the data test set is divided into five parts: S1–S5. Three parts of data are used as training, and part of data are used as test samples. The experimental data division is shown in Table 1.

**Table 1.** Division of experimental data

Experiment	Training data set	Validation dataset	Test data set
1	S1, S2, S3	S4	S5
2	S2, S3, S4	S5	S1
3	S3, S4, S5	S1	S2
4	S4, S5, S1	S2	S3
5	S5, S1, S1	S3	S4

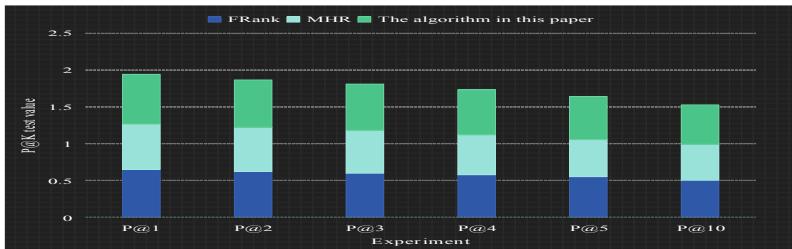
The results in Fig. 1 and Fig. 2 are from the test data P@k And MAP index detection, the experimental results of this algorithm and other sorting algorithms are compared. Other sorting algorithms include frank and MHR.

It can be seen from the results in Fig. 1 that with MAP as the measurement index, Frank model has the best effect in Experiment 1, which is 0.361, slightly higher than the corresponding experimental results in this paper. In other experiments, namely experiment 2, 3, 4, 5, this method achieves the best experimental results. According to the average value of five experiments, the highest value obtained by this method is 0.471, which is slightly higher than Frank's. However, compared with MHR method, this method is greatly improved, reaching 10.4%. It shows that the method in this paper can return the results with high user relevance, and rank first in the returned results.



**Fig. 1.** MAP performance index test results

From the result of Fig. 2, we can see that the method in this paper can return more relevant query results in general. For example, the method in this paper P@10 536, which means that more than 5 related results, can be returned on average at 10:00. P@2 642, indicating that at least one relevant result can be returned on average. Compared with other methods, P@k Compared with the map index, the increase range of the value is more obvious. With P@10 As an index, this method is 5.3% higher than Frank method and 10.6% higher than MHR method. Find out which one to use P@k In other words, it can not only return more relevant search results, but also has an obvious advantage in the amount of information.



**Fig. 2.** P@k Performance index test results

#### 4.2 Establish Accurate Large Database

The establishment of accurate large-scale database is the basis for information service institutions to provide accurate services for users. The construction of information base requires information service institutions to locate themselves accurately and determine their functions, responsibilities and development direction. For a long time, many information service organizations have been committed to updating their role positioning, and achieved remarkable results. The construction of user information database requires information service institutions to establish a secure user information platform, formulate scientific and standardized user information storage standards, and realize user information sharing. Information service organizations need static access and dynamic access to obtain user information. The information obtained by static access is often the personal information that users fill in actively. The information obtained dynamically includes the records left by users when receiving relevant services, and the investigation of users' needs by information service institutions. These information together constitute user information big data. For a long time, information service organizations insist on obtaining users' personal information and are committed to establishing accurate large-scale user information database.

#### 4.3 Change the Concept of Information Service

The development of big data era has changed the traditional information service mode. The network breaks the limitation of time and space, and makes the information service change to the direction of digitization and electronization. In order to adapt to the

development trend of the times and technology, personalized information service should be integrated into the information service. In the era of big data, first of all, we should establish the concept of innovative information service, change the original communication mode, carry out electronic information service, strengthen network publicity and reference, and provide professional, efficient and accurate resource services. At the same time, it also saves the time of searching information on the website, which is conducive to the development of big data intelligence and virtualization. Then there is the fundamental change of service concept, and the progress of technology puts forward higher requirements for information service. However, no matter how it changes, the network and big data are only the means to achieve the goal, and the service still plays a decisive role in the end. Therefore, it is necessary to establish the people-oriented service concept, follow the personalized and integrated service principles, and put users in the first place.

## 5 Conclusions

With the rapid development of information technology, the amount of information in our life has also been explosive growth, for information services also put forward higher demand. Traditional information services can only meet the demand of information collection, but there are obvious deficiencies in precision. To solve this problem, the research on information precision service based on big data technology proposed in this paper is to ensure the quantity of information collected, and at the same time, better realize the classification of data information, so as to achieve the purpose of providing accurate information service to users. Analysis shows that information precision service is the development trend of information service in the future, and the research in this paper has played a positive role in promoting the development of information precision service field.

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# A Study into the Effectiveness of Using 3D Virtual Situation to Improve Art Teaching at Colleges

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**Abstract.** The 3D virtual learning environment characterized by contextuality, immersion, and participation can greatly stimulate learners' learning motivation and is becoming an important learning environment. In the context of the reform and development of college education, guided by 3D virtual teaching technology, the 3D virtual technology is organically combined with college art teaching, and students are organized and guided to participate in modern art teaching activities. In this research, the integration of 3D virtual imaging technology and art teaching will explore its practical effects on mobilizing students' enthusiasm for learning, making breakthroughs in teaching key points, and enhancing students' interest in art learning.

**Keywords:** 3D virtual situation · Colleges · Art teaching · Integration

## 1 Introduction

At present, virtual reality technology as a relatively new technology is gradually developing rapidly in the field of education. The application of virtual reality technology in education and teaching has created a new field of “virtual teaching”. As more and more schools and educational institutions pay attention to virtual reality technology, the integration of virtual reality technology and teaching resources has become a hot research topic nowadays. In this context, this research actively promotes the integration of virtual reality technology and colleges art teaching to promote the realization of the new goals of education reform.

## 2 Characteristics of 3D Virtual Learning Situation

### 2.1 An Immersive Real Experience

In the 3D virtual situation teaching process, students become the masters of knowledge and can freely manipulate the “knowledge elements” to interact in a virtual situation, and express the position and relationship of various art teaching factors based on the three-dimensional space. In the virtual situation, the virtual objects and the physical effects of the movement are close to the actual situation, resulting in an immersive feeling [1].

## 2.2 Flexible and Diverse Interaction Methods

Art teaching based on three-dimensional learning situations has two interactive modes: first, students interact with art content, specifically for students to preview, watch, control information and obtain related feedback through equipment; and the second is the interaction between students and teachers, and human-computer interaction. Human-computer interaction is the simulation of actual communication situations through virtual body movements in a virtual situation, such as shaking hands, hugging, etc., to achieve the purpose of virtual “face-to-face” communication.

## 2.3 Hands-on Learning Experience

The 3D virtual situation has a certain degree of openness. After teachers create art elements, students can combine and split multiple elements in a specific interactive mode, freely create art works, and gradually meet the requirements of teaching goals.

## 2.4 Social Learning Based on Collaboration

3D virtual situation is a teaching mode that is biased towards socialization, which encourages students to participate in deeper learning interaction. [2] At the same time, the avatar in the virtual situation can also interact with other students to complete a learning task, including creating new situations, cooperative interaction and online discussion.

# 3 Application Value of 3D Virtual Learning Situation

## 3.1 Methods to Innovate Art Learning

Traditional colleges art teaching is usually displayed in the form of books, blackboards or multimedia. This flat teaching model is difficult to show the three-dimensional beauty of art, which also makes it difficult for many college art students to achieve a higher sense of identity with art. Through the integration of three-dimensional virtual learning situations, diversified art elements can be displayed in three-dimensional, dynamic, and colorful forms. In the learning process, students can truly “walk into” these three-dimensional elements, interact with them, and combine them so that the knowledge in the books can form a touchable and interactive “entity”, and thus form a nearly perfect learning experience [3].

## 3.2 Improve the Efficiency of Art Classroom Teaching

In the past, in the process of college art teaching, teachers usually follow the curriculum standards to explain the knowledge and essentials of art in the same way, with outdated content and single teaching format. Many painting essentials and knowledge are difficult to describe with blackboard and language, which makes it difficult for students to truly understand the key knowledge points taught by teachers. This also makes teachers have to repeatedly emphasize that even multiple classes are reviewing the same

knowledge point, which seriously affects the art teaching process. [4] The addition of virtual learning situations solves this problem well. For example, when it comes to the teaching of drawing and painting, it is difficult to show the details of drawing and painting in detail due to language and pictures alone. With the help of virtual imaging equipment, the reference object of the sketch painting can be displayed in three dimensions, and the virtual light and shadow can be constructed to show the shadow changes under each light. Through repeated observation of the shadow changes of the external features of the reference object, students finally complete the observation phase of the sketch painting. [5] This teaching form is not only intuitive, but also more vivid than language description, which greatly improves learning and teaching efficiency.

## 4 Design of College Art Teaching Based on 3D Virtual Technology

### 4.1 Design Tools

#### 4.1.1 Web3D

Web3D is a three-dimensional highlighting technology realized through the Internet, and it is a technical result of the combination of Web and 3D technologies. Web3D covers the advantages of the two imaging technologies. At the same time, it has good three-dimensional imaging computing capabilities in the network environment. It can render the 3D engine at a more efficient rate and also guarantees an efficient transmission rate. This lays the foundation for 3D virtual situation teaching.

#### 4.1.2 Cloud Computing

Cloud computing is a resource pool that needs to be actively mobilized. It concentrates all effective resources in the server so that various application systems can obtain various software services, computing capabilities and storage space as needed. The popularization and application of cloud computing technology can effectively provide more flexible computing services and 3D modeling materials for 3D virtual learning situations.

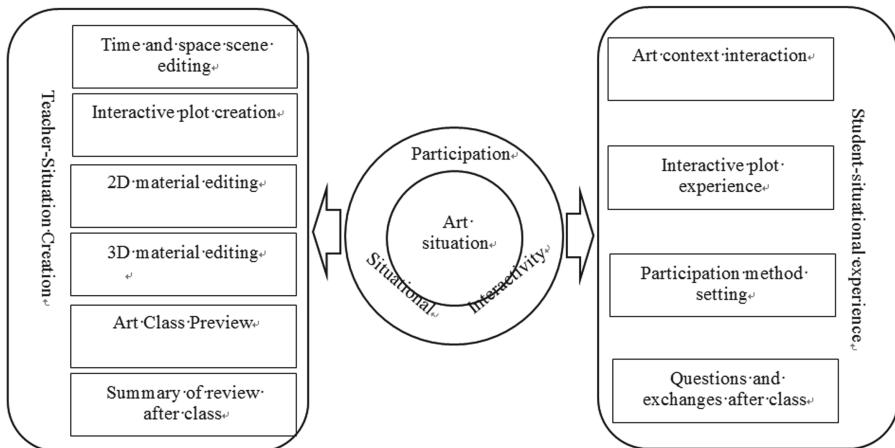
#### 4.1.3 Mobile Internet

As the name implies, mobile internet is the combination of mobile devices and the network to realize network access services for personal terminals. With the intelligent development of personal terminal equipment, the transmission of image graphics and 3D imaging information can be realized through portable terminal equipment, which provides convenience for 3D virtual learning situation teaching.

### 4.2 Design of Colleges Art Teaching Framework

Three-dimensional virtual learning situation design 3D modeling and scripting language create conditions for college art students to innovate and construct creative thinking. By creating virtual learning situations, virtual teaching elements are

constructed, and virtual materials, scenes and situation interactions are provided. In this way, college art courses can be infinitely close to reality, and learners can smoothly complete the construction of art thinking. [6] The framework of art context teaching design based on 3D virtual situation is shown in the figure below (Fig. 1).



**Fig. 1.** Design framework of college art situation teaching based on virtual situation

The use of virtual situational teaching can effectively reduce the visual limitations between students due to social experience and knowledge gaps. Through real-time interaction in 3D virtual situation, students can expand their art and artistic vision and form divergent thinking. [7] After class, students can use mobile terminal equipment to realize communication and discussion before, during, and after class, and express their opinions to teachers and students in time. The art teaching design based on 3D virtual situation teaching can fully demonstrate the teaching thought led by students as the main teacher.

#### 4.2.1 Situation Creation

The creation of the situation in the art classroom belongs to the initial stage of guidance, and its service goal is to take students as the main body. Art teachers use computing software to edit the course context, covering virtual scene design, human-computer interaction content design, art screen design, three-dimensional image design, classroom exercises and after-school review content design. [8] Teachers guide students in human-computer interaction in the created situations, and communicate and assist according to actual progress, thereby improving students' art design level.

#### 4.2.2 Situational Experience

As the subject of the situational experience, the students' situational design should meet the actual learning needs of the students, and the created situation should be as close as possible to the actual teaching environment of art. The art situation in virtual reality has a strong sense of substitution. Students can easily incarnate as a part of the

virtual scene through the device, and at the same time can also utilize the diversified art materials from the third perspective. Through the visual experience of art under the multi-person perspective, it can effectively strengthen students' perception of art materials [9].

#### 4.2.3 Design Activities and Interaction

In the art classroom teaching process, the teacher will show the pre-designed art virtual teaching situation to the students, allowing the students to form an initial first intuitive impression and discuss. The simulation of art teaching elements by watching virtual learning situations can effectively promote students' visual cognition of art knowledge points, and through the diversified combination of single art elements, they can form divergent thinking while being immersed in the scene. [2] Through the intuitive expression of art elements to reflect on the classroom theme, to promote students' art creation ability. In addition, through the human-computer communication through virtual reality technology, art education is truly entertaining and entertaining, which inspires college students' interest in art learning, and promotes the long-term development of a good learning environment.

## 5 Conclusion

At this stage, virtual imaging technology has gradually integrated into our daily lives. The integration of virtual imaging and art teaching has diversified characteristics and advantages. It not only takes into account the technical characteristics of virtual and actual interaction, multiple perception, but also has the teaching convenience that was not available in the art classroom in the past. At the same time, for students, while stimulating students' interest in art learning, students' creative thinking in virtual situations is constantly being developed. This not only improved the teaching quality of modern art courses, but also effectively promoted the modernization of the modern art education system. Therefore, through virtual situations, the shortcomings of traditional art teaching can be effectively avoided, and the development of colleges art can be better promoted.

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# Application Research and Analysis of Computer Virtual Reality Technology in College Dance Teaching

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**Abstract.** In human culture, dance has always been the core content. It not only has the effect of strengthening the body and shaping the body, but also can truly feedback the national customs and local culture of a region. As we all know, dance is not a skill that can be practiced overnight. Only by persistently training themselves can college students make their dance skills more solid, in other words, dance, with a strong practicality, learning dance well requires more practice. At present, with the change of the century, people increasingly yearn for beautiful things, and they also have a higher level of pursuit of dance. For example, the recently popular Dunhuang dance has been loved by many audiences. All of these show that the audience's aesthetic ability has been improved. In order to make China's dance industry develop healthily, colleges and universities should change the traditional teaching mode as soon as possible, give play to the role of virtual reality technology in college dance, let students master their own dance skills in the standard dance demonstration, so as to improve students' dance performance ability. This paper briefly discusses the application of virtual reality technology in dance classroom teaching, hoping to be able to provide some reference for colleges and universities to use computer virtual reality technology teaching through personal analysis, so as to ensure that China's dance industry can develop better and enter the international stage as soon as possible.

**Keywords:** Dance teaching · Virtual reality technology · Application strategy

## 1 Introduction

The dance, as a specialty, can only be improved by continuous practice, which leads to many limitations in traditional dance teaching. Generally speaking, dance teaching is to let students constantly imitate the teacher's dance movements, so that students can understand the detailed movements of dance, master basic dance knowledge, and enhance the perception of dance skills. This makes dance teaching different from other teaching modes. It is difficult to improve the teaching effect, whether it is network teaching or distance teaching. Because students watch dance teaching videos, even if they understand the dance movements and postures, it is difficult to immerse them in the scene. Teachers cannot give students dance practice guidance in time. Therefore,

the efficiency of students' dance practice after class is very poor. The emergence of virtual reality technology has eliminated the disadvantages of traditional teaching to a certain extent, and created a new teaching mode for it. This human-computer interaction system based on computer technology can create a three-dimensional virtual world for students majoring in dance. When students of dance major wear helmets, gloves and other external input devices, they can operate the virtual reality system to give instructions, so that students can use the sense of hearing, touch and vision to feel the dance action, and enhance their understanding of dance skills [1]. Therefore, this paper discusses the application of computer virtual technology in dance teaching in colleges and universities, hoping that after this in-depth analysis, it can provide some suggestions for the introduction of computer virtual technology teaching in colleges and universities in China.

## 2 The Application Status and Prospect of Virtual Reality Technology in Dance Teaching

### 2.1 Application Status of Virtual Reality Technology in Dance Teaching

First, to the foreign side, virtual reality technology was firstly to make participants simulate movement training skills, so that participants in the virtual environment with a variety of senses to make corresponding feedback on the action. Because of the real the virtual environment simulated by virtual reality technology, the participants can observe each action personally, and the training effect is particularly significant. The wide use of dance teaching in colleges and universities can greatly promote the development of foreign dance industry. Therefore, foreign scholars have studied how to develop a more mature virtual reality dance teaching system, such as synchronous teaching system, which can not only show the pace of dance, but also be accompanied by music box text description, so that learners can deeply understand dance while imitating dance movements. In addition, it can also capture the learners' dancing process using virtual reality technology, the learners can find out the mistakes in their own dance actions by comparing the double dance action process in the operation process, and improve the dance ability of the learners; Second, to the domestic aspect, the Chinese dance industry used virtual reality technology later, while foreign scholars realized the importance of virtual reality technology and began to strengthen the research and development of dance teaching system. This also made diversified functions for our teaching system, which can not only meet the need of dance teaching, but also choreograph and produce the dance. For example, the visual dance simulation system can collect and convert the learners' dance movements into two-dimensional data. After being processed by the three-dimensional virtual platform, it is designed as a three-dimensional animation to create a virtual dance environment for the learners. When the learners operate the visual dance simulation system, they can learn to dance and choreograph, and the system will also play animation videos according to the dance costumes and characters' expressions designed by learners, so that learners can watch and appreciate the stage effect of dance. The mechanical dance virtual reality technology will also store each dance action in the robot program and feed back to the

dance model to provide new dance reference for mechanical dance performers. In recent years, with the virtual reality technology in the domestic dance industry has made outstanding achievements. Domestic researchers are increasingly aware of the importance of virtual reality technology, and began to develop and improve virtual reality technology, which also makes the dance gap between China and developed countries gradually narrow, so as to achieve the standardization and professional development goals of dance teaching in China.

## **2.2 Application Prospect of Virtual Reality Technology in Dance Teaching**

At present, virtual reality technology is widely used in the field of domestic education. From its promotion effect on dance, virtual reality technology must be indispensable in the future education. It must be the main development direction of future education [2]. In this context, in order to faster dance teaching level to enter the international level, traditional teaching mode is far away enough, because the energy and time of teachers are also difficult to meet the huge needs of dance learning. Although multimedia teaching provides students with the opportunity to observe dance movements, it cannot achieve good results due to their inability to interact. Single video dance teaching has stripped off the vivid and interesting of the real dance teaching, and students can not accurately grasp the dance skills. Therefore, generally speaking, these two teaching modes are not suitable for college dance teaching. In this regard, virtual reality technology is naturally the best teaching method. It can fully integrate modern information technology and traditional dance teaching, so that students can train their own dance movements in the virtual environment and improve the efficiency of dance teaching. It can be said that the emergence of this technology has broken through the traditional teaching, the limitation of learning time and space, reduces the pressure of dance teachers' teaching and accelerates the progress of modern dance teaching in China. Therefore, virtual reality technology has created a broad development platform for dance teaching in China, and its advantages cannot be ignored in the future, which need to be constantly optimized and improved, so as to make our dance teaching level enter a higher level as soon as possible.

## **3 The Application Strategy of Virtual Reality Technology in Dance Teaching**

### **3.1 Interactive Strategies of Virtual Reality Technology in Dance Teaching**

For the dance classroom teaching in colleges and universities, there are two kinds of courses, one is professional dance courses, the other is elective dance courses. Compared with the students of professional dance courses, the dance foundation of students in dance elective courses is not solid enough, with poor dance ability. In addition, teachers' time and energy are more devoted to students in professional dance courses. So, in many cases, it is unable to meet the training needs of students in elective courses,

and it is easy to weaken the students' interest in dance practice when they encounter difficulties and puzzles. However, the emergence of virtual reality technology makes up for this defect, which gives dance students more opportunities to practice, even without the guidance of teachers. They can also observe how to practice dance and consolidate their dance knowledge and ability, which also means that elective courses and professional students have equal learning opportunities, and they have the possibility of competing with professional dance students [3]. Generally speaking, the interactive requirements of virtual reality technology are shown in the following two points: first, dance teaching has a high demand for practice, and every dance major students are eager to not only be able to choreograph, but also design movements in the future. Virtual reality technology can completely let students not be affected by external factors and concentrate on dance training, so that students can master dance movements more quickly; Second, for dance elective courses, students lack dance related knowledge and basic skills in the early stage, which is completely interested in promoting students to insist on learning dance, but students cannot obtain the teacher's timely guidance. Therefore, the learning effect is poor. Virtual reality technology can make students have a stronger sense of experience and let them repeatedly train and consolidate the basic dance movements in the interactive experience. So, both professional dance students and elective dance students can operate the system designed by virtual reality technology to understand the shortcomings of their own dance movements, adjust and improve their dance movements, so as to make their dance movements more professional [4]. As the virtual reality technology has high requirements for interactivity [5], and interactivity is to use computers and other advanced equipment to process huge data information. In order to prevent dance teaching from delaying students' training due to network and equipment and other factors, colleges and universities must pay attention to the regular maintenance and replacement of equipment, so as to provide good equipment system for dance teaching and make smooth implementation for dance teaching work.

### 3.2 Function Strategy of Virtual Reality Technology in Dance Teaching

The function of virtual reality technology is the key factor to determine the quality of dance teaching [6]. Only when the virtual reality technology has many functions and good effects, can dance teaching level and teaching quality be fully guaranteed. Generally speaking, virtual reality technology should have the following functions to promote the improvement of dance teaching level. First, demonstration function, which can be used when students practice dance movements through the virtual reality technology to demonstrate each dance action, this is a basic function that the virtual reality technology must have, so that teachers can store all the dance movements needed for teaching in the system, and then the system will also process the dance movements into data and make them into three-dimensional animation. When students operate the virtual reality technology, they can watch and imitate the dance action from multiple perspectives [7]. Second, the capture action function is to capture the movements of students when they are training dance. After storing the students' action process, students can observe by themselves, and then compare the differences between individual dance movements and standard dance movements, so as to provide reference

for students to improve dance movements; third, feedback function, virtual reality technology can feedback students' dance practice from multiple angles. According to the converted data to optimize the guidance scheme, the differences between the students' dance movements and standard movements are marked as red, and the students' dance practice is scored, so that students can improve their dance skills step by step in the objective and accurate evaluation [8].

### 3.3 The Composing Strategy of Virtual Reality Technology in Dance Teaching

If the virtual reality technology is applied to dance teaching in colleges and universities, if we want to realize all the interactive functions mentioned above one by one, we need to make clear the four elements of the virtual system, which are action matching system, motion capture system, three-dimensional mapping system and dance action data base [9, 10]. Among them, the action matching system is specially used to compare the differences between the students' dance practice movements and the original dance movements in the database; the motion capture system is dedicated to timely capture the dance action process of students' practice; the three-dimensional mapping system is specially used to build the data of students' dance movement conversion into a three-dimensional model, so as to form a visual animation dance view that can be played many times, and students can practice their own dance movements anytime and anywhere according to their own needs. In addition, there are many types of standard dance movements stored in the dance action database with complete functions. Students can also choose their favorite dance types according to their interests.

## 4 Conclusion

In a word, compared with foreign dance teaching, the current teaching gap in China is still very large, especially in the development and application of virtual technology is far less advanced than foreign countries, and there are many functions to be designed. In this regard, future scholars still need to persevere in analyzing virtual reality technology, developing more virtual reality systems, so that students have more practice opportunities. Nowadays, virtual reality technology has not been fully covered in dance teaching in China's colleges and universities. Many colleges and universities are still lack of conditions to introduce virtual reality technology. The government must pay attention to the cultivation of dance teaching in colleges and universities, invest more funds, and promote the widespread application of virtual reality technology in major dance colleges and universities as soon as possible, so as to help students in dancing major and elective major in China to improve their dance skills with the support of virtual reality technology, and become qualified dance successors as soon as possible.

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# Motion Control Algorithm of Five-Axis Virtual Axis CNC Machine Tool in the Internet Era

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**Abstract.** In the Internet age, five-axis virtual-axis CNC machine tools have a very wide range of applications in the field of complex free-form surface processing. With the rapid development of CNC technology, higher requirements are put forward for the machining accuracy of five-axis virtual-axis CNC machine tools. The purpose of this paper is to study the motion control algorithm of five-axis virtual axis CNC machine tools in the Internet era. Based on the kinematic analysis and modeling of the parallel mechanism, this paper proposes two control algorithms, and analyzes in detail the trajectory tracking control effect and control input of the two control methods. The simulation results show that the neural network sliding mode control method has fast tracking speed, high control accuracy, and can effectively eliminate the chattering phenomenon existing in conventional sliding mode control. According to the actual situation of the CNC system software, this article develops a reusable and modular CNC software system through the analysis of the CNC system software architecture and functions to reduce the development cost of the CNC system software and improve market competitiveness. Experimental research shows that the control amount of FCMAC neural network sliding mode control is relatively smooth, which effectively suppresses the chattering phenomenon of conventional sliding mode control. After  $t = 0.2$  s, the actual trajectory almost coincides with the expected trajectory, and the magnitude of the steady-state error reaches 0.01. It can be concluded that using FCMAC neural network sliding mode control to realize the trajectory tracking control of a five-axis virtual-axis CNC machine tool can meet the control requirements of general industrial systems.

**Keywords:** Five-axis CNC machine tool · Machine tool motion · Control algorithm · Trajectory tracking

## 1 Introduction

With the development of science and technology, the traditional manufacturing industry has undergone tremendous changes and has gradually entered the modern manufacturing model [1, 2]. In the current manufacturing system, numerical control technology is the key [3]. In a sense, the level of numerical control technology has become one of the important indicators to measure the level of a country's manufacturing industry [4, 5]. With the development of the market economy and intensified competition, social production has gradually shifted from mass, single-variety

production to small-batch, multi-variety timely production. In view of this, more and more manufacturers have begun to use CNC machine tools for production [6, 7].

In the research of five-axis virtual axis CNC machine tools, many scholars have studied them and achieved good results [8]. For example, Xu J has performed comprehensive spatial geometry on multi-axis CNC machine tools with different topologies based on multi-body system theory. Error modeling, which includes position and attitude errors [9]. Jia Z conducted a detailed static error and motion error analysis on the five-axis movement error of a rotary axis of a five-axis CNC machine tool, and proposed a set of comprehensive geometric error modeling mode based on multi-body kinematics, which successfully realized the accuracy of the machine tool [10].

This paper takes the five-axis virtual-axis CNC machine tool as the research object, and mainly focuses on the theoretical and experimental research on the mechanism principle and control technology of a five-axis virtual-axis CNC machine tool system. This article analyzes the mechanism of the five-axis virtual-axis CNC machine tool used in this subject, the kinematics and trajectory planning of five-axis virtual-axis CNC machine tools are studied in detail. This paper establishes a model of each branch of the AC servo system, analyzes the characteristics and control requirements of a five-axis virtual axis CNC machine tool, uses Matlab software to carry out two control methods of trajectory tracking control simulation research, compares the tracking trajectory, and determines a suitable control strategy.

## 2 Motion Control Algorithm of Five-Axis Virtual Axis CNC Machine Tools in the Internet Era

### 2.1 Motion Controller Structure Design

For the CNC system, the most important thing is to control the movement of each axis motor. It is the motion controller that receives and controls the movement of each axis motor in accordance with the instructions of the numerical control device to realize numerical control processing. Important indicators such as the accuracy of positioning control and the performance of speed adjustment in numerical control processing are directly related to the motion controller. It can be seen that the motion controller occupies a very important position in the open CNC system. The research of motion controller is a systematic work, it has the following characteristics:

- (1) In terms of system structure, modern motion control systems are equipped with sensors and measuring devices such as encoders, laser interferometers, and vision systems, which can meet advanced control strategies as a closed-loop system; the system can control motors. At the same time, it controls stepper motors, DC and AC servo motors; and supports process control of general switch and analog values.
- (2) In terms of hardware card structure, modern motion control system adopts open modular structure design, adopts DSP-based design scheme, aims at real-time in hardware planning, and has high floating point calculation function, high

processing capacity and high efficiency. Communication capability, high integration and high reliability.

## 2.2 Analysis Basis of Five-Axis Virtual Axis CNC Machine Tools

### (1) Position vector

For the selected coordinate system {A}, the position of any point P in space can be represented by a  $3 \times 1$  column vector P, that is, a position vector:

$$P = \begin{bmatrix} P_x \\ P_y \\ P_z \end{bmatrix} \quad (1)$$

Among them,  $P_x$ ,  $P_y$ ,  $P_z$  are the three coordinate components of P in the coordinate system {A}.

### (2) Jacobian matrix

The Jacobian matrix of five-axis virtual-axis CNC machine tools is abbreviated as Jacobian, which usually refers to the generalized transmission ratio transmitted from the joint space to the operating space. It is denoted as J, then:

$$\dot{P} = J(q)\dot{q} \quad (2)$$

Where  $\dot{P}$  is the space motion speed vector of the manipulator,  $\dot{q}$  is the joint speed vector, that is, the input speed vector of the drive, where

$$\dot{P} = [p_x \ p_y \ p_z \ w_x \ w_y \ w_z]^T \quad (3)$$

$$q = [\theta_1 \ \theta_2 \ \theta_3 \ \theta_4 \ \theta_5 \ \theta_6]^T \quad (4)$$

In the formula,  $w_x$ ,  $w_y$ ,  $w_z$  are the rotational angular velocity of the five-axis virtual axis CNC machine tool moving platform in the static coordinate system.

## 2.3 Trajectory Planning of Five-Axis Virtual Axis CNC Machine Tools

The five-axis virtual-axis CNC machine tool system must plan its motion trajectory to perform surface processing operations, so it is particularly important to study the motion trajectory planning of the parallel robot system. Since this mechanism adopts a decentralized control strategy, it is necessary to obtain the trajectory of each branch. There are two kinds of point control and continuous control for the position control of the five-axis virtual axis CNC machine tool.

### (1) Point position control.

This method only requires the control of the start and end positions of the five-axis virtual-axis CNC machine tool arm. The control only requires rapid and accurate movement between points. The trajectory does not

make any rules. The PTP method is relatively simple to control and is suitable for loading and unloading, handling and spot welding operations.

- (2) Continuous trajectory control is also called continuous path motion, contour motion or CP (Continuous Path) control. This method not only requires the five-axis virtual axis CNC machine tool arm to move to the target point with a certain accuracy.

## 2.4 Distributed Control of Five-Axis Virtual Axis CNC Machine Tools

First, the complex control object is decomposed into multiple related subsystems, and then the distributed controller is designed to stabilize each subsystem and suppress the correlation between the subsystems. The advantage is that the complexity of the control system changes from the system level to the sub-system level, so that the control system structure, algorithm, etc. are greatly simplified, and fault tolerance is enhanced. Especially for high-degree-of-freedom five-axis virtual axis CNC machine tools, the decentralized control strategy has many advantages over the traditional centralized control strategy:

- (1) Since the feedback information is partial, it will not affect the normal operation of other joints due to the damage of one joint sensor, which strengthens the reliability of the control system;
- (2) The decentralized structure is simple and convenient for calculation and parallel processing;
- (3) Since decentralized control does not need all the model information of the system, it has strong robustness to the uncertainty of the system. It is precisely because of the many advantages of distributed control that its research has become one of the hot topics in five-axis virtual-axis CNC machine tools and robot control in recent years.

## 2.5 Design of FCMAC Neural Network Sliding Mode Controller

Since the chattering of sliding mode control is determined by the switching items of its controller, this paper uses neural network to adjust the switching items to reduce the chattering of sliding mode control. The fuzzy cerebellar model joint controller (FCMAC) has the characteristics of simple structure and fast learning speed, which is very suitable for online real-time control. Therefore, FCMAC is used to obtain the switching control value of sliding mode control.

Use  $O_i^{(j)}$  and  $I_i^{(j)}$  to denote the output and input of the i-th neuron in the j-th layer of the network, respectively. Layer 1 introduces input into the network:

$$O_i^{(I)} = I_i^{(I)} = x_i, i = 2, \dots, m \quad (5)$$

The second layer performs fuzzy quantization on the input. For the input quantity x, the fuzzy membership of the j-th block is defined as follows using Gaussian membership function:

$$G_{B_{ij}}(x_i) = \exp\left[-\frac{(O_i^{(l)} - \sigma_{ij})^2}{\delta_{ij}^2}\right] i = 1, 2; j = 1, 2, \dots, 5 \quad (6)$$

### 3 Experimental Research on the Motion Control Algorithm of Five-Axis Virtual-Axis CNC Machine Tools in the Internet Era

#### 3.1 Conventional Sliding Mode Control

The basic steps of designing a sliding mode variable structure controller include two relatively independent parts:

- (1) Design the switching function  $s(k)$  to make the determined sliding mode asymptotically stable and have good dynamic quality;
- (2) Design the sliding mode control law  $u_{vss}$  so that the reaching condition is satisfied, so as to form a sliding mode area on the switching surface.

Once the switching function  $s(k)$  and the sliding mode control law  $u_{vss}$  are obtained, the sliding mode control system can be fully established.

The conventional sliding mode variable structure control law is:

$$u = u_{eq} + u_{vss} \quad (7)$$

Among them,  $u$  is the equivalent control quantity,  $u_{vss} = u_0 sgn(s(k))$  is the switching control ( $u_0$ ) is the constant to be determined,  $sgn$  is the sign function).

#### 3.2 Design of FCMAC Neural Network Sliding Mode Controller

For the cerebellar model joint controller (CMAC), its working mechanism is: each input variable in the input space is quantified and sent to the associative memory space, and the activated continuous storage unit is “closed by the input” as the output is similar. Encoding based on the principle, that is, Hash encoding, the network output vector is the cumulative sum of the weights stored in all units after Hash encoding.

And FCMAC first fuzzy quantizes the input to obtain the “activity” of the input vector to activate the association strength, and then activate the association strength to restore the information of the system. This controller has carried on the fuzzy processing to the space division method of CMAC, can carry on the online adjustment to the space division method of CMAC through the learning algorithm, the learning speed is faster than CMAC. FCMAC has faster response speed and higher control accuracy than CMAC.

## 4 Experimental Research and Analysis of Motion Control Algorithms for Five-Axis Virtual-Axis CNC Machine Tools in the Internet Era

### 4.1 Conventional Sliding Mode Control

For the trajectory of the five-axis virtual axis CNC machine tool motion planning in the Internet era in this article, MATLAB is used to simulate the conventional sliding mode control of the five-axis virtual axis CNC machine tool. The trajectory tracking results of each branch is shown in Table 1.

**Table 1.** Conventional sliding mode control variables of each branch

Time/s	Desired trajectory	Ordinary sliding mode
0	2.46	-2.48
1	4.52	2.63
2	6.73	6.35
3	8.45	8.35
4	10.27	10.82
5	11.35	11.24



**Fig. 1.** Conventional sliding mode control variables of each branch

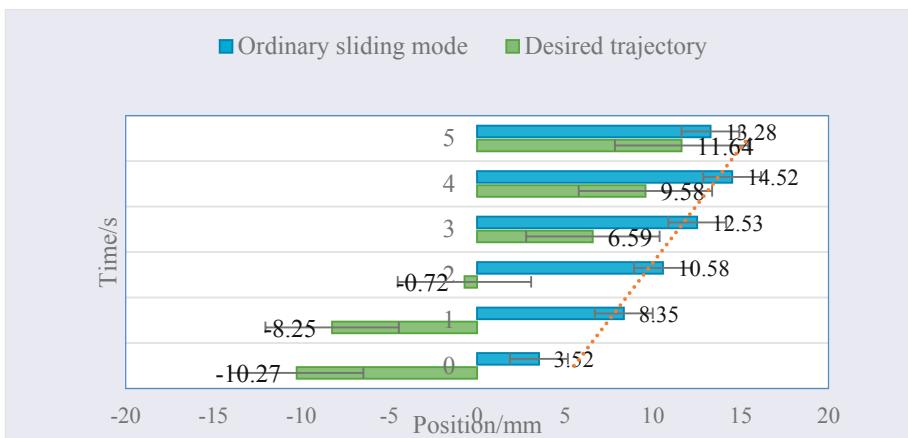
As can be seen from the simulation results in Fig. 1, the conventional sliding mode control follows the expected trajectory on the actual trajectory after  $t = 3$  s, and its steady-state error is of the order of 0.01. However, the control volume of conventional sliding mode control has a chattering problem, which will accelerate the wear of the motor and other equipment in the servo system and affect the performance of the system.

## 4.2 FCMAC Neural Network Sliding Mode Control Experiment Analysis

For the trajectory planned in this paper, the trajectory tracking control quantity of FCMAC neural network sliding mode control is shown in Table 2.

**Table 2.** FCMAC neural network sliding mode control trajectory tracking effect

Time/s	Desired trajectory	Ordinary sliding mode
0	-10.27	3.52
1	-8.25	8.35
2	-0.72	10.58
3	6.59	12.53
4	9.58	14.52
5	11.64	13.28



**Fig. 2.** FCMAC neural network sliding mode control trajectory tracking effect

It can be seen from Fig. 2 that the FCMAC neural network sliding mode control has a fast tracking speed and high control accuracy. After  $t = 0.2$  s, the actual trajectory almost coincides with the expected trajectory, and the magnitude of the steady-state error reaches 0.01. The control amount of FCMAC neural network sliding mode control is relatively smooth, which effectively suppresses the chattering phenomenon of conventional sliding mode control. The simulation results show that using FCMAC neural network sliding mode control to realize the trajectory tracking control of a five-axis virtual-axis CNC machine tool can meet the control requirements of general industrial systems.

## 5 Conclusions

In this paper, a control system model of a single branch of decentralized control is given, and then a computer simulation experiment is carried out. By comparing the simulation results of the conventional sliding mode control and the neural network sliding mode control, it can be seen that the neural network is sliding Modular control method not only has higher tracking speed and control accuracy, but also can effectively suppress chattering phenomenon, and can realize high-precision real-time control of five-axis virtual-axis CNC machine tools.

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# Research on the Influence of Modern Information Technology on Film and Television Art

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**Abstract.** The arrival of the digital era has brought convenience to people's production. For the art design of film and television (FT) animation, the introduction of advanced digital technology makes the traditional FT animation art better play its artistic, animation and interactive effects. In the digital era, the development and innovation of FT animation art cannot be limited to the creation of FT animation itself, but also to explore the impact of the digital era on the future development of FT animation art, making it a new trend of FT animation art development. The art of FT animation adapts to the development of digital age and matches with advanced digital technology. In China's FT art, digital media interaction technology is booming and has made breakthroughs in market supply and intelligent technology. However, with the development of new technology, man-machine still faces a series of challenges. Therefore, this paper explores the impact of the digital era on the FT animation art, analyzes the future development direction of the FT animation art, and puts forward the innovative creation mode of the FT animation art in the digital era, so as to provide reference and reference for the digitization of the FT animation art.

**Keywords:** Information technology · Film and television art · Modern technology · Application research

## 1 Introduction

With the improvement of people's living environment, the survival problem will not receive too much attention, so more and more people are concerned about the construction of spiritual civilization. As a very important cultural field, FT programs are loved by many people because they can bring visual and auditory pleasure to people. Nowadays, going to the cinema to watch movies is a new way to celebrate the festival. Meanwhile, with the change of ideas and the constant deepening of spiritual pursuit, many people begin to consider how to improve the artistic and technical performance of films, and film analysis has become a new development trend [1–3].

Due to the information technology (IT), the traditional FT media industry has been greatly challenged, some modern IT has entered the field of FT art. IT has begun to take root in radio and television and other film programs. How to fully integrate the new and old media and IT to play a role together is a test faced by FT workers [4–6].

Different from the subjective analysis of the earliest filmologists, nowadays, scientists around the world have made objective analysis and Research on film works from the perspective of color, lens and storytelling. They have conducted transposition analysis on film works from the perspective of the public, and take note of the behavior of the audience when watching the film works. For example, the audience's concerns, which represent people's ideas, science oriented engineers are good at integrating IT into the analysis process and visualizing it. Generally speaking, due to the unique perspective, the research results are limited, but its prospect is still optimistic. In the existing research outcomes, this article summarizes the research results of film technology these years. The focus can be summarized as the content and behavior of film watching. Finally, combined with the existing achievements and development trends, this article analyzes the shortcomings of IT in the analysis and application of FT programs, and discusses the future development trend [7–10].

## 2 Film and Television Art and Information Technology

### 2.1 Film and Television Art

FT art has a great influence on all aspects of people's life. It has become an important part of spiritual life. There are also various forms of FT advertising, and the FT art industry is also in full bloom. While inheriting the traditional FT art, FT advertising also highlights the charm of modern art. The upgrading of computer-aided technology provides favorable technology for the production of film advertising. From the traditional arrangement to today's digital production version, especially the use of special effects, the implementation of digital technology in FT post production will be unprecedented increased, and the artistic effect after the improvement of digital technology will be greatly improved. So, it is urgent to study the application of IT in FT advertising production.

### 2.2 Information Technology

As the name implies, IT is the use of computer technology, the text, image and sound fusion processing technology. Digital IT is a kind of image processing art that can make abstract information easy to manage and strengthen communication. It forms the cultural and creative core of sub lens design, art modeling design, two-dimensional animation special effects, animation production, FT production special effects, animation case analysis and practical animation production, so as to make China's FT art industry continue to develop and grow. Throughout China's FT industry, the industry development value of FT production is getting higher and higher. With the development of drama FT, FT performance, photography and other industries, the penetration area of digital IT continues to expand. In the field of FT production, various forms of computer graphics software are constantly updated, different forms of FT production techniques affect the final effect of the film.

Information is a very popular and easy to understand term. It is the source of knowledge for people to understand and transform the world. There are countless

messages in the world. Scientists have extended information theory to the field of physics, chemistry, biology, psychology, economic management and other disciplines, and have made great achievements in the FT art field. The formula is as follows:

$$H(X) = E(\log \frac{1}{P(a_i)}) = - \sum_{i=1}^n P(a_i) \log P(a_i) \quad (1)$$

### 3 Experimental Ideas and Design

#### 3.1 Experimental Ideas

At present, with digital technology and 3D video production technology, the production and distribution of FT art presents new characteristics. Modern science and technology make the transmission of FT art more diverse and more convenient. With digital technology and the application of special effects technology, the traditional production method is changed. Through the application of modern technology, the visual effect of FT works is significant. It is also more diverse and modern. Now, whether it is mobile phones, computers, or network TV can play FT programs. As the carrier of modern FT art communication, they make the FT art purchased by consumers more colorful, access to FT programs more extensive, and enrich people's daily life.

#### 3.2 Experimental Design

In the design, this paper adopts two forms: questionnaire survey and on-the-spot interview. 886 citizens are randomly selected as survey samples. The interviewees include students, ordinary people and professionals. The purpose of this study is to explore the application of modern IT in FT art. According to the results of questionnaire survey and interview, we investigated and analyzed their opinions, and the outcomes are displayed in Table 1. Based on the survey results, we found that most people are optimistic about the development prospects of modern IT, and believe that modern IT has great advantages in the application of FT art. For the social development in the era of big data, IT will improve the efficiency of data processing, and with the help of innovation and promotion of IT, China's FT art field will also make greater achievements.

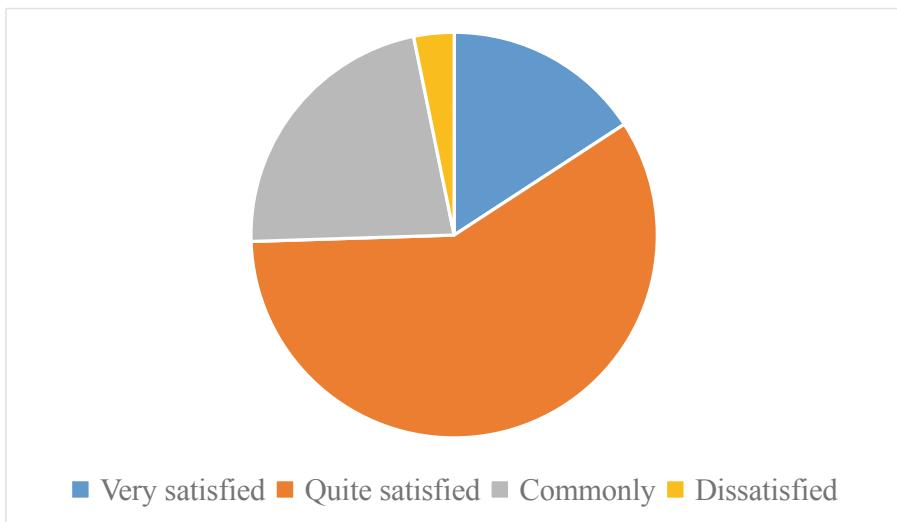
**Table 1.** Analysis of people's opinions on the application of modern information technology in film and Television Art

Investigation factors	Recognition ratio
It improves the artistic effect and work efficiency of film editing	75.2
FT art performance has better visual feeling and expressive force	89.6
The artistic thinking of FT work is more innovative, open and fashionable	79.3
Supplementary plot, innovative screen and special fusion	68.5

## 4 Discussion

### 4.1 Application of Modern Information Technology in Film and Television Art

In the era of strong development of Internet technology and mobile terminal technology, new media has also entered a high-speed period of development, which has gradually affected all aspects of human life. The antagonistic relationship between the new media and the old media can also be separated. Before the advent of modern IT, the main media carriers used to be magazines, newspapers, television, radio, etc., which can be called old media. With the emergence of new technology, media communication can be realized through more media, such as digital newspaper, digital transmission, cellular network, mobile terminal, etc., which provides more suitable and convenient resources for the public, which can be called new media. The strong development of new media can be predicted. Because it has the relationship of competition and guidance with the old media, we can guide it and use the law to achieve our planned development goal on the basis of following the development law of things. It can be seen from Fig. 1 that people are satisfied with the application of modern IT in FT art. Modern IT has enriched and improved modern social life. The audio-visual elements of traditional media FT content mainly include images and photos, synchronous voice transmission, voice over, background music, etc. On this basis, new media combines the functions and characteristics of network technology. By adding animation and other new user experience into the interactive FT content dissemination, it can only be realized by relying on Internet technology and new media technology. It can be seen



**Fig. 1.** Survey on people's satisfaction with the application of modern information technology in film and Television Art

that modern IT is also a major improvement of traditional means of production, and has become one of the development trends of FT content production.

In addition, this paper further investigates the characteristics of FT art communication modernization, and the results are shown in Fig. 2. It can be seen from Fig. 2 that under the development trend of modern society, the FT art industry presents the following characteristics. With the advent of the era of big data, China's Internet and IT have undergone earth shaking changes. The application of IT in FT art has promoted the development of film and television art communication, and the network trend of film and television art communication has gradually emerged. Internet IT is the stepping stone for people to enter intelligent life. It brings unprecedented experience to people's work, life and entertainment. With the Internet and the information age, people use their leisure time to watch film and television art works freely through video software and websites, and can express their views and suggestions on film and television art works through the Internet, which can promote the film and television art industry to get better incentives. In the network age, the traditional form of FT art communication has also been effectively changed. FT art works can be transmitted through the network, so as to improve the audience's attention to the FT art works.

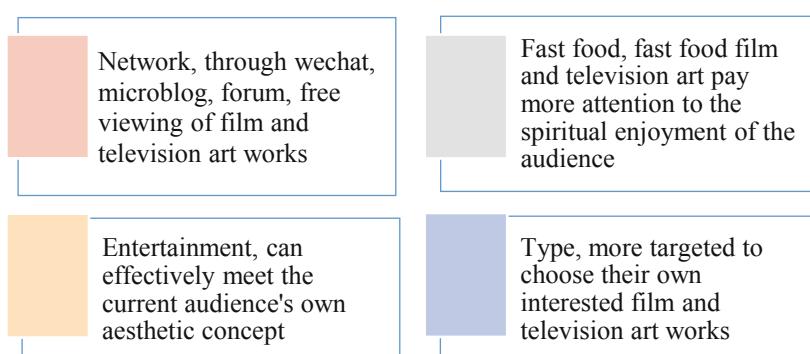


Fig. 2. Characteristics of film and television art communication modernization

## 4.2 Application of Modern Information Technology in Film and Television Art

### 1. Application in the interactive of film and television works

In the interactive aspect of FT animation art, the interaction between people and FT works is a development direction of FT works. Due to the backward production technology of early FT works and the lack of people's cognitive concept of FT works, the interactivity of FT works is difficult to get real application and development. With the maturity of digital virtual technology, FT animation art works can make viewers participate in the interaction with animation by virtue of virtual reality equipment. With the combination of animation and augmented reality equipment, people can operate virtual animation in the real world through computer

simulation software, and then complete some simulation experiments, reports and demonstrations. The interactivity of FT animation art does not stay in the immersive experience or touch feedback of viewers. With digital technology, the future FT animation art will provide more interactive experience for viewers and users.

## 2. The development and innovation of film and television animation art in the digital era

Now, the FT animation art is usually produced by digital technology. Although digital technology provides animation art with fuller detail description and more comprehensive material rendering, in the actual digital animation production process, it often needs more time and higher cost than the traditional animation art creation. Faced with the problems of cost and production technology requirements, the development and innovation of FT animation art works in the digital era need to be realized from two aspects: improving the quality of professionals and developing more advanced and lower cost production equipment. The FT animation works in the digital era, from the perspective of works, do not have essential changes with the traditional FT animation art. The use of digital technology is only to improve the presentation effect of FT animation art. However, due to the ingenious design of the story plot by the animation producers, the central idea expressed by the animation works is extremely clear and can be thought-provoking. So, in the digital era, the innovation of FT animation art should be attributed to the animation itself. Skillfully using the animation production methods brought by digital technology, designing attractive story plots and deeper story implication make the FT animation art more characteristic of the times. The changes brought about by the digital era for FT animation art are also reflected in various projection equipment and presentation methods. The efficient and convenient transmission of information resources in the digital era will facilitate the storage and dissemination of FT animation art. Through 4K technology, digital high-definition recording and playing of FT animation art works can be realized, which greatly reduces the investment of traditional shooting equipment. In addition, 5g technology can realize the transmission of FT animation works and the application in virtual equipment, which will greatly reduce the investment in traditional projection equipment.

## 3. The perspective of customization

In the FT works, from the narrator's point of view, the perspective can be divided into the first person, the third person and the consciousness perspective. The narrator's perspective and the protagonist's perspective should be matched to ensure that the narrative is more subjective. From the perspective of the third person, the event and the protagonist develop in parallel, which makes all rational things more objective. In the process of media integration, with the enhancement of public subject consciousness, the film narrative should start from the narrator's point of view, and pay more attention to the public's perspective. This leads to a new perspective of focus customization. The so-called focus refers to the detailed analysis of the target audience, so as to achieve the unique narrative effect of customer groups, and to find specific content through specific production objects. For example, in recent years, commercial blockbusters have emerged in an endless stream. We can put old actors and young actors together to effectively increase the

audience of the film, at the same time, we can improve the quality of the film and show some characteristics of personalized films.

## 5 Conclusions

In the era of big data, IT is booming like a bamboo shoot. We should take note of the visual effect of FT art work, meet people higher and higher aesthetic needs. For the sake of meet the needs of the general public, occupy a larger market share and reduce market risk, the FT art industry will also show some characteristics of typology, and at the same time, it will also cause star effect, which will lead to certain negative effects. Therefore, we should respect the will of the industry to popularize IT, but also teach and improve the artistic atmosphere of film works. In the context of the IT revolution, the FT art communication has also made great achievements. The dissemination of FT art must have the characteristics of modernization, in order to ameliorate the quality of FT art works, in order to obtain more audience's love. Only according to the current living conditions and the general direction of social development, FT art works can be loved by the public, and can they achieve long-term prosperity.

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# Prediction of Time-Delay GM (1, N) Cost Trend of Power Grid Engineering Based on Macro-environmental Impact

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**Abstract.** As power grid construction projects gradually increase and their scales continue to expand, the macro-environmental factors that affect their cost levels have become more diverse and complicated. In order to accurately and effectively grasp the change trend of power grid project cost, this paper proposes a method for predicting the macroscopic cost trend of power grid project based on time lag GM (1, N). This paper analyzes and finds out the factors that affect the cost of substation project, overhead cable project, and ground cable project, and uses these factors as input variables of the time-lag gray prediction model to establish a power grid project macro-cost trend prediction model based on time-lag GM (1, N). And actual project data are used to train and verify the prediction model. Calculation examples show that the model can accurately and quickly predict the cost of substation project, overhead cable project, and transmission line project under different economic regions and different voltage levels. The model can also provide an effective reference for the compilation of annual and quarterly power grid project standard prices.

**Keywords:** Power grid project cost · Macro trend forecast · Time lag effect · Grey forecast · GM (1, N) model

## 1 Introduction

As the backbone of the national economy, the power grid plays a fundamental role in economic construction. The construction time of power grid projects is relatively long, and the funds invested are also large. The complexity of its own makes the forecast of cost trend and capital management face certain uncertainty. At the same time, with the gradual increase and expansion of power grid construction projects, the macro-environmental factors affecting their cost levels have become more diversified and complicated. Therefore, forecasting the overall trend of power grid project cost based on the macro environment helps to grasp the overall level of power grid project cost at a macro level, and provides a reference for the compilation of annual and quarterly power grid project standard prices.

Chen Ping et al. qualitatively analyzed and predicted the impact of the macroeconomic environment on the trend of power grid project costs by comparing the economic cycle and inflation during the “Eleventh Five-Year Plan” period with data on power grid project costs, equipment prices, and material prices [1, 2]. Taking into account the influence of regional economic development level on the cost of power grid projects, Liu Weidong and others introduced the GDP deflator and used the ARIMA-ES hybrid model to predict the project cost index [3–5]. At present, the research on the factors that cause the difference in the macro-cost trend of power grid projects is still in the stage of qualitative analysis. Grey forecasting method is a forecasting method for predicting grey system [6]. This method identifies the degree of difference in the development trend of system factors. It generates and processes the original data to find the law of system changes, thereby predicting the future development trend of things [7]. Peng Nian uses wavelet transform and other related mathematical principles to establish a multivariate gray model GM (1, N) to predict deformation trend association [8, 9].

On the basis of previous studies, this article first uses the fishbone diagram method to analyze the macro-environment faced in the construction of power grid projects, focusing on the time and space dimensional characteristics of the power grid project cost to analyze the environmental factors affecting the cost trend of power grid projects; secondly, the improved GM(1, N) prediction method is used to predict the macroscopic cost trend of different power grid project projects, and compare with the traditional GM (1, N) model prediction results; finally, the method system for forecasting power grid project cost trends in different regions can predict the future trend and development of power grid project cost and promote the sustainable development of China's power grid construction.

## 2 PEST Macro Environment Analysis

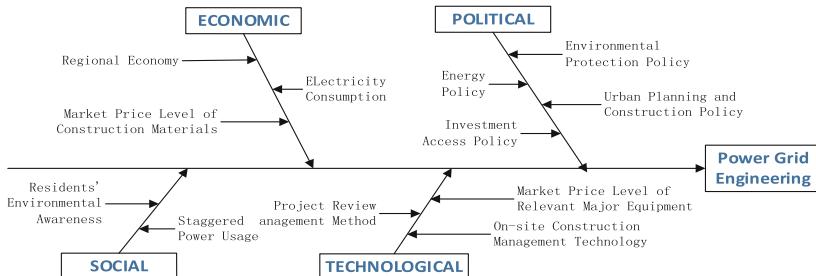
PEST analysis refers to the analysis of the macro-environment [10–12]. This article combines the macro-environmental problems faced in the construction of power grids and expands it. Based on the PEST analysis model, it covers Political, Economic, Technology and Social. Then, we analyze and discuss the macro factors that affect the investment estimation of power grid projects from these four external environmental factors. The fishbone diagram method is used to analyze the macro environmental factors affecting the cost of power grid projects, as shown in Fig. 1 below:

Political factors: One of the characteristics of power grid construction projects lies in the combination of sociality as infrastructure and economical investment projects of enterprises.

Economic factors: The economic level can be used as an important classification standard for power grid project construction areas to carry out macro-trend forecasts of power grid project costs by region.

Social factors: Social factors mainly emphasize the relevant level of awareness of social entities such as residents and enterprises, and have certain indirect effects on the requisition costs and construction period of power grid project construction.

Technical factors: Technical factors mainly include on-site construction management level, project review management methods, and so on. Among them, the market price level of related main equipment has a direct impact on the macroscopic cost trend of power grid projects.



**Fig. 1.** Macro-influence factors of power grid project cost based on PEST

Based on the content and level of the above macro factor analysis, power grid project are divided into 22 sub-categories, as shown in Fig. 2.

Economic Voltage level Project type	D eveloped	M edium	D eveloping
Substation	110/220/500	110/220/500	110/220/500
O verhead Line	110/220/500	110/220/500	110/220/500
C able Line	110/220	110	110

**Fig. 2.** Classification of macroscopic cost trend forecast for power grid projects

To further analyze the influencing factors outside the classification basis, to investigate the availability and reliability of relevant information, this paper finally chooses the input index system of the macroscopic construction cost trend forecast of power grid projects established for different types of projects. Among them, 7 influencing factors including the market price of transformers for substation projects, 5 influencing factors including the market price of steel poles for overhead cable projects, and 4 influencing factors including the market price of cable terminal joints for ground cable projects, establish input indicators respectively System, as shown in Table 1.

**Table 1.** Input index for forecasting macroscopic cost trend of power grid project

Project Type	Input Index	Unit
Substation Project	Market price of the transformer under the voltage level in the period (in quarters, the same below)	(¥)
	Market price of circuit breakers under this voltage level in the period	(¥)
	Market price of the cable under the voltage level in the period	(¥/km)
	Concrete market price in the period	(¥/m <sup>3</sup> )
	Steel market price in the period	(¥/t)
	Copper market price in the period	(\$/t)
Overhead cable Project	Quantification of relevant policies in this economic level area in this period (1-very support, 2-slight support, 3-no impact, 4-slight obstruction, 5-very obstructive)	Delphi method
	Market price of steel pipe rods in the period	(¥/t)
	Market price of iron tower market price in the period	(¥/t)
	Market price of the cable under the voltage level in the period	(¥/km)
	Steel market price in the period	(¥/t)
	Quantification of relevant policies in this economic level area in this period (1-very support, 2-slight support, 3-no impact, 4-slight obstruction, 5-very obstructive)	Delphi method
Ground Cable Project	The market price of cable terminal connectors under this voltage level in the period	(¥)
	The market price of cable intermediate joints under this voltage level in this period	(¥)
	Market price of the cable under the voltage level in the period	(¥/km)
	Quantification of relevant policies in this economic level area in this period (1-very support, 2-slight support, 3-no impact, 4-slight obstruction, 5-very obstructive)	Delphi method

### 3 Time-Delay GM(1,N) Gray Prediction Model

Since the introduction of the gray system theory, the gray prediction model has been widely used in many fields, such as industry, agriculture, meteorology, transportation, geology, economy, management, water conservancy, and so on. Grey forecasting models can be divided into two types: univariate and multivariate models that is represented by the GM (1, N) model. The traditional GM (1, N) model contains a system characteristic variable and N-1 impact factor variables, which can analyze the effect of multiple impact variables on system behavior. Based on a series of interrelated system state models, the traditional GM (1, N) model is used to describe the system characteristics in an all-round way. The specific differential equations solved are as follows:

$$\frac{dx_1^{(1)}(t)}{dt} + ax_1^{(1)}(t) = b_2x_2^{(1)}(t) + b_3x_3^{(1)}(t) + \dots + b_Nx_N^{(1)}(t) \quad (1)$$

Where  $a$  is the development coefficient,  $b_i x_i^{(0)}(t)$  is the driving term,  $b_i$  is the driving coefficient, and  $\phi = [a, b_2, b_3, \dots, b_N]^T$  is the parameter vector. Use MATLAB tools to solve the Eq. (2):

$$\phi = (B^T B)^{-1} B^T Y \quad (2)$$

Accumulate and reduce the above results to get the predicted value. The traditional multi-variable gray GM (1, N) model is generally only suitable for forecasting year-on-year changes of the variable model. However, in the macroscopic cost trend problem of power grid project, the impact of some input parameters on the cost level presents a time-lag characteristic. There are certain restrictions, and the concept of lag period needs to be introduced into the traditional gray forecasting model, that is, formula (1) is rewritten to establish the differential equation of time lag GM(1,N) as follows:

$$\frac{dx_1^{(1)}(t)}{dt} + ax_1^{(1)}(t) = \sum_{i=2}^N \sum_{j=1}^t b_i \lambda_i^{t-j} x_i^{(1)}(j) \quad (3)$$

Among them,  $\lambda_i$  is the decreasing degree of the influence of the input factors  $i$  on the characteristic variables of the system behavior, and  $\lambda_i^{t-j} x_i^{(1)}(j)$  represents the time lag effect of the input factors  $i$  in the  $j$ -th period on the output of the  $t$ -th period.

#### 4 Forecast of Power Grid Project Cost Trends

Taking a province's power grid projects completed in a total of 12 quarters from 2017 to 2019 as an example, this section will use the traditional GM(1, N) model and the GM(1, N) model that considers the time-lag relationship. The 110 kV substation project, overhead cable project, and ground cable project in the economically developed areas of the province are used to predict the macro cost trend and compare the results to verify the accuracy and validity of the time-lag GM(1, N) model.

Use the above models to make predictions separately. The first eight sample points are selected for fitting. The fitting results of the two models based on the traditional GM (1, N) model and the time lag GM (1, N) model are shown in Fig. 3, Fig. 4, and Fig. 5.

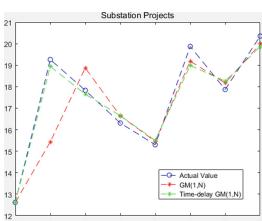


Fig. 3. Substation projects

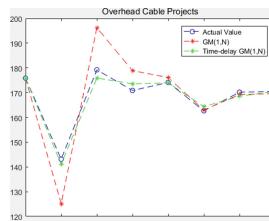


Fig. 4. Overhead cable projects

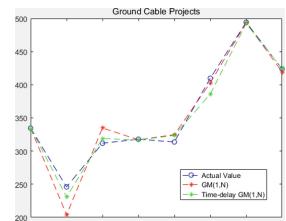


Fig. 5. Ground cable projects

Taking the substation project as an example, the error test of the fitting result is carried out: ① From the relative error of the fitting results, the fitting errors of the traditional GM(1, N) model and the time-delay model are both less than 5%, which is in line with the project cost prediction General accuracy requirements; And the average relative error of the time-delayed GM (1, N) model fitting reached 1.876%, which is better than the traditional model. ② From the gray correlation results, the traditional GM (1, N) model and the time-delay model are both greater than 0.8, which can be considered to have achieved a good level of correlation; And the time-delay GM (1, N) gray correlation degree is 0.8529, which is higher than that of the traditional model. From the perspective of both fitting error and gray correlation degree, the fitting effect of the GM (1, N) model which time lag effect is taken into is better than traditional GM (1, N) model. According to the parameter values obtained by fitting, the last four sample points are predicted. From the prediction result, which is shown in Table 2, it can be seen that from the perspective of the prediction error and the gray correlation between the prediction results and the actual values, the time lag (1, N) the prediction effect is better.

**Table 2.** Prediction results of substation projects

Completion Time	Actual Value	Predictive value		Relative error	
		GM(1, N)	Time-delay GM(1, N)	GM(1, N)	Time-delay GM(1,N)
1	23.13	22.2428	23.0086	3.836%	0.525%
2	15.83	17.5595	16.8968	10.925%	6.739%
3	17.98	18.0599	17.4614	0.444%	2.884%
4	20.93	21.9516	20.599	4.881%	1.581%
Average Relative Error				5.022%	2.932%
Grey Correlation				0.6010	0.7230

According to the results of Table 2, the time-lag GM (1, N) model can be used to predict the macro-cost trend of 110 kV substation projects in an economically developed area in a certain province. The fitting and prediction results of the remaining 21 sub-project types are similar. All of the simulations also pass the gray correlation test and the prediction accuracy test, which can effectively predict the macro-cost trend of the corresponding project. The time-lag GM(1, N) model is used to predict the cost trend of substation project, overhead cable project, and ground cable project under the 110 kV voltage level in the economically developed area of a certain province in the first four quarters of 2020. The results are shown in Table 3.

**Table 3.** 2020 power grid project cost trend based on time-delay GM (1, N)

Completion time	1	2	3	4
Substation project	21.76	19.88	17.92	22.12
Overhead cable project	152.23	150.89	147.82	150.01
Ground cable project	529.67	617.23	563.90	600.21

Judging from the forecast results, the cost of substation projects, overhead cable projects, and ground cable projects in the first to fourth quarters of 2020 will all increase to varying degrees compared with 2019. It is speculated that the reasons for this upward trend are on the one hand from the economy. As China's economy has been shifting from the stage of "high-speed growth" to "high-quality development", the investment and construction of Chinese power grid projects is also shifting from "high-speed growth" to "high quality development". The investment focus has gradually shifted to the construction of smart power grids and distribution networks; in addition, due to the impact of the epidemic, the demand for related project construction has undergone certain changes.

## 5 Conclusion and Discussion

Firstly, fishbone diagram method is used to establish a PEST environmental analysis model. From political, economic, social, and technical factors, we analyze and sort out the macro-environmental factors affecting the cost trend of power grid projects. Secondly, considering the characteristics of power grid project types, it is divided into three major categories: substation project, overhead cable project and ground cable project, and then subdivided into 22 sub-categories according to the local economic level and project voltage level, and the cost trend forecast is carried out respectively. Thirdly, an improved GM(1, N) model is used to consider the time lag effect that affects the macro cost trend of power grid projects, which solves the problem that the construction period span of power grid projects is not completely matched with the corresponding input parameters, and improves the stability of the data.

However, the selection of the time delay factor  $\lambda_i$  in the time-delay GM(1, N) model is mainly based on experts' opinions and experience which came from lots of actual projects. If conditions permit, intelligent algorithms can be used to improve and optimize the selection method of the time lag factor to further improve the prediction accuracy of the model.

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# Research on Optimization of Power Grid Investment Decision Based on Grey Prediction Model

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**Abstract.** At present, the Investment Decision of power grid is mainly based on the judgment of macro-economic situation, with few researches on the investment constraints of power grid. The current power grid investment decision-making is mainly based on the macroeconomic development situation, with little research on the constraint relationship of power grid investment. Therefore, it is difficult to carry out a quantitative analysis of the effect of grid investment and fails to form specific guidance for the investment plan. This paper analyzes the relevant factors that affect the investment capacity of power grid enterprises from internal and external aspects, and uses the grey prediction model to calculate the investment demand of power grid companies, forming the investment restriction conditions. Based on this, this paper constructs a power grid investment coordination optimization model which is constrained by power grid investment demand and power grid investment capability. Based on the above, this paper builds a model for the coordination and optimization of grid investment demand and grid investment capacity. The model effectively improves the effectiveness and precision of grid investment and ensures the efficiency of grid investment. And a case study of investment optimization was carried out in Shandong Province as an example.

**Keywords:** Power grid investment · Investment demand · Investment capacity · Investment optimization

## 1 Introduction

The Power Grid Company is a very important national pillar enterprise. It is very important for grid companies to consider the accuracy of investment ability when they make grid planning. When power grid companies formulate grid planning; they need to consider the accuracy of investment capacity, which is of great significance to promote accurate investment in scientific decision-making of power grids.

The investment ability of grid companies is restricted by many factors, and the changes of these factors will increase the uncertainty of grid investment. Many scholars

have developed various models to accurately evaluate the investment capacity of the grid, such as quantifiable grid investment capacity model [1], investment ability analysis system model2, measurement model of investment capacity3, comprehensive evaluation model of investment capacity [4], multiple perspectives of grid investment capacity evaluation index system [5], the model that can be used to classify the size and structure of investments [6], B-S model uncertainty economic analysis model in combination with options and so on. Foreign scholars have taken another approach by using costing to assess the feasibility of grid technology [7]. Bakhshi R and Sadeh J (2018) studied the feasibility of GCPV technology under a new dynamic HT strategy by calculating various economic indices and averaging the cost of energy [8].

As a power grid planner and implementer, the grid company should estimate the investment requirements of the power grid in order to rationalize its planning and increase its risk resistance. Cui (2011) designed an analysis system for grid economic indicators to solve problems related to grid planning [9]. Zeng (2012) developed a cost-benefit model for microgrids based on demand-side response [10]. Zhangxian Wu (2009) attempted to develop a sustainable financing model with the characteristics of the Chinese power grid [11]. Zhou Ying (2015) analyzed the impact of various characteristics of the investment curve on investment allocation [12]. Zhou Ying (2015) used an adaptive bell curve that accounts for environmental factors to describe grid investment needs [13]. Cai Chengkai (2011) used hierarchical analysis to determine the weights of each indicator and fuzzy mathematical methods for expert evaluation treatment to study the reasonable range of the scale of grid investment [14]. It can be seen that there are few studies on lean investment in power grids in China, so research efforts need to be strengthened in this area.

As China's national living standards improve and electricity consumption in various industries rises to new heights, the power grid should continue to improve management while expanding the scale of investment. Domestic scholars have established a variety of evaluation systems to evaluate grid investments, such as the fixed asset investment benefit evaluation system [15], the evaluation index system based on the comprehensive index evaluation method [16], the evaluation index system for grid investment programs [17], model of power grid investment evaluation system [18], the comprehensive evaluation mathematical model for post-evaluation decision making of grid investment benefits [19], the fuzzy evaluation system for grid IT investment benefits [20], and the investment benefit index evaluation system [21].

At present, most of the investment decisions of power grid enterprises in China are based on the macro-economic situation, which cannot be guided in detail by the investment plan itself. Based on this, this paper forecasts the investment demand of power grid enterprises and calculates the investment capacity of power grid enterprises to form a variety of constraints. On this basis, this paper establishes an investment decision-making optimization model. This model effectively improves the investment efficiency and precision of power grid enterprises, and guarantees the investment benefit of power grid enterprises.

## 2 Measurement of Grid Investment Needs

Investment demand is the sum of the increase in fixed asset investment and inventories generated by society as a whole over a given period of time. At present, China's power grid investment shows rapid growth momentum. At the same time, considering the fact that China's power construction is not yet saturated, the future continued investment in grid construction is indispensable and the demand for grid investment will continue to increase.

Accurate and effective forecasting of power grid investment demand can not only help enterprises to co-ordinate funds and rationalize capital investment, but also improve the business conditions of power grid enterprises.

This paper uses the grey forecasting method of investment demand to forecast. Grey theory considers the prediction of a system that contains both known and unknown or uncertain information as the prediction of a time-dependent grey process that varies within a certain range. Gray prediction is the use of such laws to build gray models and make predictions about gray systems. Gray prediction is most commonly used in the  $GM(1, 1)$  prediction model, which is modeled by using raw data sequences as the solution to differential equations.

The  $GM(1, 1)$  modeling process is as follows:

Note that the original data series  $X^{(0)}$  is a non-negative series:

$$X^{(0)} = \left\{ x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), \dots, x^{(0)}(n) \right\}$$

Where  $x^{(0)}(k) \geq 0, k = 1, 2, \dots, n$ ,

Its corresponding sequence of generated data is  $X^{(1)}$ :

$$X^{(1)} = \left\{ x^{(1)}(1), x^{(1)}(2), x^{(1)}(3), \dots, x^{(1)}(n) \right\}$$

Where  $x^{(1)}(k) = \sum_{i=1}^k x^{(0)}(i), k = 1, 2, \dots, n$

$Z^{(1)}$  is the immediately adjacent mean-generated sequence of  $X^{(1)}$

$$Z^{(1)} = \left\{ z^{(1)}(1), z^{(1)}(2), \dots, z^{(1)}(n) \right\}$$

Where  $Z^{(1)}(k) = 0.5x^{(1)}(k) + 0.5x^{(1)}(k-1), k = 1, 2, \dots, n$

Call  $x^{(0)}(k) + az^{(1)}(k) = b$  model  $GM(1, 1)$ .

## 3 Measurement of Capacity for Grid Investment

In this paper, the knowledge of system dynamics is used to measure the investment ability of the power grid.

### 3.1 Identification of Factors Influencing the Investment Capacity of Grid Enterprises

Grid investment refers to the investment related to grid infrastructure, including power transmission and transformation projects of various voltage levels, minor infrastructure projects, and other special projects. The grid investment capacity is the upper limit on the size of the investment that the company's finances can support, given the target profit, debt asset ratio limit and the assumed increase in electricity sales.

Investment capacity consists mainly of depreciation, profit, and financing, and is affected by many external factors such as the economy and policies. For depreciation, this paper quantifies the firm's depreciation capacity in terms of the original value of fixed assets, the combined depreciation rate and construction in progress, thus serving as the main correlates of depreciation. For financing, a company's financing will be affected by the level of exchange rate, difficulty of lending, short-term borrowing, long-term borrowing, interest rates and other factors. In this paper, the above factors are quantitatively analyzed to measure the level of financing of enterprises, which is important to reflect the overall investment capacity of enterprises. For a firm's net profit, the net profit of the firm is affected by its costs, revenues, and tax policies, with the difference between revenues and costs making up the net profit of the firm. The different influences that comprise each level become linked systems that affect the investment capacity of the grid in both indirect and direct ways.

Based on this, this paper uses debt asset ratio, total profit, and profits turned in as constraints on the ability to invest in the grid.

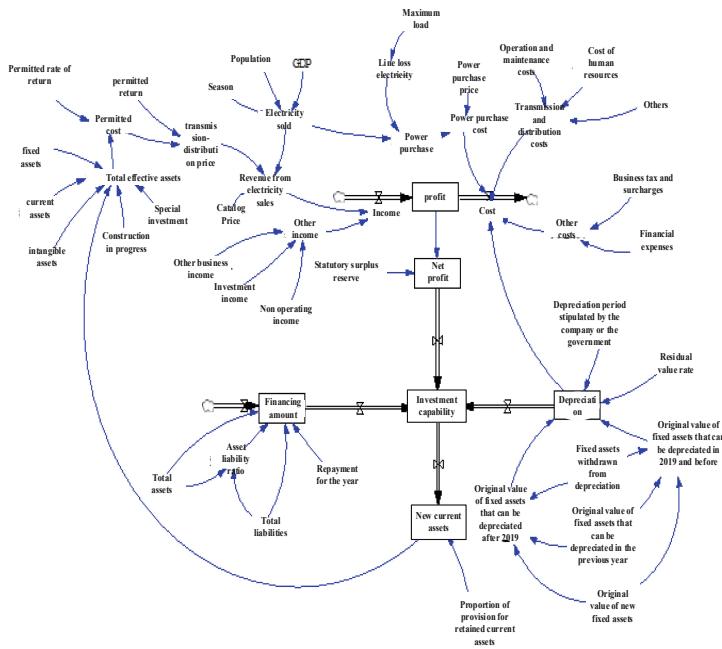
### 3.2 Model Construction

Based on the analysis of the factors influencing the investment capacity of power grid, the investment sources are divided into three parts: profit, depreciation and financing. At the same time, considering the investment funds as a part of the current assets, the forecasting model is constructed. The system flow diagram is shown in Fig. 1.

The formula for calculating the constructed investment capacity is as follows:

$$Ic_i = Np_i - Tp_i + D_i + \Delta F_i - \Delta LA_i \quad (1)$$

where  $Ic_i$  is the investment capacity of the grid in year  $i$ ,  $Np_i$  is the net profit of the grid company in year  $i$ ,  $Tp_i$  is the profit contributed by the grid company in year  $i$ ,  $D_i$  is the depreciation in year  $i$ ,  $\Delta F_i$  is the amount of new financing for the grid in year  $i$ , and  $\Delta LA_i$  is the new liquid assets of the company in year  $i$ .



**Fig. 1.** Forecast stock flow chart of investment capacity of Power Grid Enterprise

## 4 Optimization Model for Grid Investment Decision Based on Investment Demand and Investment Capacity Empirical Analysis

### 4.1 Grid Investment Constraints

In this paper, investment demand and investment capacity are hard constraints, and additional constraints are set as prerequisites for an optimization model for grid investment decisions. The constraints of this model are the following three: power supply demand constraints, investment capital constraints, and project attribute constraints.

#### (1) Demand constraints on power supply

The supply demand constraint refers to the supply capacity to be planned for the grid and the regions within it. The capacity-to-load ratio is an important measure of the grid's supply capacity.

#### (2) Investment capital constraints

Grid investment should also have a cap on investment based on consideration of the demand for electricity supply, which will generally be constrained by the ability of companies to invest.

(3) Project attributes constraints

A mandatory construction project constraint means that the investment must be built regardless of the outcome of the project's comprehensive evaluation.

The mutually exclusive project constraint means that two projects cannot exist at the same time.

A subordinate item constraint indicates that an item can only exist if another item exists.

The simultaneous project constraint indicates that two projects must be constructed or not constructed at the same time.

## 4.2 Grid Investment Decision Optimization Model

Based on the above constraints on grid investment, it is assumed that the construction or non-construction of the project as the main decision variable for investment decision is set as  $x_i^{jk}$ , where  $i$  are different projects,  $j$  is different regions, and  $k$  represents different voltage levels.

Construct an optimization model for grid investment decisions as follows:

$$\gamma^k < \frac{\sum (x_i^{jk} v_i) + v_0^{jk}}{L^{ik}} < \theta^k$$

$$k = 10 \text{ kV}, 35 \text{ kV}, 110 \text{ kV}, 220 \text{ kV}, 550 \text{ kV} \quad j \in RG; i \in TS^{jk} \quad (2)$$

$$F_D \leq \sum x_i^k s_i^k \leq F_P \quad (3)$$

$$F_D^k \leq F_P^k \quad (4)$$

$$s_i^k = f_{si}^k + f_{Li}^k (L_i^k - L_{i-1}^k) + f_{ci}^k (C_i^k - C_{i-1}^k) \quad (5)$$

$$x_i = 1; i \in F \quad (6)$$

$$x_i + x_j \leq 1; (i, j) \in M \quad (7)$$

$$x_i - x_j \geq 0; (i, j) \in C \quad (8)$$

$$x_i = x_j; (i, j) \in E \quad (9)$$

Equation (2) represents the power supply capacity constraint.  $\gamma^k$  and  $\theta^k$  are the lower and upper limits of the specified reasonable range for the  $k$  voltage level capacity-to-load ratio, respectively,  $x_i^{jk}$  and  $v_i$  are the decision variables and supply capacity of  $k$ -voltage level project  $i$  in region  $j$ ,  $v_0^{jk}$  and  $L^{ik}$  are the substation capacity and the load in the planning year of  $k$ -voltage level in region  $j$ ,  $RG$  is the power grid and the collection of power grids in each region, and  $TS^{jk}$  is the substation project to be built for  $k$ -voltage level in region  $j$ .

Equation (3) represents the investment needs and investment capacity constraints. The total investment plan for all proposed projects should be able to meet the overall demand and not exceed the overall capacity constraint. As shown in the equation,  $F_D$  is the investment demand that needs to be met for the year,  $F_P$  is the investment capacity for the year, and  $s_i^k$  is the investment cost of project  $i$ .

In Eq. (4),  $F_D^k$  is the investment demand at  $k$  voltage class and  $F_P^k$  is the investment capacity at  $k$  voltage class. For the construction of the investment model by voltage class, the investment demand for the corresponding voltage class should be less than its investment capacity.

Equation (5) is the calculation of investment cost  $s_i^k$  for a single project, where  $k$  means under  $k$  voltage level;  $f_{si}^k$  is the cost of building a single substation;  $f_{Li}^k$  is the cost of building a new unit length of overhead line;  $L_i^k$  is the length of overhead line in the current year;  $L_{i-1}^k$  is the length of overhead line in the previous year;  $f_{ci}^k$  is the cost of building a new unit length of cable;  $C_i^k$  is the length of cable in the current year; and  $C_{i-1}^k$  is the length of cable in the previous year.

Equation (6) is the constraint on mandatory construction projects, which can be ensured by adding constraint  $x_i = 1$ .  $F$  Is the set of mandatory construction projects.

Equation (7) is a mutually exclusive project constraint, indicating that two projects cannot co-exist, and  $M$  is the set of mutually exclusive projects.

Equation (8) is a subordinate item constraint indicating that item  $j$  can exist only if item  $i$  exists, and  $C$  is the set of subordinate items.

Equation (9) is the simultaneous item constraint, which means that two items must be on or off at the same time, and  $E$  is the set of simultaneous items.

## 5 Empirical Analysis

Due to the limitations of space and data collection, this paper takes 2020 as an example to screen the investment strategies for each voltage level of Shandong power grid and propose investment optimization schemes.

### 5.1 Shandong Grid Investment Strategy Construction

In this paper, the range of the total voltage capacity are obtained by means of voltage capacity load ratio constraints, combined with the planning values of the network supply load. The capacity prediction of a single substation is then used to obtain the number of substation seats that should be built in the new situation.

According to the capacity constraint interval of each voltage level and the forecast of the capacity of a single substation in Shandong Province in 2020, the approximate number of substations per year under each voltage level in Shandong Province in 2020 can be obtained, and then form the investment strategy screening pool. The investment strategy constraint interval for each voltage level in 2020 is shown in Table 1 below.

**Table 1.** Investment strategy constraint intervals for each voltage level in 2020

Voltage level	Range	Value(Unit: 10,000 yuan)
500 kV	min	39
	max	55
220 kV	min	342
	max	406
110 kV	min	1474
	max	1638
35 kV	min	1381
	max	1535
10 kV	min	84359
	max	103920

## 6 Shandong Grid Investment Strategy Screening

This section screens the investment strategies based on the decision aid model for grid investment optimization. According to the constraints, the total investment level for new construction and expansion at all voltage levels in 2020 should not exceed the forecasted investment capacity for that year, and should also meet the investment needs for that year. In addition to that, you should also meet your range of abilities and needs.

The investment capacity of the power grid is predicted using the investment capacity model constructed in this paper. This paper forecasts the investment proportion of voltage grades which may appear in 2020, and the results are as shown in Table 2.

**Table 2.** Investment capacity projections for 2020

Voltage Rating	500 kV	220 kV	110 kV	35 kV	10 kV	Total
Percentage of investment by voltage level	0.0925	0.1325	0.1275	0.055	0.5775	
Measured investment capacity in 2020 (Unit: 10,000 yuan)	375550	537950	517650	223300	2344650	4060000

The results of the investment needs projections are shown in Table 3 below. Investment strategies should be screened with the goal of meeting the province's investment needs as much as possible, while each voltage class should also meet its own voltage class's investment needs.

**Table 3.** Projected investment needs for 2020

Voltage rating	500 kV	220 kV	110 kV	35 kV	10 kV	Total
Projected investment needs in 2020 (Unit:10,000 yuan)	153540	348670	242350	393900	1776000	3021620

Finally, the grid investment optimization decision aid model is used to screen the investment strategies, and the final investment strategy screening model is obtained, resulting in the investment planning savings after the above constraints are filtered as shown in Table 4 below.

**Table 4.** Investment strategies for new substations of various voltage levels in 2020 (excerpt)  
Unit: seats

Strategy group	New construction						Expansion			
	500 kV	220 kV	110 kv		10 kv		500 kV	220 kV	110 kv	
			Min	Max	Min	Max			Min	Max
1	8	13	122	260	15074	17624	0	0	4	8
2	8	14	122	260	14882	16940	0	0	4	8
3	8	15	122	260	14691	16748	0	0	4	8
4	8	16	122	260	14499	16557	0	0	4	8
5	8	17	122	260	14308	16366	0	0	4	8
6	8	18	122	260	14116	16174	0	0	4	8
7	8	19	122	260	13925	15983	0	0	4	8
8	8	20	122	260	13734	15791	0	0	4	8
9	8	21	122	260	13542	15600	0	0	4	8
10	9	13	122	260	14915	16972	0	0	4	8

From the above results, it is clear that the optimization assistance model can result in a variety of accurate investment strategies. Among them, there is no number of intervals that can be built for 35 kV class substations. Due to the actual situation in Shandong Province, the planning of 35 kV substations generally does not take into account the addition of new substations, so the planning results are also in line with the actual situation.

## 7 Conclusions

This paper establishes an optimization model for power grid investment decision based on internal and external development needs by forecasting the investment demand and investment capacity. The study has strong theoretical and practical significance to

effectively improve the effectiveness and accuracy of grid investment and ensure the benefits of grid investment.

The main findings of this paper are as follows:

1. Firstly, based on the characteristics of the historical data of grid investment and considering multiple factors that affect grid investment, the  $GM(1,1)$  model is chosen for measurement in this paper to eliminate the influence of uncertainties.
2. For grid investment capability, the knowledge of system dynamics is used to identify the factors influencing the investment capacity of the grid. The investment capacity correlation analysis model of the power grid from the aspects of depreciation, net profit, and financing is constructed, and the investment capacity prediction stock flow diagram of the power grid enterprise is obtained. The three constraints of debt asset ratio, total profit, and profits turned in are then formed to create a model for measuring the investment ability of the grid.
3. Based on the prediction of grid investment demand, two hard constraints, investment need and investment ability, are used as prerequisites for the optimization model of grid investment decision. The constraints also include power supply demand constraints, investment capital constraints, and project attribute constraints. On this basis, a coordinated analytical model of investment demand and investment capacity is developed.
4. An example analysis is carried out in Shandong Province. Firstly, an investment strategy screening pool is established based on various historical data. Then the investment strategies are screened based on the investment demand and investment ability coordination analysis model. Finally, the results of the investment planning excerpt after the constraint filter are derived.

**Acknowledgements.** This work was supported by State Grid Shandong Electric Power Company project (No.SGSDJY00GPJS2000083).

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# Analysis of Computer Technology on Sports Technical Movement Characteristics of Model Test Research

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**Abstract.** Exercise can enhance our physical function, so we have been taking the course of physical education since we went to school. In order to make sports action more standardized and improve people's sports level, this paper uses the image processing technology and multimedia database technology in computer technology to conduct quantitative research on the movement characteristics of sports technology, and establish the action feature model. This paper discusses the application of digital motion simulation technology in sports training, including the application of digital motion simulation technology in sports training. The research shows that the establishment of the digital model of human movement structure can make use of the analysis and comparison between the standard movements in the labeled action library and the technical movements made by the athletes, so as to find out the gap between them, so as to make a set of good improvement scheme for the athletes.

**Keywords:** Computer technology · Action feature model · Digital model · Pattern design

## 1 Introduction

With the great improvement of people's living standard, people pay more attention to sports. Scientific and standardized sports activities are a common concern. In order to make the motion more scientific and standardized, and improve the quality and scope of motion, we use the high-speed photography and video image analysis method to analyze the traditional technical activities. The biggest disadvantage of this method is that it is impossible to accurately measure the athletes' behavior at the end of each activity. Therefore, this method cannot meet the needs of numerical analysis [1] and morphological analysis of motion [2].

With the development of computer technology in science and technology, it has also led to the rapid development of modern sports field, such as the calculation and automatic analysis of sports movement structure image, as well as the quantitative analysis and action analysis of movement technical structure. The research has laid a solid foundation for the application of digital technology simulation [3–5] in sports technical structure, which enables sports professionals and coaches to predict the

function of sports technical structure in the process of sports design. This paves the way for the research on the structural characteristics of sports technology and the integration of science and technology into sports practice, thus promoting the design of sports technology [6–8]. Using computer digital simulation technology to improve the structure of sports technology or rebuild sports technology can significantly shorten the time of sports action research and improve the technical structure of sports design. The feasibility and practical value of the design scheme greatly improves the training efficiency of sports technology training.

Therefore, this paper discusses the research on the computer technology model of sports technical characteristics. This paper makes a quantitative study on the characteristics of sports technical activities and develops a sports behavior model [9, 10]. The structure of human body movement in sports, the digital model implementation of computer digital simulation technology and the application value of computer digital in sports technology training are described in detail. The research shows that with the rapid development of modern science and technology, computer digital simulation technology is playing a more and more guiding role and value in the practice of continuous integration with sports technology.

## 2 Formal Description of Sports Technical Movement Characteristics

### 2.1 Body Shape Model

Sports technical action is a continuous dynamic process, which can be decomposed into several discrete static figures with the help of animation frame concept. The whole body shape of human movement is represented by the position of all limbs, and its model is formally expressed by BNF normal form as follows:

$$<\text{shape}> ::= \{ <\text{Limb position}> \} \quad (1)$$

$$<\text{Limb position}> ::= <\text{rotate}> | <\text{displacement}> \quad (2)$$

$$<\text{Rotate}> ::= <\text{Limbs}> <\text{X angle}> <\text{Y angle}> <\text{Z angle}> \quad (3)$$

$$<\text{Displacement}> ::= <\text{articular}> <\text{object}> <\text{X diatance}> <\text{Y diatance}> <\text{Z diatance}> \quad (4)$$

$$<\text{Object}> ::= <\text{articular}> <\text{sports equipment}> <\text{scene}> \quad (5)$$

The symbol “::=” indicates “contains” and “{}” indicates repeatable content. If “standing” is the basic body shape, and the “standing” of the human body is defined as relative to the basic shape, the human body is defined as a stationary body shape, on the contrary, the legs in different positions are fixed limbs, and vice versa. The moving limb can also be divided into active motion limb and passive motion limb. Active movement refers to the limb that plays a major role in the target. If the unknown legs

and walking legs are ignored, the position of the moving limbs will be used to describe the body shape, which is called the representation of behavior characteristics.

## 2.2 Quantification and Reprocessing of Action Features

- 1) Quantitative treatment
  - (1) The absolute position of each body line and joint point is determined according to the limitation of human body image and human frame library, and the head or upper limb is searched step by step.
  - (2) The relative position of the limb relative to the root limb is calculated and compared with the basic body shape to determine the body and motion information;
  - (3) The physical representation of characters is used to describe the key shapes of actions;
  - (4) Organize, transform, store and store the action behavior information of actors in the action model base;
- 2) Pretreatment of action map
  - (1) There are two ways to insert motion images: one is to use a scanner to insert existing still images into a computer. Another method is to use digital camera to take pictures of athletes' actual sports and import them into the computer, then input the information into the computer, and then save the pictures in the form of BMP.
  - (2) Image processing: perform image processing software, including the use of image editing software, to eliminate noise and irrelevant scenes, and enhance image quality and size consistency. The purpose of filtering and optimizing process is to avoid all kinds of interference in the process of pattern recognition, and convert the action mode into moving human image.

## 3 Experimental Thinking and Design

### 3.1 Experimental Ideas

This paper discusses the research on the computer technology model of sports technical characteristics. In this paper, the characteristics of sports technical activities are studied, and a sports behavior model is established. The structure of human body movement in sports, the digital model implementation of computer digital simulation technology and the application value of computer digital in sports technology training are described in detail.

### 3.2 Experimental Design

The design and analysis of technical action design is based on human frame structure model and standard measures. Compare the described operation with the corresponding

standard measures, or describe several related steps for behavior comparison, and obtain the action analysis report. Including the work of action model library, including action model storage, action questionnaire, action image and behavior measurement statistics.

Using computer technology to quantify the characteristics of technical activities is conducive to the analysis and improvement of sports technical activities, so as to improve sports performance. For example, in martial arts, athletes must first carry out pre competition activities, good stability, fast rhythm and sufficient energy. Therefore, we can input the athletes' technical movements into the computer, form the action mode after the characteristics are quantified, and formulate the action plan. Then we can compare and analyze the routine activities in the routine activity library with the athletes' technical activities, find out the gap and make improvement. In addition, whether the content of Wushu routine is substantial and whether the structure layout is reasonable also plays an important role. The workflow of action feature quantification and pattern analysis is shown in Table 1.

**Table 1.** Workflow of action feature quantification and pattern analysis

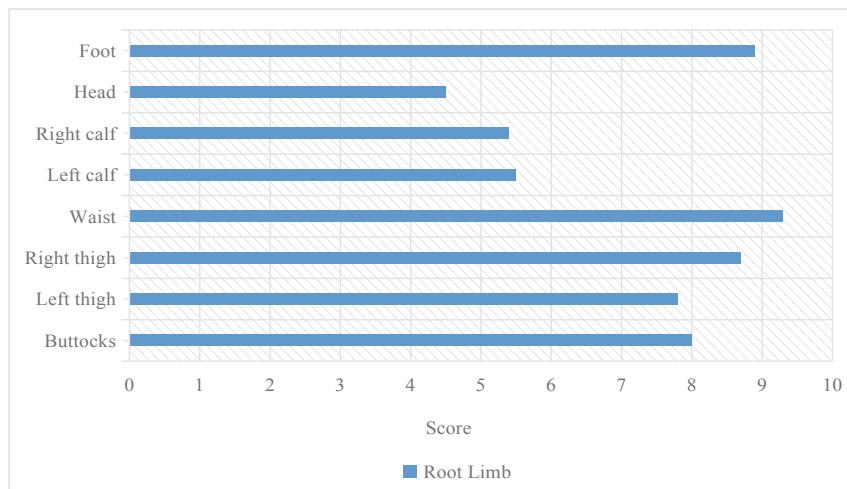
Picture input	Image processing	Pattern recognition	Pattern analysis
Action picture	Model diagram	Action model	Analysis report

## 4 Discussion

### 4.1 Model Experiment Analysis of Computer Technology on Sports Technical Movement Characteristics

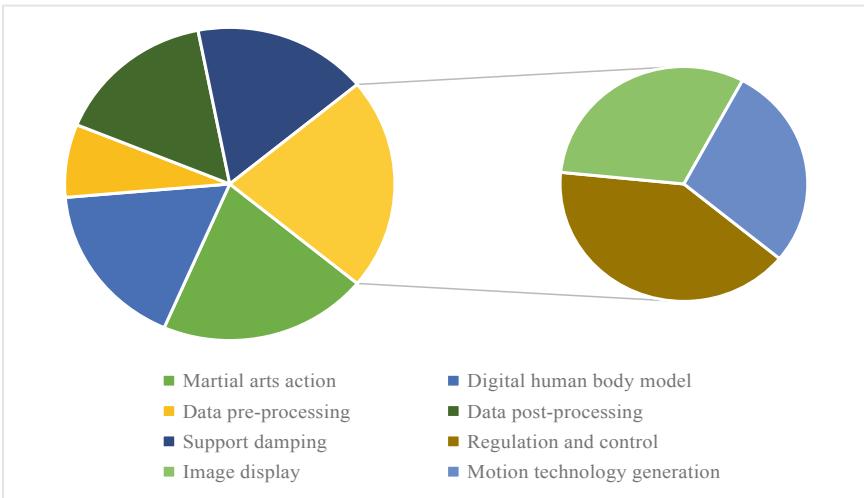
With the rapid development of modern electronic computer technology, there are many computer program software's on the market to study the multi rigid body system model mechanics. These software programs can be used to solve the forward and reverse problems of kinematics and dynamics of human body multi-body system in the process of martial arts. Because all the technical movement structures of human body in martial arts must follow mechanics and biology Therefore, through the calculation method of its digital simulation technology, we can solve the problem of quantitative analysis of the technical structure of human Wushu movement in sports. The steps of computer digital analog technology include data input, data pre-processing, analog calculation, data post-processing, technical action plan modification or innovation, action design, data post-processing and image display. In computer technology, using image processing technology and multimedia database technology to measure the movement characteristics of sports technical activities will help to improve students' action and technical performance, because it is helpful to analyze and correct sports movements. Therefore, we can import the technical steps of athletes' limbs into the computer in the

form of pictures, and establish an action mode after the computer completes the behavior screening process. Therefore, the inability to visualize and display is not as good as the computer to establish the action feature model. In the computer dynamic design, the actions of each hand and joint can be described in detail, which can be turned into a regular action library, and then the simulation display can be merged and executed according to the needs.



**Fig. 1.** Action limb constraint hierarchy

In the human limb model library, hand and body degrees of freedom and constraints of human frame are stored. The structure includes code, body name, common name, joint point layout, connection state and degree of freedom limit. In the form of questionnaire, the importance degree of action limbs was scored. The total score was 10 points. The higher the score, the greater the importance of action limbs. It can be seen from Fig. 1 that in the process of human movement, the limited movement of the upper limbs leads to the lower limbs and lower limb limbs to do the same thing. The movement of lower limbs can drive the movement of all organs in the body, and the movement of lower limbs will not affect the same movement of upper limbs. The movement of the lower limbs can drive all the movements of the whole body, and the movement of the lower limbs does not affect the upper limbs.



**Fig. 2.** Application of computer digital technology

As shown in Fig. 2, the application process of computer digital simulation technology involves many different aspects, such as establishing the digital model of continuous motion and dynamic properties of multi rigid body system, establishing kinematic, dynamic and biological equations of movement structure, applying or compiling software, debugging calculation and data checking according to the research topic, purpose and task of martial arts movement technical structure Check, feedback adjustment and control, and ultimately establish and improve the optimal structure of martial arts movement technology.

## 4.2 Procedures and Steps of Computer Digital Analog Technology

### 1. Data input

The input of the data includes the kinematic parameters of the technical structure of martial arts obtained from the three-dimensional photographing method or the plane video recording, the dynamic parameters of the movement technical structure and the biomechanical parameters such as human inertia and rotational inertia measured by the electronic force measuring platform system. The program of filtering, modifying and smoothing the number can be used to reconfirm and modify the wrong or suspicious data.

### 2. Data preprocessing

Data preprocessing includes coordinate transformation, error processing and time synchronization processing. According to the fact that there is inertial and non-inertial reference coordinates in the film or video data to represent the motion space characteristics. Therefore, it is necessary to transform the original data to coordinate, to process the parameters statistically, to eliminate singular points in error

processing, and to smooth the whole set of data. These data pre-processing work has a direct impact on the accuracy of the system calculation results.

### 3. Computer digital analog calculation

After the correct pre-processing stage of input data, the whole process of sports technical movement in space can be calculated according to the dynamic equation, and the accuracy and error of the simulation program can be verified by comparing it with the actual image. When the result image of computer simulation is compared with the actual action image, the trajectory of the two is basically consistent, which shows that the computer digital simulation technology program is in line with the research practice and has a good guiding role and significance for sports training practice.

### 4. Data post-processing and image display

The data calculated by computer digital simulation technology should be displayed in different ways according to the requirements of the research project content and task. The calculation program of computer digital analog technology has various data conversion functions, and can display the results in various graphic ways. This process is called data post-processing, and the most intuitive and reasonable technical action graphic results can be obtained. In the process of researching and designing the optimal technical structure scheme of martial arts, the continuous graphic output calculated by computer digital simulation technology has a very important reference value for the modification and innovation of Wushu action technical structure scheme, and can play a direct and decisive role.

## 5 Conclusions

In the research of computer technology activities, the quantitative research on computer technology activities is carried out, the characteristics of sports technical activities are studied, and the behavior model of limb activities is established. The paper includes data input, data processing and sports activity technical structure model to improve the simulation program. The paper describes the application of the structure design of sports movement technology and the value of computer application in sports technology training. The realization method and structure function of digital simulation technology in sports action technology are discussed in detail. According to this research, the body shape model of human body movement can compare and analyze the standard action and the athlete's technical action in the standard action library, find out the gap, put forward the improvement scheme, and show that the computer technology can improve the performance of sports.

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# Form Analysis of Antenna Cable Net Structure Based on Balanced Matrix Analysis Method

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**Abstract.** In order to analyze the cable net structure of space deployable antenna accurately and efficiently, this paper introduces the balance matrix analysis method to calculate the pretension of the cable net structure with certain topological shape. When using the balance matrix analysis method, it is needed to first judge the structure type and solution form of the cable net system according to its self-stress mode number and mechanism displacement mode number, and then use the balance matrix analysis method to solve the balance equation of the cable net structure to calculate the optimal pretension value and the original length of cables. Since the solving process of the balance matrix analysis method is only a linear process of solving force balance equations, there is no complicated nonlinear iterative calculation in this process, the calculation speed is fast, and the calculation has a good convergence performance.

**Keywords:** Space deployable antenna · Cable net structure · Balance matrix · Cable pretension · Nonlinear iterative calculation

## 1 Introduction

Cable net deployable antenna is a kind of deployable antenna with flexible reflector and rigid support. This kind of antenna has more average comprehensive advantages in aperture, weight, reflector accuracy and structural stiffness. For this kind of deployable antenna, how to ensure the required surface accuracy of the antenna reflector is one of the key problems to be solved. The large-span reflector of cable net deployable antenna is mainly composed of cable net structure and wire reflector, and the shape error between the cable net reflector and the ideal reflector determines the accuracy of antenna reflector. Therefore, only by analyzing and calculating the shape of antenna cable net structure to make it have the preset parabolic reflector shape, can the antenna reflector be accurate Degree index can meet the requirements [1–3].

The cable net structure of cable net deployable antenna is a typical geometric flexible structure system, which is quite different from the rigid structure system. The rigidity of rigid structure system is provided by its own material. The rigid structure can have a certain shape without external force. When analyzing and calculating this kind of structure, the influence of external load on structure deformation and performance is generally emphasized. Cable net structure can have definite shape and stiffness only under certain pre tension, and cable net structure is applied when the pre tension reaches the equilibrium state, the internal force distribution state of the structure has a

corresponding relationship with the cable net shape. In addition, before analyzing and calculating the cable net structure with given topological shape, it is also necessary to determine the system shape to determine whether the given structure can form a full tension cable net structure system. According to the characteristics of the cable net structure, the shape analysis and calculation of the cable net structure need to be carried out in three aspects: system shape determination, internal force distribution state and cable net shape.

In terms of the calculation theory of cable net structure, there are more mature and applied methods at present. In addition to the nonlinear finite element method introduced above, there is also the balance matrix analysis method based on force method [4–6].

Nonlinear finite element method can link the pre tension change with the shape change of cable net structure, and can clearly reflect the influence of pre tension on the shape and performance of cable net structure. However, there are still some shortcomings when using this method to calculate the cable net structure of cable net deployable antenna, the cable net structure is often large in size and complex in form, and the nonlinear finite element method cannot do a better optimization calculation.

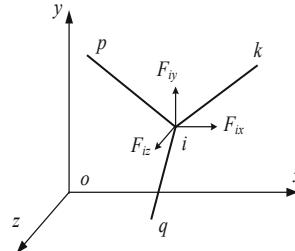
In addition to the nonlinear finite element method, the balanced matrix analysis method is another commonly used method for the shape analysis and calculation of cable net structure of deployable cable net antenna. Based on the theory of force method, the geometric shape of the structure and the constitutive relation of the material are considered separately. When using the balance matrix analysis method, the pretension value of the cable net structure is obtained by solving the force balance equation of the structure, and then the original length of each cable element is calculated from the material constitutive relation. In addition, it should be pointed out that by analyzing the structure shape judgment information contained in the force balance matrix, the system morphology of cable strut structure with given topological shape can also be determined.

Considering that the balanced matrix analysis method is convenient and efficient, it is a suitable choice to analyze and calculate the cable net structure of cable net deployable antenna.

## 2 Equilibrium Equation of Cable Net Structure

Because the shape and topology of cable net structure of deployable antenna is designed according to the shape and accuracy requirements of antenna reflector, the purpose of shape analysis and calculation of cable net structure is to obtain the pre-tension value of each cable element corresponding to the given ideal shape.

For the self-balanced cable net structure with given geometric topological shape in the global coordinate system, any node in the cable network structure as shown in Fig. 1 must be able to meet the following equilibrium conditions under the condition of not considering the self-weight and sag of the cable element [7, 8]:



**Fig. 1.** Schematic diagram of force balance relationship of node  $i$  in cable net structure

$$\sum_{j \in N_j} \frac{x_j - x_i}{l_{ij}} T_{ij} = F_{ix} \quad (1a)$$

$$\sum_{j \in N_j} \frac{y_j - y_i}{l_{ij}} T_{ij} = F_{iy} \quad (i = 1, 2, \dots, n) \quad (1b)$$

$$\sum_{j \in N_j} \frac{z_j - z_i}{l_{ij}} T_{ij} = F_{iz} \quad (1c)$$

Among them,  $n$  is the total number of nodes in the cable net structure,  $j$  represents any node connected to node  $i$ ,  $N_j$  is the node set of nodes connected to node  $i$ ,  $x_i, y_i, z_i$  and  $x_j, y_j, z_j$  coordinate values of nodes  $i$  and  $j$  in  $x, y$  and  $z$  directions respectively,  $l_{ij}, T_{ij}$  represents the length and pretension of cable elements with  $i$  and  $j$  ends in equilibrium,  $F_{ix}, F_{iy}, F_{iz}$  are the component forces of external load on point  $i$  in  $x, y$  and  $z$  directions in equilibrium state.

According to the above-mentioned node force balance relationship, the overall balance equation of all unconstrained nodes in cable net structure can be established:

$$[\mathbf{A}]_{M \times N} \{\mathbf{T}\}_N = \{\mathbf{F}\}_M \quad (2)$$

Where  $[\mathbf{A}]$  is the balance matrix of cable net structure, the number of rows  $m$  is the total number of degrees of freedom of unconstrained nodes in the structure, and the number of columns  $n$  is the total number of structural elements;  $\{\mathbf{T}\}_N = \{T_1 \ T_2 \ \dots \ T_N\}^T$  is the pretension column vector of each cable element in the equilibrium state;  $\{\mathbf{F}\}_M = \{F_1 \ F_2 \ \dots \ F_M\}^T$  is the external load column vector corresponding to the degrees of freedom of each unconstrained node in the structure.

The above-mentioned force balance equation reflects the relationship between the internal force and external load of the structure. Next, from other aspects of the structural mechanical properties, according to the small deformation assumption, the deformation compatibility equation of the element can be listed as follows:

$$[\mathbf{B}]_{N \times M} \{\mathbf{u}\}_M = \{\mathbf{e}\}_N \quad (3)$$

Where  $[\mathbf{B}]$  is the coordination matrix,  $\{\mathbf{u}\}$  is the node displacement corresponding to the degrees of freedom of each unconstrained node,  $\{\mathbf{e}\}$  is the elongation of cable element after deformation.

### 3 Determination of System Form

The determination of system form is to analyze and judge the topology, geometric relationship and constraint sufficiency of the system. It is the first work to be done before the morphological analysis and calculation of a given cable net structure. In the traditional structural analysis and design, Maxwell's criterion is usually used to determine the system, that is, for a spatial bar system with  $i$  nodes and  $K$  constraints, at least  $3i-k$  bar elements are required for the system to become a stable geometric invariant system, or structure. However, in fact, Maxwell criterion is only a necessary condition rather than a sufficient condition to judge the geometric stability of the system. In other words, not all the member systems meeting Maxwell's criteria can become structures. Therefore, the traditional Maxwell's criterion has some defects when it is used to determine the system shape. At present, the determination of system shape is generally completed by analyzing and judging the stiffness matrix or balance matrix. When the system is geometrically unstable, there will be linearly related rows or columns in the stiffness matrix and equilibrium matrix, which will lead to the singularity of the matrix. However, compared with the stiffness matrix, the balance matrix not only can reflect the geometric stability of the system, but also contains the structural self stress distribution information and mechanism displacement information which can be used to determine the shape of the system.

In 1965, Timoshenko and young introduced the concept of balance matrix rank to calculate the two important system determination parameters of articulated bar system: independent self stress mode number and mechanism displacement mode number; In 1978, Calladine introduced the rank of equilibrium matrix into the calculation of geometric stability of tensegrity structures; In 1986, Pellegrino and Calladine system gave the relationship between the rank of balance matrix and the mode number of self stress and displacement of mechanism, and studied the physical connotation of four subspaces formed by the decomposition of balance matrix, and formed the basic theory of balance matrix analysis method [9–11].

In the balance matrix analysis method, the modal number of self stress and displacement of the mechanism is as follows:

$$s = N - r \quad (4)$$

$$m = M - r \quad (5)$$

Among them,  $s$  is the self stress mode number of the system,  $m$  is the displacement mode number of the system,  $r$  is the rank of the equilibrium matrix of the system.

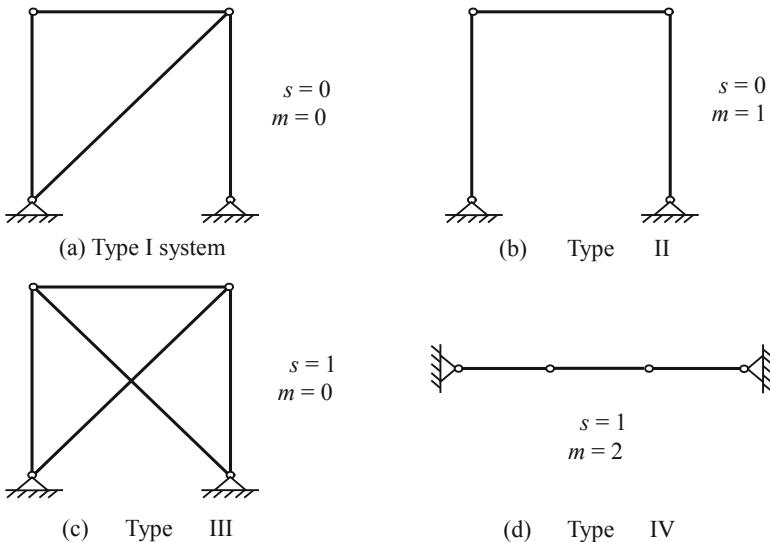
The self stress modal number of the system and the displacement modal number of the mechanism obtained from the rank  $r$  of the balance matrix determine whether the formulas (2) and (3) have solutions and the form of the solution when there is a solution. According to this, the hinged bar system can be divided into four categories (as shown in Table 1).

The type I system in the table is actually the statically determinate structure in structural mechanics. The type II system is finite displacement mechanism, which can change the configuration under zero stress state, and can not achieve self balance state by applying pre tension. Although the finite displacement mechanism can not be used for bearing as static structure, with the development and application of deployable structure, the research on the displacement process of this kind of mechanism is paid more and more attention by structural designers. The type III system is statically indeterminate, which can reach the state of self balance under zero external load under the action of pretension. The type IV system is a geometrically variable system, which, like the finite displacement mechanism, will change its configuration under zero stress. However, the special feature of the system is that it can sometimes become a geometrically stable self-equilibrium structure by applying pre tension. The key to whether it can become a self-equilibrium structure is whether the displacement trend of the

**Table 1.** Determination of system type

System type	Type parameter	Equation solving	Morphological characteristics of system	System determination
I	$s = 0$ $m = 0$	The equilibrium equation and the coordination equation have unique solutions	No pretension can be applied Geometric invariance	Calm down Fixed motion
II	$s = 0$ $m > 0$	Under certain constraints, the equilibrium equation has a unique solution, otherwise there is no solution There are infinitely many solutions to the harmony equation	No pretension can be applied Geometrically variable	Calm down Can't move
III	$s > 0$ $m = 0$	The equilibrium equation has infinite solutions Under certain constraints, there is a unique solution to the coordination equation, otherwise there is no solution	Ability to apply pretension Geometric invariance	Quiescent Fixed motion
IV	$s > 0$ $m > 0$	Equilibrium equation and compatibility equation There are no solutions or infinite solutions	Ability to apply pretension Geometrically variable	Quiescent Can't move

system can be eliminated after the pre tension is applied to rigidization. The type IV system structure which achieves self balance by applying pretension usually has the advantages of reasonable force transmission path, beautiful appearance, large space span and low manufacturing cost, which is different from the traditional structure. Most of the integral tension structures in engineering belong to this kind of system.



**Fig. 2.** Example of system determination

Figure 2 is a simple example of the above-mentioned four types of systems, in which the type IV system shown in the fourth figure is the type of system that can achieve self-equilibrium by applying pretension.

## 4 Conclusions

This paper makes a detailed analysis and comparison of the two main methods, nonlinear finite element method and balance matrix analysis method, which are commonly used in the form calculation of cable net deployable antenna, and systematically introduces the basic concept of the balance matrix analysis method and the method for determining the system shape. For the deployable antenna cable net structure with complex form and large number of elements, the balance matrix can be simplified according to the axial symmetry of the structure, and then the pre tension optimization calculation method can be carried out.

**Acknowledgments.** Financial support by Shaanxi Province Department of Education (19JK0348) is gratefully acknowledged.

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# Research on Technology of Digital Resource Management and Publishing Platform for Ancient Books Based on Artificial Intelligence

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**Abstract.** Under the popularization of artificial intelligence and the support of big data storage technology, Chaoxing Company and Hualu Group cooperate with university digital libraries to digitally collect, clean, classify and utilize ancient books. What they do, not only regenerate and protect ancient books, but also inherit traditional culture. Through sorting out the technology used by digital resources platform, this article discussed the organization styles of ancient books digitization. Then, an automatic integration system for ancient book sorting was proposed, contributing to the combination involving production, teaching and research, as well as the international cooperation of ancient books digitization in the future.

**Keywords:** Knowledge-based digitization · Artificial intelligence · Ancient text mining · J2EE architecture

## 1 Introduction

Due to the increasing number of books, newspapers, scientific and technological literature, the building area, as well as the staff of the library increase simultaneously. Traditional management, system and technology of the library have been greatly improved in every dimension. However, various difficulties, faced by the preservation, classification management, searching and borrowing remain to be solved. Currently, there are three main methods to digitize ancient books. The first method is digitization as it is, which means scanning or photocopying the original appearance of ancient books. The benefit of this method is that it can maximize the preservation of historical information of them. The second method is text-based digitization, which is to record the full text of ancient books into a searchable database. The third method is knowledge-based digitization, referring to in-depth processing, such as indexing the ancient book database, according to the knowledge management model. At present, readers can search the metadata of all types of ancient documents, viewing and browsing ancient books, shadows, e-books, rubbings and maps, using the network platform of ancient books in colleges and universities. Therefore, the research of retrieval system and support system will become the focus of digitization of ancient books [1–3].

## 2 System Architecture

The collection of digital service platform is based on the technical framework of the J2EE framework. Through integrating and managing structured and unstructured data resources, it provides a resource service platform that integrates sorting, editing, reviewing and publishing of data resources. The system adopts centralized deployment, that is, all sub-sites are centrally deployed on a unified hardware platform with the main site. According to the actual needs, distributed method, and the mixed use of centralized and distributed methods can be also applied. The construction of the platform and the deployment method are not related. Various types of deployment methods are flexibly supported by the platform (Fig. 1).



Fig. 1. Feature thematic database

On the basis of standard metadata, the ancient book management and application system is established according to the characteristics of ancient books to achieve the application of various service forms, such as electronic reading and production of various special CDs.

The database provides resource online service platform, the main functions are as follows.

### (1) Authentication function

Users in the unit's IP address range can automatically log in to obtain corresponding access rights by judging the IP.

Users outside the unit's IP address range can log in with their username and password to obtain corresponding access rights.

This function can effectively avoid resource leakage and ensure the security of ancient digital resource storage.

## (2) Release function

The platform provides at least three levels of classification (category for short) according to the classification of ancient books (For example: Four-stage classification, dividing ancient books into Confucian classics, history, philosophy and literature.) The full text can be browsed by clicking on the specific ancient book. The category name and structure must be processed according to the actual needs. The processed books can be placed under the corresponding category for easy reading.

## (3) Search function

The platform supports field search for title, author, subject term. It also supports the second search in the search results. It supports searching in the selected category. The platform also applies advanced search with multiple conditions, such as search by book title, responsible person, edition item.

## (4) Reading function

The platform supports browser reading mode, which means users do not need to install plug-ins or readers. When the full text of the book is browsed, it can be made into a simulation book mode, with single-page mode, double-page mode browsing, and other easy-to-use functions such as turning pages and jumping a page. E-books should be catalogued as needed and displayed on the left side of the screen during full-text browsing, in order to jump to specific chapters.

## (5) Ranking function

The platform can generate rankings based on the user's reading situation. The administrator can recommend some books to the homepage as needed for readers to read easily.

## (6) Statistical function

The platform provides various statistical methods as follows.  
It provides access statistics for the homepages, searching page and reading page.  
It provides statistics on the reading status of internal and external users.  
It supports reading statistics of a single IP address and user name.  
It supports the display of statistical results in lists and charts.

### 3 Digital Resource Security

The collection digitization service platform is a medium that provides online publishing of digital ancient books and digital resources, but these digital resources have certain copyright protection requirements [4, 5]. At the same time, protecting the digital resources from being stolen and used for illegal transmission is vital. Under the consideration of the security of digital resources, security protections have been used applied. The specific measures adopted are as follows.

## (1) Open reading restriction of full text

The number of pages to be read is limited to the first 14 pages or 20% percent through the program configuration file. If users want to continue reading, they need to verify the OPAC account and obtain the remaining content through document delivery.

(2) Access restriction on platform IP

Through the IP range setting management in the software background control function, you can add the IP range that is allowed to access the platform, and those who are not within the IP address range cannot access the platform.

(3) Document delivery management

Through the program configuration file, a single user is limited to the maximum number of 5 copies per day and 15 copies per month to prevent malicious users from illegally obtaining resources.

(4) Interface call management

The collection digital service platform service platform serves as a storage, retrieval and reference platform for digital resources. It can also provide other platforms with a page reading interface. Programs authorized to call the interface within the IP range can directly call the resource page.

(5) Platform certificate management

This function provides an independent platform certificate for each digital service platform user to restrict malicious copying of software. It can also effectively prevent threats of modifying software configuration parameters. At the same time, the IP concurrency number and document format can be set through the certificate in the platform.

(6) Data path encryption

By encrypting the display path of digital resources, the address deployed on the platform and the qualification of digital resource storage are effectively hidden. Plus, it can prevent hackers from finding the resource storage location through the path to steal digital resources.

## 4 Touch Screen Display System of Ancient Book Digital Resources

### 4.1 System Introduction

The benefit of the system are as follows:

- It can expand the audience of historical materials for easy dissemination.
- It can facilitate the development of historical, scientific and cultural research.

Chaoxing Company made a comprehensive large-screen service system suitable for the on-site display of digital resources of ancient books. Combing the reading habits of ancient books, it is committed to “serving the audience of ancient books and historical materials, taking into account the needs of mass culture quick review, and building cultural dissemination and academic. The research integrated platform is a 24-h self-service smart cultural product, integrating traditional culture and modern technology, national reading and cultural services.”

It not only brings a different reading experience to readers, but also greatly expands the service scope of public libraries due to its small footprint and easy installation. The system can also accelerate the process of library digitization and open up a intelligent reading mode of ancient books and other historical materials.

The core concept of the system is to break through the limitations of time and space, providing digital resource reading services of the special collection of ancient books in the library.

#### 4.2 The Composition of the Touch Screen Display System for the Digital Resources of Ancient Books

The touch screen display interactive system is mainly composed of three parts: 24-h electronic self-service terminal platform, digital resources of digital processed ancient books, data centre server and management system.

The self-service terminal platform has the necessary application software and management system platform, and performs data interaction with the data centre server system to complete the system platform upgrade, ancient book data update, data statistics and other functions.

Project	Indicators
Display  	Size :43 inches (customizable) Screen Direction: Landscape Screen type: original high quality full angle of view of industrial LED LEC screen Resolution: up to 1920×1080 Dynamic contrast :1400:1 Visual angle :89°/89°/89°/89°(L/R/U/D) Touch Principle: Infrared optics true 6 touches, 2 writings Response time :<6.5 milliseconds Effective Touch Recognition :>5 mm Writing style: Finger, pen or any other opaque object Touch resolution :32768×32768

Fig. 2. Service terminal appearance

The introduction of the touch screen display system is as follow.

- (1) The service terminal is displayed on the horizontal screen. It is suitable for placing at the lobby or the entrance of the library (Fig. 2).
- (2) Service terminal hardware parameters (Fig. 2).
- (3) Data centre server

The self-service lending terminal of newspapers exchanges data with the data centre server through the network to realize the irregular upgrade of the platform and the regular update of electronic resources.

(4) Backstage management system

The powerful background management system can transmit information with all newspapers and periodicals, and monitor the usage of each machine in real time. The user can modify the unit name, LOGO, and the main interface advertising book to achieve personalized display (Fig. 3).

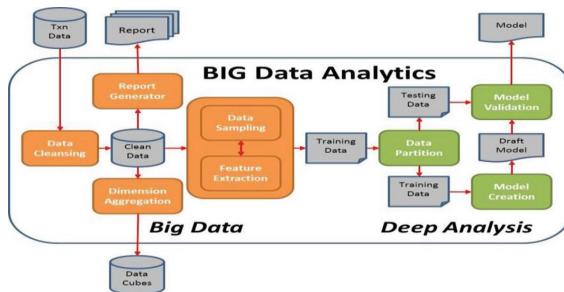


Fig. 3. GIS - based new generation database presentation

Since the first International Symposium on the Digitization of Ancient Chinese Books, information technology has developed rapidly in the past decade. The digitization of ancient books has made great progress in both research and practice fields. The digitization of ancient books in the age of artificial intelligence will likely make the following progress during the 14<sup>th</sup> Five-Year Plan period. The first is to realize automatic text conversion. Deep learning technology based on text mining can realize automatic translation between classical Chinese and vernacular through optimized search and automatic writing engines. The second is to realize the virtual reproduction of historical scenes through VR and AR technology, as well as the automatic combination and association of cultural relics, historical figures and events under the background of holographic projection. The third is the collaborative innovation of interdisciplinary, to realize the automatic point correction of ancient books. The integration and automatic marching of knowledge databases of various disciplines. The fourth is to break through the international and ideological restrictions, and realize the automatic data mining and logical analysis of the ancient documents of various countries and the ancient books circulating overseas. In the era of artificial intelligence, technology is bound to promote the integration and innovation of the digitization of ancient books and the inheritance of traditional culture.

**Acknowledgement.** This work is supported by the Hunan Provincial education department Project Foundation in 2018 (No. 18c0052).

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# Optimization Strategy of Supply Chain Financial Platform Based on Blockchain

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**Abstract.** The traditional supply chain financial platform is faced with the problems of logistics information supervision, cumbersome and inefficient financing process, and information asymmetry, which cannot meet the financing needs of small and medium-sized enterprises. This article applies the blockchain technology to the supply chain financial platform, and optimizes the design of the supply chain financial platform based on the blockchain from three aspects: the demand of the supply chain financial platform, the architecture design of the decentralized supply chain financial platform and the design of privacy protection, so as to promote the supply chain finance to break the traditional bottleneck and realize the innovation and development.

**Keywords:** Blockchain · Supply chain · Financial platform · Demand optimization · Architecture design · Privacy protection design

## 1 Introduction

In recent years, with the rapid development of China's economy, a large number of small and medium-sized enterprises have emerged, and the difficulty of financing has always been a constraint on the development of small and medium-sized enterprises. Supply chain finance is one of the effective ways to solve the financing of small and medium-sized enterprises, especially in recent years, the supply chain financing platform has been developing in full swing on the Internet, but the traditional supply chain financial platform is facing problems such as logistics information supervision difficulties, cumbersome and inefficient financing process, and information asymmetry. Blockchain can be understood as a distributed multi node ledger database technology, which is formed by the combination of existing consensus algorithm technology, point-to-point communication technology, cryptography technology and other technologies. It has the characteristics of transparency and auditability, traceability and tamper resistance, and decentralization, blockchain proposes and applies a lot of innovative technologies to build a credible trading mechanism in an open environment, such as public account book, asymmetric encryption and authorization, consensus and incentive mechanism [1], ensures the security, reliability and unforgeability of information [2, 3], which is particularly suitable for the application in the financial industry.

## 2 Demand Optimization of Supply Chain Financial Platform Based on Blockchain

### 2.1 Function Requirement Optimization

In the traditional supply chain finance platform, there are only two kinds of user rights, which are suppliers and core enterprise users. In order to achieve flexible and fine-grained function permission setting, the supply chain financial platform based on blockchain has three roles of super administrator, administrator and operator in each user type. Super administrator can create a management for the enterprise according to the needs of the enterprise the administrator can create the operator account and set the operation authority subset, and the operator can operate the related functions within the scope of his authority [3].

### 2.2 Non Functional Requirements Optimization

The non-functional demand optimization of supply chain financial platform based on blockchain mainly includes the following aspects [4–8]:

- (1) Reliability: in the design of the platform, various possible problems should be fully considered, and a perfect treatment scheme should be formed to ensure that the platform users can operate in time and complete the accounts receivable pledge loan.
- (2) Security: encrypt the data of each node, manage users and permissions, and ensure the privacy, integrity and security of trade information.
- (3) Maintainability: in order to ensure that the maintenance and upgrading of the platform will not affect the use of all users, nodes should be set in each role of the supply chain, so as to achieve simple and rapid upgrade.
- (4) Transaction performance: it is necessary to reduce the delay and wait of users when using. In order to ensure high throughput, the number of concurrent users should be increased as much as possible. The performance of blockchain network can be regarded as the lower limit value of the whole platform.

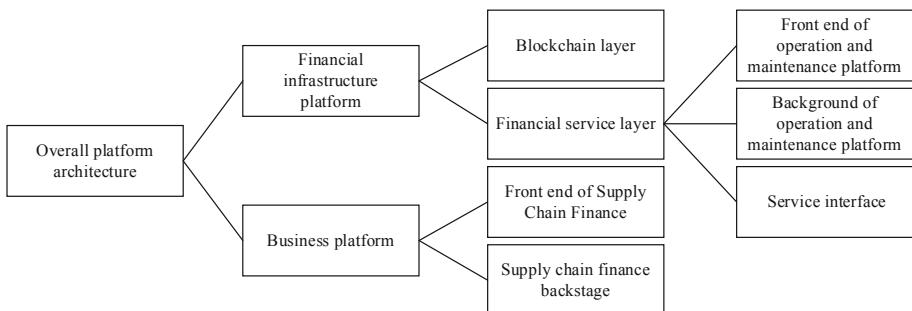
## 3 Architecture Design of Decentralized Supply Chain Financial Platform Based on Blockchain

Supply chain is a system composed of organization, personnel, activities, information and resources, which involves the whole process of transferring products or services from suppliers to customers. Many features of the emerging blockchain can be combined with the supply chain: distributed database makes it not controlled by the third party and reduces the risk caused by the intervention of intermediary agencies; the trust mechanism overcomes the cooperation and trust problems in the supply chain, minimizes the negative impact of information asymmetry on the participating supply chain nodes, and prevents nodes from forging data and other improper behaviors. Although the traditional centralized supply chain financial platform can protect users' private data

and prevent fraud to a certain extent, there are still some problems such as reselling user data, tampering with system data or misuse data by central institutions. There is no centralized equipment and management organization in blockchain, so it can avoid the problems of traditional supply chain financial platform.

### 3.1 Function Requirement Optimization

This system mainly consists of two parts: one is the business service platform which carries all business processes of financial business, including the front-end and back-end parts of supply finance, and the other part is the financial basic platform composed of financial service layer and blockchain layer. Its main task is data exchange, secure storage and data synchronization, as well as necessary operation and maintenance of the financial basic platform. Figure 1 shows the overall architecture of the system.



**Fig. 1.** The overall architecture of the system

### 3.2 Special Design of Platform Module

From the perspective of platform function, the supply chain financial platform based on blockchain can be divided into two parts: platform business processing module and platform basic module.

#### (1) Basic module

The basic module mainly includes three parts: user management module, enterprise certificate management module and privacy protection module. Its main purpose is to ensure the security of the data stored in the blockchain. The main function of the platform basic module is to control the user's operation rights under the enterprise. Due to the limited space, this paper only makes a brief analysis of several main operation processes.

In order to ensure the security of the platform, each user should pass the authority verification after logging in. Only after the authority verification and user legitimacy are passed, the platform will call the real business functions. This verification process is mainly completed through the blockchain. When the blockchain receives the function call from the business platform, it will obtain the user permission mark and the permission ID of this function, and operate the authority identification and user permission

identification of this function. When the result is “non-zero”, the blockchain will verify the user’s identity information, execute the function function, return the call information, and the user will conduct relevant business operations.

## (2) Business processing module

Business processing module mainly includes capital flow processing module, order transaction processing module, supplier management and other business processing functions involved in the supply chain financial platform.

Order transaction process: core enterprises issue orders to suppliers through the supply chain financial platform. The blockchain records and feeds back the order information to the suppliers through the service interface, and records the delivery information of the suppliers. The blockchain also records the harvest information and financing application information of the core enterprises. In this process, the core enterprises and suppliers can obtain the information through the blockchain Information required.

Capital flow process: according to whether there is financing demand, the capital flow process is also different. The capital flow process with financing needs involves banks, suppliers and core enterprises. After receiving the accounts receivable financing application from suppliers, banks should review the historical transaction information of suppliers, and then decide whether to make loans. After the bank loans successfully, the suppliers complete the order, and the core enterprises pay the bank loans. For the capital flow without financing demand, the core enterprise pays the supplier when it is due, and the supplier confirms the payment. Of course, regardless of whether there is a capital flow process with financing needs or not, the transaction information of each step of operation will be written into the blockchain through the service interface.

## 4 Privacy Protection Design of Supply Chain Financial Platform Based on Blockchain

Although the traditional supply chain financial platform also encrypts the transaction information, it lacks a complete privacy system and encryption intensity is not high. In order to meet the high privacy requirements of the enterprises in the supply chain finance platform and take advantage of the unforgeable and traceable features of blockchain [9], this paper designs a privacy confidentiality system for the supply chain finance platform based on the blockchain. The privacy system is mainly composed of the following parts:

### 4.1 User State Authentication and Permission Authentication

In order to ensure that illegal users can not call the various operation functions of the financial platform, the supply chain financial platform based on blockchain will prohibit users in frozen state from carrying out relevant operations. At the same time, super administrator account will be created for the enterprise when the enterprise certificate is imported. The account has no specific operation authority, and can only manage and divide the authority of administrator and operator of the platform. When each role is

called, the blockchain will perform and operation on the user's permission set. Only when the operation result is "1", can it be called.

## 4.2 User Signature Verification

In order to ensure that the user's identity can not be forged, the supply chain financial platform based on blockchain will automatically obtain the current time stamp when the user calls the function. According to the time stamp, a check code is automatically generated every 10 min. The check code is spliced with the user's password. The signature is generated by using the user's private key through ECC algorithm. The authenticity of the user's identity is guaranteed by the user's signature verification.

## 4.3 Data Encryption

In order to prevent illegal access to blockchain ledger files, the system uses symmetric encryption technology to encrypt data before and after data on the chain to ensure the security of data on the chain. There are three kinds of secret keys in the privacy protection system: certificate key, platform key and business key. The platform secret key is configured by the platform and is suitable for certificate management, supplier management, permission management and role management modules. The business secret key is effective when the core enterprise and the supplier establish a link. It is mainly used in order management, delivery management, receiving management, financing management and payment management modules. It ensures that only the core enterprise and the supplier enterprise certificate information can obtain the secret key to access business data, thus ensuring the privacy of business data. Digital assets are issued based on blockchain, and the rights and interests of accounts receivable are digitized, and the true expression of debt subject is ensured by encryption means, which facilitates the division, circulation and confirmation of rights and interests of accounts receivable, improves the liquidity of accounts receivable, and optimizes the business process and customer experience [10, 11].

## 4.4 Underlying Data Separation

In order to ensure the privacy of transaction information, the system separates the data between businesses and between enterprises. In addition, in order to improve the writing speed and improve the complexity of query conditions, the virtual table is used to store the underlying data.

# 5 Conclusion

The application of blockchain technology to the supply chain finance platform will help to improve the security and confidentiality of the supply chain financial platform, solve the problems of logistics information supervision difficulties, cumbersome and inefficient financing process, and information asymmetry in the supply chain finance, and help to further promote the innovation and development of supply chain finance.

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# Systematic Research on Art Appreciation Based on Blockchain Technology

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**Abstract.** With the development of artificial intelligence and computer science, blockchain has been widely concerned since its appearance. Its tamper proof, traceability, anonymity and openness have attracted more and more people's interest. Many researchers and practitioners have stepped into this field. This paper describes the application of blockchain technology in artworks through the overview of related concepts such as technology, security, speculation, security and so on. Through the design of relevant data, this paper analyzes the application effect possibility of blockchain in art appreciation, and points out that under the intervention of different roles, only on the basis of ensuring security and legitimacy can blockchain be widely applied for art appreciation.

**Keywords:** Blockchain technology · Artworks · Art appreciation · Artificial intelligence

## 1 Introduction

At present, the rapid development of high and new technology with information technology and Internet technology as the core is constantly changing the way we understand the world. China's Internet has developed for more than ten years, changing our understanding of the world, and we are inseparable from it. At this stage, the Internet has become an interactive, public participation, across time and space, virtual new media, giving birth to a variety of forms, to meet the personalized needs of consumers as the core of the global integrated network economy [1]. In this new economic normal, what does the network economy bring to the development of the art market, the deep relationship between the industrial structure of the art market and the network economy, whether the art market can adapt to the pace of the development of the network economy, and how to market the art works under the Internet are all the subjects that need to be explored. Many art e-commerce enterprises in China seem to have gone astray. Therefore, by the end of the year, many art e-commerce enterprises have shrunk, transformed and upgraded, and even closed down.

In the second half of the 20th century, with the development of Internet infrastructure and software and hardware, the efficiency of human information exchange has been explosively improved, which has brought about the rapid development of various industries. Human beings have entered the information age [2]. Blockchain technology is actually a collection of distributed storage, P2P network and secret algorithm. Bitcoin is based on relevant technologies of blockchain [3]. With the advent of intelligent

technology, due to the dispersity and unforgeability of blockchain, blockchain is considered to be able to establish information in various actual business scenarios and improve transparency, reliability and security. The combination of blockchain and cloud computing, artificial intelligence, Internet of things and other fields will also bring great development opportunities. With the introduction of bitcoin, more and more attention has been paid to the decentralized digital currency [4]. Users do not need to trust trusted third parties to use digital currency on the network. Although the technology was used for peer-to-peer payment at the beginning, it began to play an increasingly important role in the development of the times. Ethereum smart contract is one of the landmark achievements of blockchain. According to the definition, the smart contract should be able to run on the blockchain, and its implementation should be determined by the consensus protocol of the whole network.

How to find the best balance between the economies of scale and scope, the increasingly closely linked art market, as well as the resulting numerous external effects and behavioral distortions of various conflicts, and to achieve the appropriate balance between the free market and regulation, is indeed no small challenge [5]. In the art market, it is difficult to distinguish the authenticity of artworks, to estimate the price, to confirm the right, and to deal with high risks. Even today, with the continuous development of science and technology and the improvement of appraisal level, these problems cannot be avoided and solved. They even seriously hinder the operation of domestic art capital market and the enthusiasm of the public to participate in art appreciation and trade, directly inhibit the prosperity and development of China's cultural market, and affect the people's pursuit of a better life. Based on the decentralization and disintermediation of blockchain technology, the coexistence of encryption and openness of information interaction, traceability and unforgeability, the high efficiency and security of transaction circulation and the emergence of new value-added mode will inevitably bring new revolution to the development of art market [6]. Many art producers, investors, intermediaries and enthusiasts have also seen the opportunities brought about by blockchain technology, trying to grasp new industry applications through blockchain technology, and then realize a new channel to master the art market. Blockchain not only has many advantages, but also has many problems. This paper will do further analysis.

## 2 Related Concepts of Blockchain Technology for Art Appreciation

### 2.1 Ether

Ethereum is the cryptocurrency of Ethereum. Users can acquire ether by mining, buying from the market or other users. Token is a kind of cryptocurrency, which is implemented in the form of smart contract and runs on Ethereum. The development of token contracts should follow certain criteria so that the front end can identify token activities. The token contract maintains a mapping table, and each item records a token holder and the token balance that belongs to him. Unlike ether transactions, token holders transfer their tokens to another token by calling specific functions implemented

in the contract. If some tokens are successfully transferred, the mapping table is updated accordingly. Token contracts should issue event notifications to inform other applications of token changes, such as wallets, trading markets, etc. Any application can know the execution result of token contract by listening for the event sent out. In addition to standard functions and standard events, the token standard also allows developers to implement nonstandard functions and nonstandard events. The ERC — 20 standard defines six standard function interfaces and two standard events [7, 8].

## 2.2 Network Marketing of Art Market

In order to better combine art marketing activities and the Internet, and truly realize the online marketing of artworks, we should re-examine the network virtual market, adjust the old ideas and establish new ideas. At the same time, network marketing is incorporated into the overall marketing strategy of artworks to give full play to the advantages of the Internet. Many links are involved in the management and operation process, including market survey, customer analysis, channel structure, art promotion, electronic transaction, after-sales service, customer feedback, etc.

Taking some professional art websites that people are more familiar with at this stage, such as Jiade online, artnet, Tianlu Linlang art website, etc., the complete mode of online marketing of artworks has been well demonstrated. In particular, Tianlu Linlang art network, which has just emerged, is one of the most representative. Its core business models are Gallery alliance, antiques alliance and Tianlu market. It integrates all kinds of information resources in the art market through complete and ingenious means in combination with the information and interactive functions of the art market. And in the art marketing activities in the whole link of the design of network marketing functions, although at this stage some of the functions of these websites are not well implemented, but its clear solution ideas in the art network marketing will fully reflect the function of this network marketing. If we can grasp the opportunity and the direction of development properly, we can open up a new world for the development of China's art market.

## 2.3 STP Strategy

Based on population and population, based on population and society. First of all, social segmentation refers to the segmentation of the art market to provide customized services in combination with different social stages and cultural types; secondly, the art market is divided by geographical units; thirdly, population segmentation refers to the reference system of age, occupation, religion and race. In addition, we should select the target market scientifically. Combined with regional, cultural factors, consumer behavior and other factors, the target market of artworks should be positioned to better select target customers. This paper comprehensively considers the potential, competitors and enterprise characteristics, scientifically grasps the changing trend of art market, and adopts the no difference and no difference network marketing strategy. At the same time, positioning the market. Combined with the selected art target market, the characteristics, status and image of enterprises and products in the art target market are

clarified, and the corresponding image and characteristics of products are created for online marketing [9, 10].

## 2.4 Ethereum

Ethereum is the largest blockchain platform supporting smart contracts, ranking second in market value. Exploring it can yield many useful insights, as Ethereum has a large number of transactions, accounts, blocks, and popular applications developed as smart contracts, not to mention the numerous new attacks against platforms and smart contracts. Unfortunately, it is not easy to explore Ethereum systematically because it involves a large amount of heterogeneous data, which are generated and stored in Ethereum in different ways. Although some interesting findings about Ethereum have been reported in recent studies, these studies are limited by their data acquisition methods: these methods cannot provide comprehensive and accurate data. In order to fill this gap, we propose a systematic, high fidelity Ethereum data collection framework using the internal mechanism of Ethereum. Based on the synchronization mechanism of Ethereum, we plug the client to recover and capture all kinds of data to the greatest extent. This work not only supports the analysis in existing research, but also enables users to explore unknown phenomena and gain in-depth understanding.

## 3 Systematic Research Method of Art Appreciation Based on Blockchain Technology

### 3.1 Overall Structure

It consists of three stages. In the data acquisition stage, the original data is obtained from the blockchain synchronously by nodes, and it is extracted and sorted through five collectors, including block, execution track, transaction, smart contract and token. The transaction collector needs the data collected by the block collector and the trajectory collector, because the external transactions are stored in the block, and the internal transactions are extracted from the trajectory. The contract collector relies on the transaction collector because contracts are deployed and invoked by transactions.

### 3.2 Collection of Smart Contracts

The contract collector obtains the information of smart contract, which can be used to determine token information, analyze non deployed contracts, etc. When the smart contract is deployed, its deployment bytecode includes three parts: initialization bytecode, runtime bytecode and the area for storing initialization parameters. Since contracts are deployed in different ways for external and internal transactions, these two situations need to be dealt with separately.

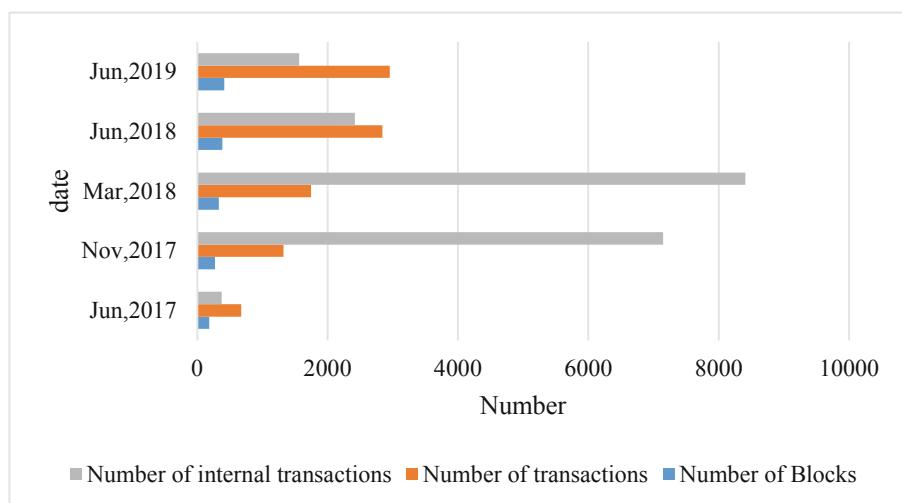
### 3.3 Token Collection

Although many tokens have been created, distributed and controlled by smart contracts running on Ethereum, little is known about token behavior. Token contracts usually follow certain criteria so that they can be identified, transferred and traded by third-party applications (e.g., wallets, trading markets), but they can also define non-standard functions to implement custom functions.

## 4 Systematic Research and Analysis of Art Appreciation Based on Blockchain Technology

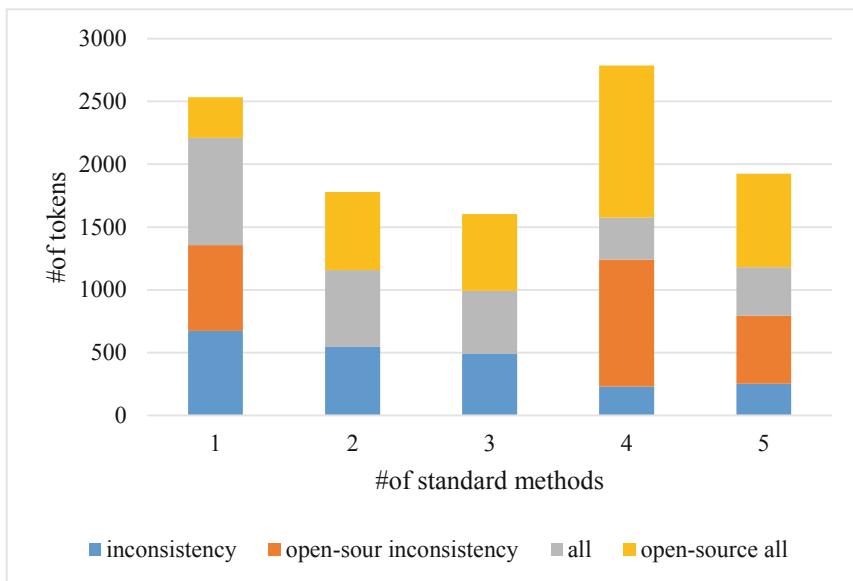
**Table 1.** Checkpoint statistic

1	Project	Jun, 2017	Nov, 2017	Mar, 2018	Jun, 2018	Jun, 2019
2	Number of blocks	1,818,095	2,705,154	3,314,524	3,854,124	4,125,741
3	Number of transactions	6,744,121	13,214,175	17,453,247	28,415,621	29,541,213
4	Number of internal transactions	3,758,061	71,458,515	84,112,474	24,174,168	15,642,143



**Fig. 1.** Checkpoint statistic

With all the historical data available, we can profile the blockchain at any checkpoint. For example, we select six checkpoints and get six sets of statistics. Table lists the blockchain statistics obtained at six checkpoints. Line 2 shows the number of blocks, and the number in brackets represents the average number of transactions contained in each block. We can see that over time, a block will contain more transactions as Ethereum becomes more and more popular. In addition to the number of transactions, line 3 shows the average number of internal transactions executed per transaction in brackets. The second checkpoint has the largest number, which can be explained by reported self-destruct attacks. The attack creates a large number of empty accounts by repeatedly executing the EVM operation `selfdestruct`. Note that the execution of a self-destruct operation results in an internal transaction (Table 1 and Fig. 1).



**Fig. 2.** Number of standard functions identified in token

We classify them according to the number of standard functions implemented in tokens, open source tokens, inconsistent tokens, and open source inconsistent tokens, and give the results in the Fig. 2.

**Table 2.** Statistical table of reasons for inconsistency

Reason	Number	Describe
Defective token	87	Incorrect implementation of standard event or core data structure M
Missing standard time or m modification	2014	Token contract has not issued standard time notice or modified M
Charge	49	The charging function is realized in standard function or non-standard function
Token issuance	647	In the standard function or non-standard function for token issuance operation
Token destruction	457	Token destruction in standard or non-standard functions
Token purchase	243	Purchase token with ether in standard or nonstandard functions

We manually investigated all 2352 open source inconsistent tokens to reveal the cause of the inconsistency. Table 2 lists 11 main reasons, some of which have several subcategories. We have selected some classic cases to explain in detail below and give the inconsistent number of tokens. Note that a different token may be caused by a variety of reasons. The biggest reason we find that the token is inconsistent is 3, and we find 68 of them. The number in ‘< >’ indicates the number of tokens in the corresponding category. All the inconsistent tokens described in this section have been deployed in Ethereum and have been called by other accounts.

## 5 Conclusion

In the information age, the road of art market development is more tortuous, but the future is promising. In the face of the impact of market economy, China's art gradually enters the market, with the help of the latest network marketing is an inevitable choice. How to carry out effective network marketing is an important topic for art market. In any case, in order to revive the national culture and achieve a new breakthrough in art, artists should face the market and actively participate in the market. They should not be greedy for interests and give up pursuing the essence of traditional culture. The market needs masters, and masters must stand the test of the market. Only in this way can we form strong cultural self-confidence, and promote Chinese art to the whole world, so that more people can feel the breadth and profundity of Chinese culture.

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# The Influence of Blockchain Technology on the Development of Animation Design

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**Abstract.** The lack of creativity in animation design is no longer a new topic, which has greatly hindered the development of animation design. As a modern technology, blockchain technology can meet the information needs of animation designers. This paper studies the influence of blockchain technology on the development of animation design. In order to further explore the impact of blockchain technology on the development of animation design, we selected 30 animation designers and equally divided them into two groups. Group A adopts traditional methods for animation design, and group B uses blockchain technology for animation design on this basis. Compare the efficiency and quality of the two groups of animation design, as well as the copyright disputes over time, and use the method of questionnaire survey to score and evaluate the final works. The experimental results show that 36% of the works in group A are satisfied, 49% are ordinary and 15% are dissatisfied; 43% of the works in group B are satisfied, 50% are average and 7% are dissatisfied. Thus, blockchain technology can not only protect the copyright of designers, but also further improve the efficiency and effect of animation design. It can be said that blockchain technology can effectively promote the development of animation design.

**Keywords:** Blockchain technology · Animation · Data center · Data transmission time overhead

## 1 Introduction

Due to the evolution of the times and the progress of science and technology, there are various technological innovations every day. In this case, blockchain technology came into being [1, 2]. In various industries, blockchain is based on its unique advantages to show its strength, especially the vigorous development of blockchain in the financial industry [3, 4]. For human beings, although blockchain technology was born in a constantly changing era, it is essentially a kind of technological innovation, and the progress of the times cannot be separated from the promotion of innovation [5, 6]. For example, the purpose of the early primitive people to create tools was to continue to survive, thus resulting in a kind of creative thinking. Therefore, creation is an important factor to promote the development of human civilization [7, 8]. From the perspective of the art industry, the emergence of blockchain also has a great impact on the development of animation design.

The rapid development of computer technology and information technology provides a good environment for the in-depth development of animation design, making animation design since the beginning of development, has obtained very significant development results [9, 10]. On the one hand, the development of animation needs mature market and adequate financial support. On the other hand, the development of economy is inseparable from the development of animation. As part of the cultural industry is animation, the development of animation can also be seen as the development of cultural industry. However, the efficiency of animation design and copyright protection still have a big gap, the development of blockchain can better make up for this defect.

This paper analyzes the impact of blockchain technology by comparative experiment and questionnaire survey. First, we select 30 students with similar comprehensive scores from colleges and universities and divide them into two groups: group A and group B. at the same time, we conduct experiments on the two groups to analyze the differences in animation design efficiency, effect and copyright disputes between the two groups. The results show that blockchain technology can not only protect copyright, but also promote design efficiency and improve design effect.

## 2 Animation Design and Block Chain Technology

### 2.1 Animation

After a series of continuous reproduction of images, the image that causes continuous changes in vision can be called animation, which is essentially the continuation of vision, such as the projection of television and film. In medicine, “the obsession with vision” has proved to be a feature of human beings. In other words, people don’t disappear in a second after seeing an object or a picture. When an image appears before it disappears completely, it can create a smooth visual effect. Animation uses this principle.

Animation can be divided into five categories according to the mode of transmission.

#### (1) TV animation

Also known as “TV version”, it refers to the cartoons that appear constantly on TV according to different regions, TV stations and broadcast times. It can also be divided into several categories, such as late night anime, csanime, full day anime, wowowowanime, etc.

#### (2) Theater animation

Also known as the “theater version”, refers to the animation shown in the theater. The total duration of what China calls “film distribution” is usually one and a half hours, and the production cost is usually higher than that of TV and ova animation.

#### (3) Ova animation

Also known as “OAV”, it is an abbreviation for “original video animation”. Sold live or on video. Later, it developed into the abbreviation of “original visual animation”. Although it covers a wider range of content and fields, the main body is still animation that has not been shown in TV stations or theaters.

(4) Web animation

This is a project published on the Internet. It provides real-time projects in the form of receiving and online projection. With the deployment of optical fiber network, the quality of network animation is no less than that of TV and drama.

(5) Experimental animation

Also known as “art animation”, this type of animation is a kind of animation made for non-commercial purposes. The producer’s motivation is entirely based on his love and love of animation.

## 2.2 Block Chain Technology

Block chain technology is referred to as BT, also known as distributed generic technology. This is an Internet database technology, which is characterized by dispersion, openness and transparency, enabling everyone to participate in database files.

Block chain technology has some noise data, and data filtering uses filters to process filtered terminal data. Export the data characteristics of the Internet of Things terminal, create an analysis dimension from the feature data matrix, and clean up the data. Suppose there are n datasets S in the block chain, where each dataset has m features, which can be described as:

$$R_i = [r_{i1}, r_{i2}, \dots, r_{im}]_{1*m} \quad (1)$$

Partition matrix S is used as s classifications to create subsets. Vector L is the geometry extracted from a subset of eigenvectors:

$$L = [l_1, l_2, \dots, l_m]_{1*m} \quad (2)$$

When  $l_j = 1$ , the second feature in the description matrix is extracted. Matrix operations are implemented according to the following formulas:

$$R_i L^T = [r_{i1}, r_{i2}, \dots, r_{im}] \begin{bmatrix} \frac{l_1}{l_1} \\ \frac{l_2}{l_2} \\ \vdots \\ \frac{l_m}{l_m} \end{bmatrix} = \sum_{j=1}^{l_1} r_{ij} \quad (3)$$

In this formula,  $R_{ij}$  extracts the feature vectors when  $l_j = 1$ . By extracting the feature subset, it can extract the terminal data collection of the Internet of Things to get the feature subset and create the dimension analysis.

## 3 Research Methods and Design

### 3.1 Research Methods

(1) Controlled experimental method

In this paper, animation designers are divided into two groups, one using traditional animation design methods, the other using block chain technology to animate

design, to compare the efficiency and quality of animation design between the two groups.

(2) Questionnaire method

In this paper, the final results of traditional animation design and block chain method of animation design are randomly and anonymously evaluated by the reviewers, who are from various professors and associate professors of animation design specialty of our city art college.

### 3.2 Experimental Design

(1) Source of personnel

We rank the sophomore students of animation design major in our city art college according to their usual results and internship experience. Thirty students with similar overall results were selected and divided into two groups on average. Fifteen students in group A used traditional methods for animation design and 15 students in group B used block chain technology for animation design.

(2) Experimental steps

Two groups of people, A and B, performed animation design at the same time. The number of animation designs completed by the two groups was counted in the first week, the third week, the fifth week and the seventh week of the experiment. At the end of the experiment, each teacher was asked to rate the animation design effect of the two groups of people. The rating level included satisfaction, general and dissatisfaction. The final result was calculated as a percentage of the total amount. One month, three months and six months after the end of the experiment, the two groups involved in copyright disputes were counted to evaluate the protection of copyright by block chain technology.

## 4 Analysis and Discussion of Research Results

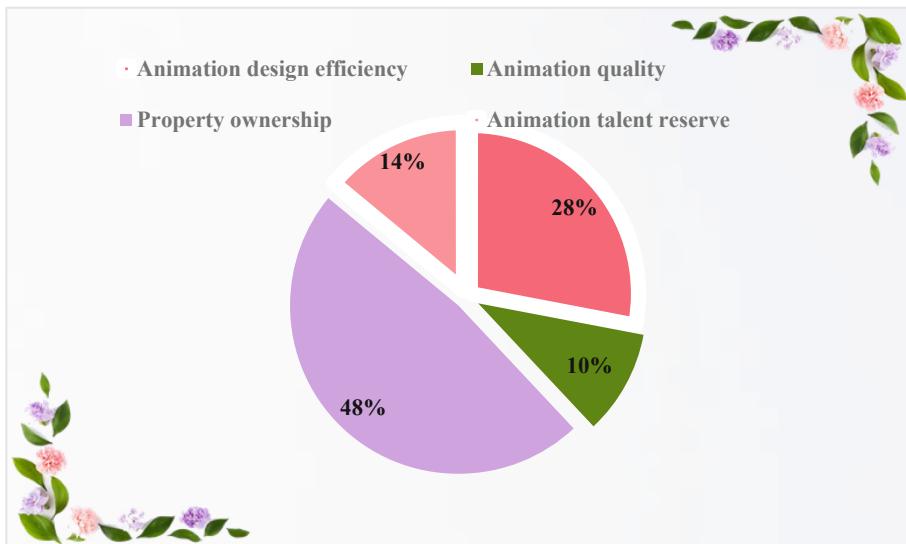
China's animation industry has gone through two stages of "how to build" and "how to operate". Now it has reached the next stage of "how to create". The creativity of animation is the key to the development of China's animation industry. This is not only related to occupying the local animation market, promoting basic social values, but also the most important way to enhance the soft power of Chinese culture and promote Chinese culture to the world. It has not only economic benefits, but also the benefits of cultural industry development and social development. This is not only a difficult academic research, but also a real problem to be solved urgently.

There is a lack of thought on the protection of intellectual property rights and the phenomenon of infringement occurs many times. In the animation industry, there are two kinds of behaviors that harm the interests of animation creators. One kind of behavior is direct injury. It is manifested as plagiarizing and plagiarizing the original script without paying the original author's remuneration. There are difficulties in enforcing, examining and proving such infringements. In addition, deleting animation scripts without the permission of animation scriptwriters, or even selling out the script

fees of animation scriptwriters, or delaying payment, seriously affects the rights of animation creators and the enthusiasm of animation scriptwriters. Therefore, since 2004, extensive measures have often been taken to protect collective rights. Another type of behavior is indirect damage, especially in the case of piracy and violation of animation derivatives. Since the 21st century, entrepreneurs of the domestic animation industry have gradually recognized the demand for animation derivatives in the domestic market, leading to such piracy and infringement acts continue to be prohibited. Whether the early Blue Cat mode, the later Pleasant Sheep mode, or the current mode of ubiquitous entertainment, there is no way to stop piracy of animation derivatives. On the one hand, it infringes the interests of animation image copyright companies, on the other hand, it also indirectly infringes the rights and interests of animation creators.

#### 4.1 Block Chain Technology's Impact on Animation Design

In the field of animation design, if you want to innovate, the development and application of technology cannot be overwhelmed. The impact of block chain on animation design is mainly in the efficiency of animation design, the quality of animation, the ownership of property rights, the reserve of animation talents, etc. The impact of each aspect is shown in Fig. 1.



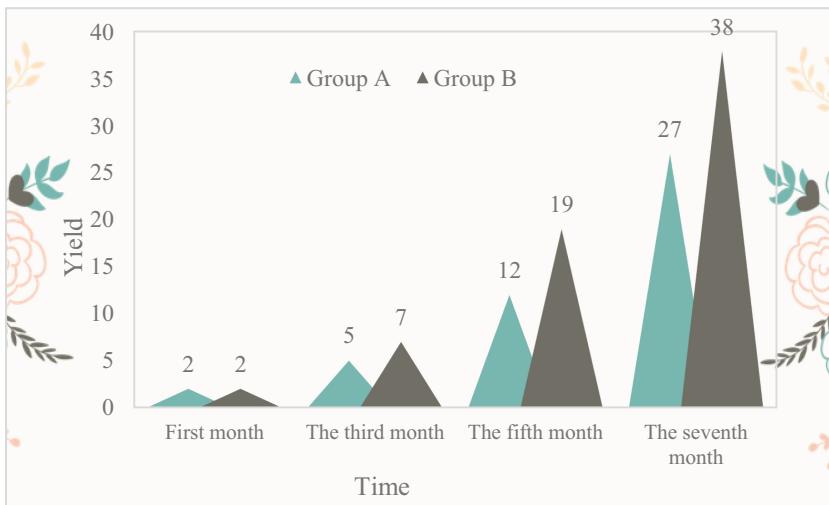
**Fig. 1.** The impact of blockchain technology on animation design

From Fig. 1, we can see that block chain technology has the greatest impact on the development of animation design, with 48% impact on ownership, 28% impact on the efficiency of animation design, and has some impact on the quality of animation and the reserve of animation talents, but the impact is small. It can be seen that block chain

technology can better protect the intellectual property rights of the original authors. And everyone can create animations on one platform at the same time to improve the overall efficiency of the animation design industry.

## 4.2 Block Chain Technology's Impact on the Efficiency of Animation Design and Property Rights Disputes

Efficiency is the first element of any industry, and it is equally important in the field of animation design. To explore the impact of block chain technology on the efficiency of animation design, we divided animation designers into two groups, A and B, and tested their number of designs at different times, as shown in Fig. 2.

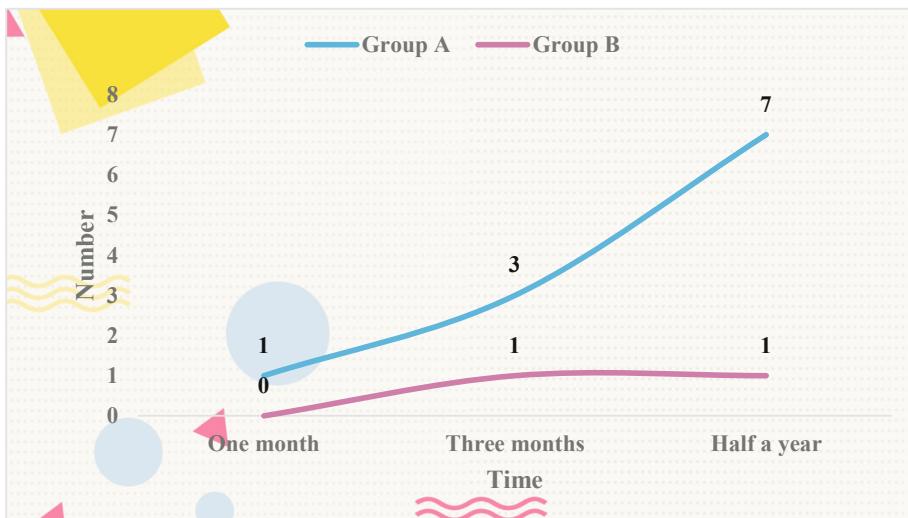


**Fig. 2.** The impact of blockchain technology on animation design efficiency

In Fig. 2, we can see that in the first month of the experiment, the output of both groups was 2, which is not much different. However, from the statistics of the third month, there was a difference between the two groups. At this time, the output of group A was 5 and group B was 7. At the fifth month, the output of group A was 12, the output of group B was 19, at the seventh month, the output of group A was 27, and the output of group B was 38 more than that of group A. From the comparison of these data, we can see that the gap increases with time, so block chain technology is more helpful to improve the efficiency of animation design.

Block chain is a distributed storage database. All nodes follow basically the same protocol, and all nodes follow the same consistency algorithm. The algorithm is used to keep all nodes' data consistent. In this sense, Block Chain technology can better store the data records of the mobile project creator's first creative mobile project, and can fully record all the data from the initial inspiration to the last work. Transferring "time stamp" chains and cryptographic continuous digital signature technology in mobile

projects provides identification and evidence of existence at any specific point in time. It solves the problem of copyright ownership of animation. After the experiment, the number of ownership disputes between animation designers is shown in Fig. 3.



**Fig. 3.** The impact of blockchain technology on property rights disputes

From Fig. 3, we can see that in the first month after the publication of the work, Group A personnel involved in a property right dispute, starting at 3 in the third month and 7 in the seventh month. At the same time, group B only involved one person in the third month, and there was no change in the seventh month, indicating that block chain technology is a good way to protect the author's copyright.

### 4.3 Evaluation of Animation Design

We disrupt the order of the A and B groups of works and ensure that there are no special marks. We give them to each teacher for evaluation, divide their evaluation results into three grades, and register their percentages. The evaluation results are shown in Table 1.

**Table 1.** Evaluation of animation design

	Satisfied	Commonly	Dissatisfied
Group A	36%	49%	15%
Group B	43%	50%	7%

As can be seen from Table 1, 36% of the works in Group A are satisfied, 49% are general, 15% are unsatisfactory; 43% are satisfied, 50% are general, and 7% are unsatisfactory. Therefore, using block chain technology can make the final animation better.

## 5 Conclusions

The development of Chinese animation design industry in different periods has left a large number of key issues in the creation. There are not only historical but also practical problems, the most important of which is the problem of property rights. Block chain is an upgraded Internet technology. The emergence of block chain technology, on the one hand, can protect the interests of owners, improve the efficiency of animation product creation, and will reform the multi-industry ecological industry. At the same time, the conflict between animation design industry and block chain technology can protect the intellectual property rights of animation design and have a profound impact on the animation project industry. Fully safeguarding the rights and interests of innovative talent flow projects can effectively improve the creative quality of animation content. This paper divides project experimenters into two groups to study the effectiveness and efficiency of project design, as well as disputes over property rights and liquidation. The result shows that block chain technology can protect the author's intellectual property rights and improve the efficiency of animation design.

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# Design of a Three-Dimensional Cultivation Device for Home Sprouts Based on SolidWorks Simulation Analysis

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**Abstract.** In order to better meet the needs of home sprouts cultivation and improve the convenience and appreciation of user management, a three-dimensional cultivation device for home sprouts was designed. The device consists of a frame structure, a cultivation system, a water supply system, and a light supplement system, a control system and other components. A simulation analysis was carried out using SolidWorks, and the results showed that the strength of each part can meet the force requirements, the irrigation water can flow into each cultivation trough smoothly, and the water supply in each trough is even. The prototype application test results show that: it can meet the cultivation requirements of sprouts, and the cultivation effect is better than ordinary three-dimensional cultivation devices, and the management convenience, ornamental, and comprehensive user satisfaction are also better than ordinary three-dimensional cultivation devices. The device can provide a certain reference value for related designs, and has broad promotion prospects in the field of home sprout vegetable cultivation.

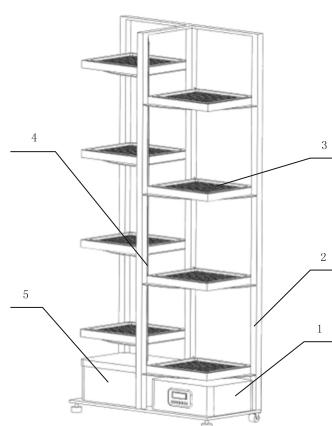
**Keywords:** Three-dimensional cultivation device · Home sprout cultivation · Solidworks simulation analysis

## 1 Introduction

“The position and environment one lives can change his virtue, and the recuperation can change his physique”, this is what Mencius said more than 2,000 years ago, showing that the importance of the living environment to human life and even the course of life has been realized by our ancestors long ago.

Basing on the continuous development of the economy, people start pursuing higher quality of life and pay more and more attention to improve it. At this point, home gardening gradually became popular, and was loved by people. The so-called home gardening refers to the cultivation and decoration of gardening plants in a relatively open space at home such as the roof, or the balcony [1]. Nowadays, under the social background where people’s material life is generally satisfied, facing the fast pace of social life with various challenges and pressures, people are more caring about their own living environment, in which they try to successfully create a green space in the limited space

that they can relax themselves in leisure time and make the body and mind happy, and that has become the common yearning and pursuit of many urban life groups. “Home gardening” is a future trend that conforms to the development of the gardening field, and is also an inevitable trend of human life [2]. With the improvement of people’s living standards, people’s demand for green vegetables has risen from focusing on the number of varieties of vegetables to paying more attention to the quality and edible safety indicators of vegetables [3]. Home vegetable cultivation not only has the characteristics of strong ornamental, fast growth, and the cultivation is not restricted by the region, season and the professional degree of the grower, and no pesticides and fertilizers are needed to be applied during the planting process. The vegetables produced can be eaten with safety and have both the effect of greening the home environment and cultivating sentiment [4]. Sprout vegetable is a new type of “living vegetable” that uses various beans, grains, trees and other plant seeds or other vegetative organs to develop into young shoots, seedlings, stems, etc. under suitable environmental conditions. It is rich in nutrition, unique in flavor, fragrant, crisp and tender, and has special medical and health care functions [5] with soft quality, good taste, unique flavor, and have therapeutic effects. Since sprouts produce low pollution and have fast growth during the cultivation process with no fertilizers, hormones and pesticides used, they are favored by consumers [6]. With the continuous development of agricultural technology, the continuous reduction of urban arable land, and the continuous improvement of people’s living standards, various modern small-scale soilless cultivation techniques and facilities are developing rapidly, and will become an inevitable trend of home gardening [7]. In recent years, there have been many researches on three-dimensional cultivation devices. Zhang Xiaowen and others designed the control system of the three-dimensional cultivation device for leafy vegetables [8]. Lu Zhuan and others designed an assembled three-dimensional cultivation symbiosis device for balcony agricultural products planting [9]. Li Zhiqiang conducted a small-scale soilless three-dimensional cultivation device and technology research [10]. Zhu Zhihao and others designed an intelligent green cultivation device [11].



1. Control system
2. Frame structure
3. Cultivation system
4. Light supplement system
5. Water supply system

**Fig. 1.** Three-dimensional cultivation device for home sprouts

Although there are many researches on cultivation devices, devices suitable for home sprout cultivation are still rare. In order to better meet the needs of home sprouts cultivation, and improve the convenience and appreciation of user management, this paper designs a home sprouts three-dimensional cultivation device, which consists of a frame structure, a cultivation system, a water supply system, a light supplement system, and a control system, etc. The use of frame structure design improves the space utilization rate of the home and also improves the purpose for ornamental of cultivation. The light supplement system ensures the light demand of the sprouts. Through the control system, it is possible to control the timing of opening and closing the water supply system and the supplementary light system, realizing the automation of cultivation management.

## 2 Overall Design

The three-dimensional cultivation device for home sprouts includes: frame structure, cultivation system, water supply system, and light supplement system, control system, etc. (Fig. 1). The frame structure is used to support the entire cultivation device and install various systems. The cultivation system is used to cultivate sprouts. The water supply system is used to provide irrigation water for sprouts. The light supplement system is used to supplement the lack of natural light during the cultivation process. The control system is used to control the automatic operation of the cultivation device.

## 3 Structural Design

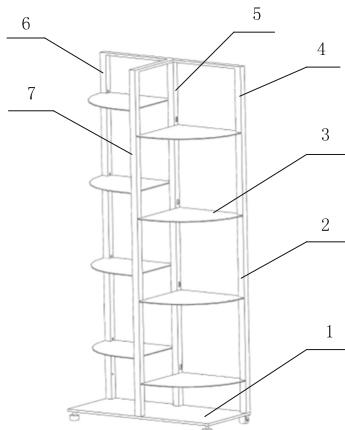
### 3.1 Design of Frame Structure

The frame structure includes a base, frame and partition (Fig. 2). The base adopts a stainless steel plate to increase the stability of the cultivation device. There are two wheels on the rear side of the lower part of the base to facilitate the movement of the cultivation device. There are two adjustable screws on the front side of the lower part of the base to adjust the level of the cultivation device. The frame is welded by stainless steel square pipes, including columns and beams. There are 8 water inlet holes on the column A, and the water inlet pipe can pass through the holes to supply water to the corresponding cultivation tank. There are 4 water return holes on the column B and column D respectively, and the water water return pipe can pass through the holes to make the water in the cultivation tank flow back into the water tank. There are mounting holes for the fill light on the column C. The partition is used to support the cultivation trough.

### 3.2 Design of Cultivation System

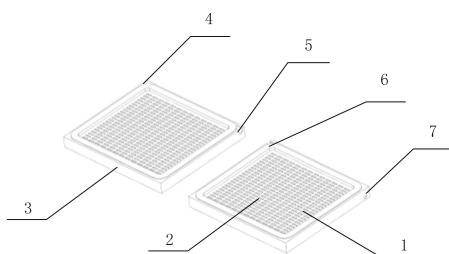
The cultivation system consists of a cultivation trough and a seedling tray (Fig. 3). The cultivation tank can hold a certain amount of irrigation water. There are 2 groups of cultivation troughs (group A, group B), 4 in each group. The cultivation troughs of

group an provided with water inlet holes at corner b for connecting water inlet pipes, and at corner a, water return holes are provided for connecting water water return pipes. Group B cultivation troughs are provided with water inlet holes at corner a for connecting the water inlet pipe, and at corner b with water return holes for connecting the water water return pipe. The height of the inlet hole is 1 cm higher than the height of the return hole.



1. Base 2. Frame 3. Partition  
4. Column B 5. Column A 6. Column D 7. Column C

**Fig. 2.** Frame structure



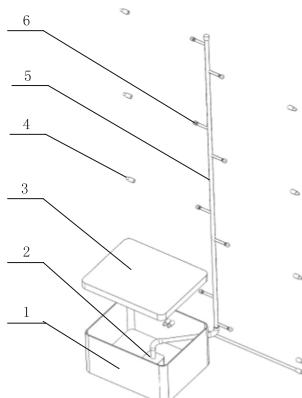
1. Seedling tray 2. Group A cultivation troughs 3. Group B cultivation troughs  
4. Corner b 5. Corner a 6. Corner b 7. Corner a

**Fig. 3.** Cultivation system

### 3.3 Design of Water Supply System

The water supply system includes: water tank, water tank cover, water pump, water inlet pipe, irrigator, and water return pipe (Fig. 4). The water tank is installed on the base to store irrigation water. This design can hold 10 L of irrigation water. The water pump is used to pressurize the irrigation water in the water tank, and it is delivered to

each cultivation tank by the water inlet pipe, and an irrigator is installed at the outlet of the water inlet pipe of each cultivation tank to supply water to the cultivation tank. The irrigator adopts a pressure-compensated head, which can make the irrigation water supply of each layer evenly. The water return pipe is connected to a cultivation trough and the column B or the column D, and the return hole of each cultivation trough is connected to a water return pipe. When the irrigation water in the cultivation tank reaches the position of the water return pipe, it flows into the column B or the column D from the water return pipe, and then flows back to the water tank.



1. Water tank 2. Water pump 3. Water tank cover  
4. Water return pipe 5. Water inlet pipe 6. Irrigator

**Fig. 4.** Water supply system

### 3.4 Design of Light Supplement System

The light supplement system uses LED plant growth lights, and the ratio of red light to blue light is 4:3. The fill light is installed inside the column C, and the power line of the fill light extends to the control box along the inside of the column C.

### 3.5 Design of Control System

The control system includes: control box, timing switch, liquid crystal display, buttons, etc. The timing switch adopts a two-way timing switch, one is used to control the water pump of the water supply system, and the other is used to control the fill light of the fill light system. There are buttons and LCD display on the front of the control box. The user can set the working time of the timer switch through the button, thereby controlling the opening and closing of the water supply system and the light supplement system.

## 4 Simulation Analysis

After the device structure design is completed. The finite element analysis of the frame structure with the simulation function of SolidWorks software shows that the strength of each part can meet the force requirements and the structure design is reasonable. The fluid analysis of the water supply system was carried out using the flow simulation function. The results showed that the irrigation water can smoothly flow into each cultivation tank, and the water supply in each tank is even, and when the water level reaches the position of the water return pipe, it can flow back into the water tank smoothly.

## 5 Application Test

Based on the above design results, a prototype of the three-dimensional cultivation device for home sprouts was made. The planting experiment of buckwheat sprouts, Lathyrus sativus sprouts, pea sprouts and other sprouts was carried out using the prototype. The test results are shown in Table 1. The results show that: it can meet the cultivation requirements of sprouts, and the growth condition is good. From the average seedling height and fresh weight per unit area, the cultivation effect is better than the ordinary three-dimensional cultivation device, and the management convenience, ornamental and comprehensive user satisfaction are also better than ordinary three-dimensional cultivation devices.

**Table 1.** Sprout vegetable cultivation test

Cultivation device type	Ordinary three-dimensional cultivation device			Home ultrasonic three-dimensional cultivation device		
Types of cultivated sprouts	Buckwheat sprouts	Lathyrus sativus sprouts	Pea sprouts	Buckwheat sprouts	Lathyrus sativus sprouts	Pea sprouts
Average seedling height (mm)	83	92	113	85	110	120
Fresh weight per unit area ( $\text{g}/\text{dm}^2$ )	40.22	28.32	38.65	41.06	31.24	40.15
Watering times per day (times)	3			0		
Management convenience	2			5		
Ornamental	2			5		
Comprehensive user satisfaction	3			5		

Note: The cultivation time of this experiment is from May 8th to May 18th, 2020. Management convenience, viewing and comprehensive user satisfaction indicators are collected using user survey methods, with 5 points being the best.

## 6 Conclusion

In order to better meet the needs of home sprouts cultivation and improve the convenience and appreciation of user management, a three-dimensional cultivation device for home sprouts was designed. The device consists of a frame structure, a cultivation system, a water supply system, and a light supplement system, a control system and other components. The use of frame structure design improves the space utilization rate of the home and also improves the ornamental nature of cultivation. The light supplement system ensures the light demand of the sprouts. Through the control system, it is possible to control the timing of opening and closing the water supply system and the light supplement system, realizing the automation of cultivation management. A simulation analysis was carried out using SolidWorks, and the results showed that the strength of each part can meet the force requirements, the irrigation water can flow into each cultivation trough smoothly, and the water supply in each trough is even. The prototype application test results show that: it can meet the cultivation requirements of sprouts, and the cultivation effect is better than ordinary three-dimensional cultivation devices, and the management convenience, ornamental, and comprehensive user satisfaction are also better than ordinary three-dimensional cultivation devices. The device can provide a certain reference value for related designs, and has broad promotion prospects in the field of home sprout vegetable cultivation.

**Acknowledgements.** This work was supported by National Key Research and Development Program of China (2017YFE0118500).

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# Single-Phase Ground Fault Line Selection Based on RTDS Simulation for Network with New Energy Accessed

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**Abstract.** Based on the features of zero-sequence components when single-phase line in the distribution network connected with new energy grounding, including parallel lines, a line selection method in view of the sum of vectors about the zero-sequence current at both ends is proposed in this paper. Firstly, using the zero-sequence current measured at the initial end of each line, the current with the largest amplitude and negative direction is identified as the uncertain current. If the uncertain current is in an independent line, it is the faulty line. If the suspected faulty line is a line group containing parallel lines, then the sum of vector about the zero-sequence current at the both ends in the line group is further calculated. The line which has the largest magnitude of the zero-sequence current vector sum at both ends and have negative direction is the faulty line in the parallel line group. The RTDS simulation verifies that this method can effectively conquer the influence of unbalanced current, make line selection more accurate, and improve the safety and dependability of the distribution network.

**Keywords:** New energy · Single phase to ground fault · RTDS simulation · Zero-sequence current vector sum · Line selection

## 1 Introduction

Nowadays, with the continuous access of new energy sources and the continuous improvement of power supply reliability requirements, a large number of parallel double-circuit or multi-circuit power supplies have become very common. Compared with single-circuit lines, multi-circuit lines have a large number of turns and mutual inductance between lines, which increases the types and complexity of line faults, and poses new challenges to many aspects of line protection [1]. If a grounding fault happened at the above-mentioned parallel multi-circuit line, the existing line selection method not only cannot effectively solve the impact of unbalanced current in the parallel double-circuit line or multi-circuit line, but also when a grounding fault happened on one of the parallel double-circuit (multi) lines, the fault line cannot be selected quickly and accurately, and all parallel double-circuit (multi) lines can only be checked for power failure, which seriously interferes with the production, work and life

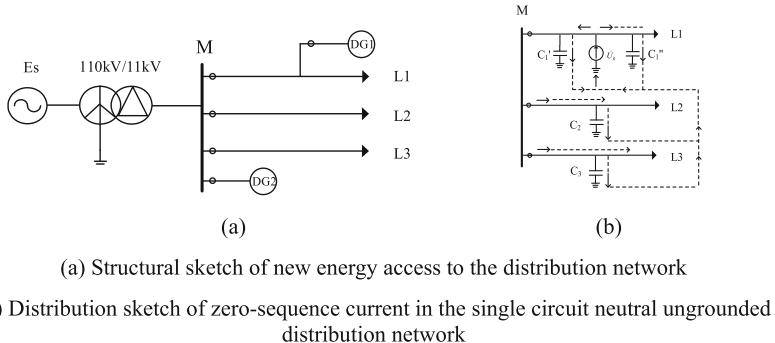
of users [2]. Therefore, the research on the line selection method for the neutral ungrounded network which has parallel multi-circuit lines has important research value for improving the safety and dependability of the distribution network.

In this document, according on the research of new energy access to parallel multi-circuit lines, the vector sum about zero-sequence current in each line is calculated on the basis of the examination of the first end of the line. Then, the suspected fault line is selected by observing zero-sequence characteristics. Then, the grounding fault line of the network with neutral point ungrounded of parallel multi-circuit is realized [3, 4]. This way can overcome the influence of unbalanced current, accurately complete line selection, reduce the scope of power failure, and improve the safety performance and reliability of the distribution network.

## 2 Fault Characteristic Analysis

### 2.1 Fault Characteristics Analysis of New Energy Access to the Distribution Network.

As shown in Fig. 1, new energy is connected to the single circuit neutral ungrounded distribution network.



**Fig. 1.** New energy access to neutral ungrounded distribution network

When grounding fault happens on L1 of system M, we can obtain the zero-sequence current of the normal phase by formula (1) and (2).

$$\dot{I}_{0,f,i} = 3\dot{U}_0\omega C_i \quad (1)$$

$$\dot{I}_{0,g} = -3\dot{U}_0\omega(C_2 + C_3) \quad (2)$$

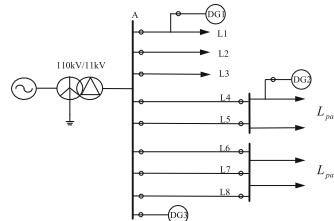
For the normal line, the current flowing pass is equal to the capacitance current to ground, the orientation is following from the bus to the line. For fault line, the current flowing through the fault line is the sum of it flowing pass all normal lines, and the orientation is opposite to the non-fault line, which is the line flowing to the bus [5].

Currently, most single-phase grounding research is done by extracting and analyzing the characteristics of currents in the line which is faulty.

For the distribution network with parallel multi-circuit (double) lines, when a grounding fault happens on parallel double-circuit line or a multi-circuit line, if the existing single-phase grounding line selection method is simply applied, it will not be able to accurately select which line in the line group is in fault, only parallel double-circuit lines or multi-circuit lines can be checked for power failure, which will seriously interfere with the production, work and life of users [6].

## 2.2 Analysis of the Fault Characteristics of New Energy with Parallel Lines Connected to the Distribution Network

Figure 2 is a simplified model of a neutral-point ungrounded distribution network of new energy with parallel multi-circuit lines, where line A is a bus, and lines L1~L3 are independent lines. L4~L5 form a parallel double-circuit line group  $L_{par\cdot 1}$ , L6~L8 form another parallel multi-circuit line group  $L_{par\cdot 2}$ . It is stipulated that the positive orientation of the zero-sequence capacitive current is the bus bar to the line, the opposite orientation is negative. According to the monitoring the status of circuit breakers on both sides of the distribution network, the operation status of parallel multi-circuit lines in the current distribution network is determined. By detecting the magnitude of zero-sequence voltage, the single-phase grounding fault is judged. If it is, fault line selection is started [7, 8].



**Fig. 2.** Neutral ungrounded distribution network with parallel lines new energy accessed

When the grounding fault happened, using the current transformer at the first end of line to measure the zero-sequence current vector. Regarding the line group with parallel multi (double) circuit lines, the sum of zero-sequence current vectors of each parallel multi (double) circuit line group is calculated according to the formula (3), and the sum is taken as the current criterion of the group.

$$\dot{I}_{0,par\cdot n} = \sum_{i=1}^M \dot{I}_{0,n\cdot i} \quad (3)$$

Among them,  $\dot{I}_{0,par\cdot n}$  is the sum of the current vector of the n-th parallel double (multi) circuit line group, M is the number of lines contained in each group of parallel

double-circuits(multi),  $\dot{I}_{0\cdot n\cdot i}$  is the current value at the start of i-th line in n-th group of parallel double-circuit(multi) lines.

Firstly, each group of parallel double-circuit(multi) lines is regarded as a line, and using formula (3) to calculate its zero-sequence current. According to the formula (4), the line with the largest amplitude of zero-sequence current and with negative direction is the suspected fault line X.

$$\dot{I}_{0\cdot x} = \max \{ |\dot{I}_{0\cdot 1}|, |\dot{I}_{0\cdot 2}|, \dots, |\dot{I}_{0\cdot \text{par}\cdot 1}|, \dots, |\dot{I}_{0\cdot \text{par}\cdot n}| \} \quad (4)$$

It is further judged whether the suspected fault line x obtained from the above formula is a certain parallel double-circuit(multi) line group. If the suspected fault line X is an ordinary single circuit line, then the suspected line is the fault line [9]. If the suspected line is a group of parallel multi-circuit lines, then collect the zero-sequence current vector at first end and finally end of each line in the parallel multi-circuit line at the same time, and calculate the current vector sum at the first end and finally end of each line according to formula (5). Then the line with the maximum zero-sequence current vector sum amplitude at both ends and the negative direction is the fault line in the parallel double-circuit(multi) line group.

$$\dot{I}_{0\cdot px\cdot i} = \dot{I}_{0\cdot x\cdot i} + \dot{I}'_{0\cdot x\cdot i} \quad (5s)$$

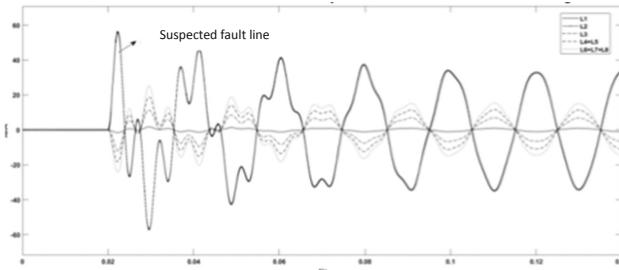
In the formula (5),  $\dot{I}_{0\cdot px\cdot i}$  is the sum of the current in the first and the finally end of the i-th line in the x-th parallel double(multi) line,  $\dot{I}_{0\cdot x\cdot i}$  is the current at the start of the i-th line in the x-th parallel double(multi) line group,  $\dot{I}'_{0\cdot x\cdot i}$  is the current at the terminal of the i-th line in the x-th parallel double(multi) line group.

### 3 Single-Phase Grounding Line Selection Method for the Network with Parallel Lines New Energy Accessed

Use MATLAB/Simulink software to set up a simulation model of a neutral ungrounded distribution network with parallel lines new energy accessed can be seen in Fig. 2. Assuming that the zero-sequence voltage is set to 10% of the rated phase voltage, when the voltage is greater than this value, a single-phase-to-earth fault has occurred.

According to Fig. 2, L1–L3 are independent lines, L4–L5 form a group of parallel double-circuit lines, L6–L8 form another group of parallel multi-circuit lines; the zero-sequence measurement current at the first end of line L1–L8 is  $\dot{I}_{01} \sim \dot{I}_{08}$ ; the measurement current at the finally end of line L4–L8 is  $\dot{I}'_{04} \sim \dot{I}'_{08}$ .

When phase-A grounding fault occurs on independent line L2, the waveform of zero-sequence current at the first end of every line can be seen in Fig. 3.



**Fig. 3.** Zero-sequence current of every line when phase-A grounding fault occurs on L2

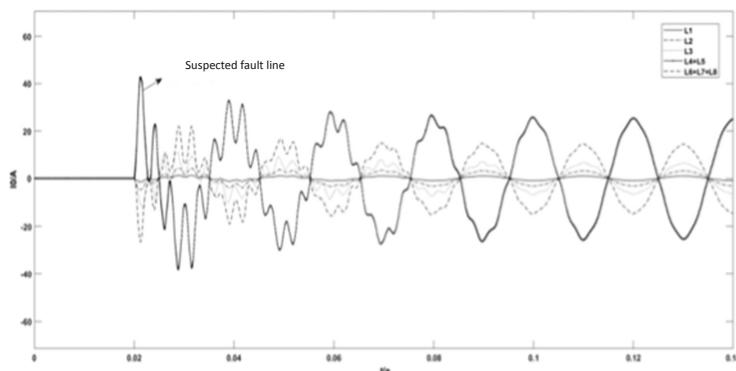
Based on the zero-sequence current vector measured at the beginning of the line, and use formula (3) to calculate the vector sum of the current at the beginning of the two sets of parallel lines, the results can be seen in Table 1:

**Table 1.** Vector sum of zero-sequence current of every line when L2 is fault

	L1	L2	L3	$\bar{I}_{0,par-1}$	$\bar{I}_{0,par-2}$
$\bar{I}_0$	1.006	-33.67	6.667	11.12	14.83

As shown in Table 1 that the amplitude of zero-sequence current of L2 is 33.67, and it is the largest, the direction of it is negative, and line L2 is an independent line without parallel multi-circuit lines, so it can be directly judged that L2 has single-phase grounding fault.

When phase A ground fault happens on L4, the waveform of current at the first end of each line can be seen in Fig. 4.



**Fig. 4.** Zero-sequence current of each line when phase-A-to-earth fault occurs on L4

According to the zero-sequence current vector measured at the line first end, and use formula (1) to calculate the vector sum of the zero-sequence current at the beginning of two parallel double-circuit (multi) lines respectively, the results can be seen in Table 2:

**Table 2.** Vector sum of zero-sequence current of every line when L4 fault occurs

	L1	L2	L3	$\dot{I}_{0,par-1}$	$\dot{I}_{0,par-2}$
$\dot{I}_0$	9.081	3.195	6.457	-25.026	14.839

It can be seen in Table 3 that the current amplitude of the parallel double-circuit line group composed of L4~L5 is the largest and the direction is negative. It can be determined that the parallel double-circuit line group composed of L4~L5 has fault, and it is necessary to further judge which line in the parallel double-circuit group has fault. Use formula (5) to find the vector sum of the zero-sequence current at both ends of the L4 and L5 lines respectively, and the results can be seen in Table 3:

**Table 3.** Vector sum of zero-sequence current at both ends of L4 and L5 lines

	$\dot{I}_{0,p1.1}(L4)$	$\dot{I}_{0,p1.2}(L5)$
$\dot{I}_0$	-19.80	2.893

What we can see in Table 3 is that the zero-sequence current amplitude of L4 is the largest and the orientation is negative, and the L4 can be accurately chosen as the faulty line.

## 4 Conclusions

When a single-phase grounding fault happens in the distribution network with new energy access, the zero-sequence characteristics can be used as the basis for line selection. Using the measurement of zero-sequence current at the initial of each line, the suspected line is preliminarily judged. When the suspected fault line is a line group with parallel multi-circuit lines, it is creatively proposed to eliminate the influence of unbalanced current by the zero-sequence current vector sum at both ends of every line in the parallel multi-circuit line group as the line selection criterion [10]. Through the simulation experiment, this method can find the fault line accurately and effectively without power failure, and can effectively better the security and dependability of distribution network operation.

**Acknowledgements.** This work was supported by State Grid Jiangsu Electric Power Company Science and Technology Project. (SGJSXZ00FCJS1901022).

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# Application of 3D Printing Technology in Jewelry Design in the Era of Artificial Intelligence

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**Abstract.** Since the end of last century, 3D printing technology has appeared, and has been used in the field of jewelry design. In the era of artificial intelligence, the good development of 3D printing technology has brought a touch of light to the design field. This paper investigates the situation of jewelry design and production under the 3D printing technology, and studies whether the 3D printing technology is suitable for the design and production of jewelry, in order to make the 3D printing technology add luster in the jewelry design. This paper systematically expounds the importance of 3D printing technology in jewelry design, and introduces the application methods of 3D printing technology in jewelry design, including using different materials to print jewelry and using different printing methods according to users' preferences. And according to customer demand, in-depth interpretation of 3D printing technology in the application of contemporary jewelry design. The experimental results show that in the era of artificial intelligence, the practical application of 3D printing technology in jewelry design is very feasible, and people's satisfaction is as high as 78.1%. This paper applies 3D printing technology to jewelry design, explores the difference between traditional jewelry production and 3D printing jewelry production, analyzes the influence and improvement of 3D printing technology on traditional jewelry production, and the research on innovative jewelry production is helpful to the development of jewelry design and production.

**Keywords:** Artificial intelligence · 3D printing · Jewelry design · Application

## 1 Introduction

In the last century, the concept of artificial intelligence came into being. Up to now, it has been developing vigorously in many fields. With the rise of deep learning, artificial intelligence has become the focus of research and application in various fields. The world is combining emerging technologies with modern production and manufacturers to create maximum benefits. Artificial intelligence technology mainly includes psychology, linguistics and logical reasoning, which can help people solve the related problems in daily life and improve their living standards. With the rapid development of artificial intelligence, it has become the leader of intelligent technology [1–3]. Artificial intelligence enables the computer system to realize the transformation of human thought and behavior after being input into certain specific programs, and

complete the work of simulating human life. At the same time, it improves the convenience and accuracy of data processing in people's daily life [5].

In recent years, the development of jewelry design has changed significantly compared with the past. 3D printing technology has quickly captured the jewelry design industry. In the new era, people have no interest in traditional jewelry. The jewelry design based on 3D printing, which has the characteristics of participation and high efficiency, has attracted their attention. Traditional jewelry design is becoming more and more desolate, and generally presents a retrograde trend. The future of this declining industry is closely related to the overall fate of the jewelry design industry. Therefore, it is necessary to study and analyze the important factors that affect the development of traditional jewelry design and 3D printing jewelry design. Under the influence of the era of artificial intelligence, find a more suitable way for traditional jewelry design and more development prospects [4–6].

Nowadays, 3D printing technology has been widely used in many fields. Jewelry design is a very important part of handicraft. The jewelry design style of 3D printing is distinct, which is different from the traditional jewelry design. It pays more attention to the expression of the artist's inner feelings in the works. This is why the advantages of 3D printing technology are gradually emerging. This paper will focus on the advantages and disadvantages of 3D printing technology in modern jewelry design and application methods [7–10].

## 2 3D Printing Technology and Jewelry Design

### 2.1 3D Printing Technology

3D printing is known as additive production technology, any pre-production technology must be designed by the designer to achieve production. This is why the step of 3D printing technology is to design sketch first, then complete the modeling of sketch through modeling program, and then print the strong model layer by layer through 3D printer. Compared with the traditional production mode, the batch production only takes a few days, which saves a lot of time cost and labor cost. There is also a very limited range of errors in 3D printing. The popularity of 3D printing technology greatly improves the production efficiency, and the audience is also very wide. People can even make their own favorite jewelry. However, the application requirements of 3D printing technology are very high, which requires the designer not only to draw the design drawings, but also to skillfully use the modeling program. At the same time, R & D and supply costs are high. So far, 3D printing technology has not formed an industrial chain, nor completely replaced the traditional production methods and processes.

### 2.2 3D Printing Technology Applied to Jewelry Design

In the jewelry industry, especially in the development stage of jewelry, 3D printing technology has been widely used. It can add materials to render after modeling, and can match the high quality renderings you like and want. 3D printing technology greatly improves the efficiency of jewelry design, it also improves the accuracy. The design

and production of traditional jewelry completely depends on the ability of manual measurement and artists. And 3D printing technology obtains 3D model by computer, which greatly improves the accuracy. This is also very conducive to the customization and development of our high-end jewelry. 3D printing production, you can choose a variety of materials, simulate various effects, and then you can choose the final product appearance according to the effect picture. The cost of model making is reduced and more affordable. In today's society, consumers' pursuit of jewelry is more and more different. Jewelry is more and more personalized and artistic. Therefore, designers should make complex and fluent shapes according to the needs of customers. Through three-dimensional software, it can be directly and easily made. This is difficult to achieve by handicraft. It will further reduce the cost of time and space, so that the traditional jewelry design can be innovated and developed. 3D printing jewelry works will also be trusted and liked by the public, which will lead the development trend of jewelry design. Quadratic cost function is a way to measure the predicted value and actual value of artificial neural network. It can effectively promote the training of artificial neural network. The specific calculation formula is as follows:

$$C = \frac{(y - a)^2}{2} \quad (1)$$

$$\frac{\partial C}{\partial w} = (a - y)\sigma(z)x \quad (2)$$

$$\frac{\partial C}{\partial b} = (a - y)\sigma(z) \quad (3)$$

### 3 Experimental Ideas and Design

3D printing technology will come into every aspect of our life and change people's role as consumers. Consumers will no longer be limited to buying. Everyone can become a designer and produce their own products. The role of professional designers may simply be to develop better design models for public use. This paper believes that 3D printing is not a product at all, but creativity. For example, in the case of more and more diverse production technology, through a variety of effective and appropriate technology, products become more and more in line with the needs of customers, so our focus is also changing. Therefore, how to use modern technology to effectively promote the creative development of our thinking, and then better achieve it, has become a problem faced by modern designers. In the design, this paper adopts two forms: questionnaire survey and on-the-spot interview, and 886 people are randomly selected as the survey samples. There are ordinary people and professionals in the respondents. This study aims to explore the application of 3D printing technology in jewelry design in the era of artificial intelligence.

## 4 Discussion

### 4.1 Status Analysis of 3D Printing Technology in Jewelry Design in the Era of Artificial Intelligence

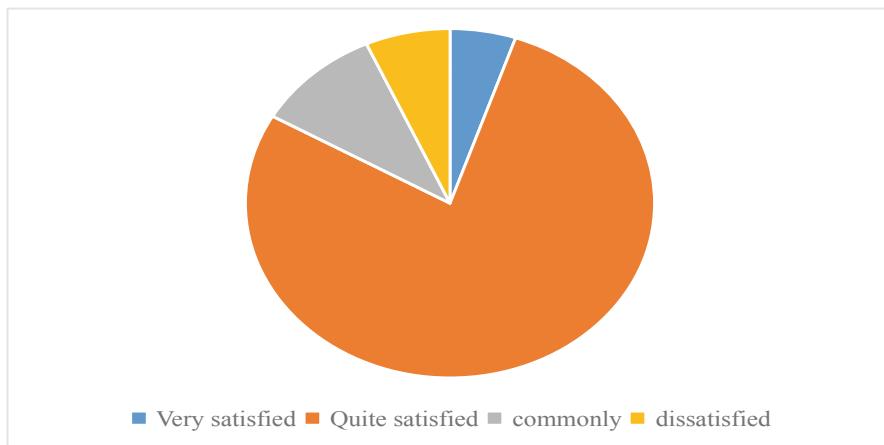
According to the experimental results, we investigated and analyzed the results, and the results are shown in Table 1. Jewelry industry generally uses alloy, wax, nylon, plastic as production materials. At present, many domestic 3D printing materials rely on import. Another problem is to solve the mixed manufacturing of multiple materials, because only by printing mixed materials can we enrich the effect of jewelry and create jewelry with various structures. 3D printing can transform virtual complex model into real entity, especially for some complex shapes with hollow, concave, interlocking or a large number of regular detail patterns. On the one hand, it promotes the promotion of jewelry creativity, making some innovative and creative designs that only exist in the mind and have no practical value in the traditional field appear in jewelry creation; on the other hand, it promotes the upgrading of jewelry manufacturing industry, and can make some special structures that are difficult to form by traditional manufacturing methods or can only be realized by complex processing technology.

**Table 1.** The advantages of jewelry design in 3D printing

Advantage	Give an example
Rapid reproduction of prototype	UV curing molding technology
Special modeling structure	Spiral torus structure
	Fractal structure
	Suspended hollow structure
	Multidimensional spatial structure

In addition, this paper investigates the public's satisfaction with the application of 3D printing technology in jewelry design in the era of artificial intelligence, as shown in Fig. 1. It can be seen from Fig. 1 that people are very satisfied with the practical application of 3D printing technology in jewelry design in the era of artificial intelligence. Jewelry art design has also released great potential, bringing jewelry design into a broader world. First of all, it greatly reduces the constraints of process level on design concept. In the foreseeable future, as long as the model is established in CAD software, it can be realized by 3D printing. Secondly, it fully expands the design expression space. Art design based on 3D printing is no longer limited to the external form of the work, but the fine structure and internal composition of the work. Through this technology, we can precisely design the physical support structure, internal space form and even texture of the work, so as to undertake the expression function and become an independent image carrier. The meaning of the work will be greatly expanded. Finally, the application of materials has entered a new stage. At present, more and more materials are used for 3D printing. The printing of ceramics, glass and metal has been realized, and the simultaneous forming technology of various materials will eventually

make a breakthrough. In the future, jewelry can be made of different materials and different forms.



**Fig. 1.** People's satisfaction survey on the application of 3D printing technology in jewelry design in the era of artificial intelligence

This paper further investigates the basic framework of 3D printing technology, and obtains the architecture of 3D printing technology, as shown in Fig. 2. 3D printing has its unique advantages in jewelry design: (1) complex structure and diverse styles. 3D printing is a kind of digital modeling, which is drawn by computer program, and then printed out the wax plate with rich design style. (2) Three dimensional sense. Compared with ordinary jewelry, 3D printing jewelry is fuller and brighter. (3) Customized. 3D printing jewelry is first through 3D digital modeling, then printing, three-dimensional modeling is easier to integrate into the buyer's ideas, anyone can become a designer. People can also predict the appearance of jewelry through three-dimensional modeling, which can significantly improve consumer satisfaction with the finished product, and everyone can become a designer of customized jewelry. (4) The process is simple and the cost is low. 3D printing reduces the cost of jewelry production, and the price of printers and 3D materials is 79% lower than that of traditional crafts and materials. 3D simplifies many tedious work of traditional jewelry design, meets the rapid needs of modern people with the shortest cycle, and makes art and technology better integrate into people's life.

### Subtractive manufacturing

- Electronic cutting
- Chemical cutting
- Solid cutting
- Mechanical grinding

### Additive manufacturing

- Cascade addition
- Solid free form
- Rapid prototyping

**Fig. 2.** Basic framework of 3D printing technology

## 4.2 Application Direction of 3D Printing Technology in Jewelry Design in the Era of Artificial Intelligence

### 1) Take the road of full combination of tradition and fashion.

Traditional jewelry full of artists' superb talents is not only art, but also has a complex and profound relationship with technology, ethnology, aesthetics and other disciplines. The jewelry on the head, face and body of ancient emperors, and the jewelry of women and ethnic minorities, regardless of their design or technology, can become a model in the jewelry industry. This is something we can't ignore. We must inherit and learn its essence. The technology and technology of traditional jewelry is still of great practical significance to our design. However, its complex design process and relatively unique design style are obstacles to the rapid development of traditional jewelry design, and also one of the important defects of traditional jewelry design. In recent years, the application of 3D technology in jewelry design and design has only made up for the shortage of traditional jewelry design and technology. It simplifies the complex process of traditional jewelry design. It can make use of the network advantages and foreign advanced experience to shape the design style, so that jewelry design no longer exists as a pure art form, but become the combination of technology and art, and can freely design to bring progress. 3D printing design is not only fast, but also diversified and fashionable. This is undoubtedly an opportunity for the redevelopment of traditional jewelry combining two elements.

### 2) Realize the parametric design of jewelry.

The humanization of 3D printing technology directly transforms the design scheme into the design result completely consistent with the design scheme through processing. It guarantees the full expression of design concept. At the same time, 3D printing also has the function of high precision, it can accurately present perfect works, especially suitable for processing fine jewelry in the production process. 3D printing perfectly makes up for the error between traditional jewelry design process and manufacturing process. In the process of jewelry design and processing, 3D

printing technology can be adjusted according to different design schemes to produce different jewelry effect pictures. Therefore, 3D printing technology is the maintenance expression of jewelry parametric design. 3D printing not only provides a processing method for the printing process of jewelry design, but also changes the designer's design concept and provides some choices for designers. Jewelry can not only choose common metal materials, but also some composite materials and ceramic plastics, which is a new attempt for designers. This will change the aesthetic concept and, if successful, will promote the development of this trend.

### 3) Realize the change from traditional manufacturing to intelligent creation.

In terms of intelligent technology, China is similar to the international level. 3D printing is the representative production of advanced industries, which can perfectly match with intelligent digital, including 3D scanning, virtual display, etc. In the future, artificial intelligence can be extended from computers to the real world, and 3D technology can directly print smart jewelry with perceptual skills. For example, hand decorated jewelry is added to the intelligent sensing device to make it a functional jewelry. Jewelry enterprises must update the traditional design and production concepts, use intelligent technology to occupy the market, maintain scientific and technological innovation, continue to promote the application of high-tech services such as 3D printing technology, and digitize artificial intelligence and robots in the jewelry industry, so as to expand and strengthen "high-end jewelry production".

## 5 Conclusions

The development and progress of jewelry art is always closely related to the development of new technology. In the era of artificial intelligence, 3D printing technology is applied to jewelry design, because it can give jewelry unique personality, bring us different design concepts, and become a new trend. However, for the application and development of 3D printing technology in jewelry design, we still need to maintain accurate positioning. 3D printing technology plays an important role in the development of jewelry art design, but also needs our continuous innovation and exploration. Personalized jewelry customization will also be popular. 3D printing technology will rebuild the identity and role of consumers in the industry. Consumers, they are not just buyers, they are also involved in the personalized design of jewelry. There are still many shortcomings in 3D printing. But with the progress of technology and the continuous development of the market, it will overcome many problems and have a positive impact on the jewelry design industry.

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# Risk Prevention and Control of Automobile Enterprise Purchasing Parts Supply Management Based on Block Chain Technology

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**Abstract.** In recent years, with the development of science and technology, in order to further explore the world, we explore and study the supply management of automobile enterprise procurement parts based on block chain technology. Based on the reality of China's automobile industry supply chain, combined with the advanced supply chain management theory at home and abroad, this paper makes a comprehensive and systematic analysis of the automobile industry supply chain by combining theoretical research with enterprise cases, and tries to explain in theory, refine the method and structure of the supply chain, and construct the precise supply chain system and fine supply chain of the automobile industry management system and efficiency evaluation system. Based on the analysis of the subjective and objective elements and their interaction in the supply chain, an accurate comprehensive cost model of the supply chain is established. In order to achieve the balance between customer satisfaction and supply chain operation cost, the supply chain structure and operation process are designed in turn. The basic structure of the Bit coin system is designed and realized with the help of block chain technology. It can be said that the basic system of Bit coin is constituted by the block chain. Block chain technology has been considered by professionals to be a very promising technology since its discovery. This article introduces its key technology, composition, basic principles, and limitations, and conducts research on some related issues.

**Keywords:** Block chain technology · Automobile supply management · Risk prevention and control · Automobile enterprises

## 1 Introduction

With the continuous advancement of information technology in recent years, the continuous enrichment of customer content, and the shortening of product life cycles, enterprises have faced unprecedented challenges and opportunities in the market.

With the continuous progress of information technology, the scope of application of block chain technology is becoming wider and wider. Many experts have studied the technology of block chain. For example, some domestic teams have conducted a

systematic mapping study on block chain technology, with the purpose of collecting all relevant research on block chain technology. The goal is to understand the current research topics, challenges and future development direction of block chain technology from a technical perspective. Several major papers were extracted from the scientific database. The results show that more than a majority of papers focus on bit coin system, while a small number of papers focus on other block chain applications, including smart contracts and licensing. Most researches focus on block chain technology [1, 2]. For the Internet of Things e-commerce, some teams proposed and designed the Internet of Things e-commerce model. For the traditional e-commerce model, this new model has redesigned many elements, and with the help of transactions based on block chain technology and smart intelligent contracts, transactions of intelligent property and payment data on the Internet of Things can be completed [2, 3]. H. experts also proposed a block chain based method to protect the accuracy of sensor data currency. This method is applied to the microbial sampling robot system. The purpose of this method is to ensure that the work of the robot is not interfered by human beings, especially the data tampering behavior of the monitoring personnel. The research results show that, due to the security protection of currency block chain, the method has the characteristics of strong anti-tampering, low cost and easy implementation [4]. Although there are abundant research results on the application of block chain technology, there are still some deficiencies in the research of automobile Procurement Based on block chain technology.

In order to study the block chain technology based on deep learning, this paper studies the application of block chain technology and finds the data structure of block chain. The results show that block chain technology plays an important role in automobile supply management.

## 2 Method

### 2.1 Block Chain Technology

Block chain is a distributed shared ledger, which needs to establish trust relationship between all connected nodes. Block chain is the first digital accounting technology with self-regulating function in human history. The core value pursuit of block chain becomes a safe public account book. Compared with the previous accounting technology, block chain maintains a growing data link, which can only add records, and the data that has occurred cannot be tampered with. Block chain technology does not need centralized control mode, but all participating nodes in the network can reach a consensus. Some participating nodes are allowed to shut down and some malicious nodes are allowed to exist. Using the mechanism of cryptography to ensure that transactions are not destroyed and destroyed [5]. The blocks in the block chain are Merle hash trees, and the hash values of leaf nodes are transaction hashes. The hash value of the non-leaf node is calculated by the leaf node. The asymmetric encryption algorithm used in block chain is elliptic encryption algorithm. Elliptic curve refers to the curve determined by Eq. (1). It is encrypted by encryption algorithm (2).

$$y^2 + a_1xy + a_3y = x^3 + a_2x^2 + a_4x + a_6 \quad (1)$$

$$y^2 = x^3 + 7 \quad (2)$$

$$k = k * G \quad (3)$$

(3) Where: K is the private key, G is the generating point, and K is the public key calculated according to the elliptic curve. In order to express the multiplication of integer points on an elliptic curve, the elliptic curve used here is Eq. (2), and K is taken as 8, that is, the calculation result is shown in Eq. (4).

$$K = 8 * G \quad (4)$$

## 2.2 Supply Management of Purchased Parts in Automobile Enterprises

The automotive industry supply chain is an open and dynamic system, which is a whole composed of many related elements, which are interrelated but independent of each other. According to the definition of system, a system is a whole composed of multiple related and independent elements mentioned above, which can achieve certain goals. And the system also has very obvious characteristics. First, composition. The system consists of two or more elements. Second, hierarchy. System elements should be distinguishable. Third, borders. The boundary of element is smaller than that of system. Fourth, correlation. The elements are interrelated. Elements and systems are relative. Fifth, purpose. The combination of elements is to achieve a specific purpose. Sixth, integrity. The system is a whole [6]. Supplier management service changes with the service object's own industrial structure, industrial status, production capacity, logistics capacity and other factors. The main factors to evaluate supplier management service level are procurement quality (value), cost, delivery time, service, flexibility, category, etc. At present, the evaluation standard of automobile supplier management service system is not uniform. Each major engine factory has established its own evaluation system. The United States attaches importance to competition, Japan and South Korea attach importance to long-term cooperation, and Germany attaches importance to the quality of parts themselves. However, fundamentally, they are all designed to maximize the value of suppliers. In the process of purchasing or supplier management, the quality defects or cost increase caused by the lack of technical ability, management ability or information transmission ability can be attributed to the value loss caused by the chaotic state of management service system.

The automotive supply chain is the most representative supply chain structure model. With automobile manufacturing enterprises as the core enterprise, it is guided by the needs provided by customers, starting from the purchase of raw materials required in the production and processing process, and then through the enterprise's storage management, production and processing of these raw materials, the production of the required parts of the automobile Semi-finished products or finished products are finally sold through distribution channels, and corresponding after-sales service management is provided to buyers, thus forming a complete supply chain structure

combining production and sales. As the core of the entire supply chain, on the one hand, automobile manufacturers can drive other related companies to improve their products and form a virtuous circle with the development of suppliers. On the other hand, automobile manufacturers are also closely related to purchasing users.

### 3 Experience

#### 3.1 Extraction of Experimental Objects

Due to the small scale and dispersion of parts enterprises, there are thousands of parts and raw materials suppliers for each large automobile factory. According to the purchase plan of the whole vehicle factory, the parts supplier will send the parts to the parts warehouse of the first automobile factory. According to the production instructions or production Kan ban of the general assembly plant, the warehouse will send different parts to the temporary warehouse of the assembly plant on time, or send them to the assembly line through the direct delivery station. On the basis of the above-mentioned modular supply mode and the current single part supply mode in China, combined with the actual situation of China's automobile manufacturing industry, the intermediate mode of transition to modular supply, namely quasi modular supply mode, is proposed. The logistics center with parts assembly function is established in the vehicle factory, and the modules directly used for assembly are provided to the vehicle factory to replace the traditional parts Part supply mode [7].

#### 3.2 Experimental Design

In the process of product R & D, there are three main ways to entrust the design and production of parts and components: first, the way of drawing entrust men t: the vehicle enterprise is responsible for the product function design and development, while the supplier is only responsible for production; second, the drawing approval method, in which the vehicle enterprise puts forward the functional characteristics requirements, and the whole detailed design is completely controlled by the supplier; third, the standard part refers to the complete compliance with the prevailing market standards, Parts designed and developed by suppliers [8]. Automobile manufacturers cooperate with multinational companies and establish joint ventures, learn from multinational companies during the cooperation, absorb advanced production and management technologies from all parties, and then through self-correction and improvement, they will gradually develop into a strong domestic independent brand and serve other domestic brands. The enterprise lays a road for development. With continuous development in recent years, auto industry enterprises have made significant progress in terms of management level, parts procurement and corresponding supply management level. However, there is still a gap that cannot be ignored if compared with excellent foreign companies. Through the investigation of the existing market, this paper analyzes the situation of automakers' parts procurement and corresponding supply management, and studies the main existing problems in our country.

### 3.3 Statistical Analysis of Data

Mathematical statistics: use Excel data processing software to conduct statistical processing of relevant data, and present in the form of charts. The formula is as follows:  $SUMIF(\$A\$2 : \$G\$2, H\$2, A3 : G3)$ .

## 4 Discussion

### 4.1 Data Structure of Block Chain

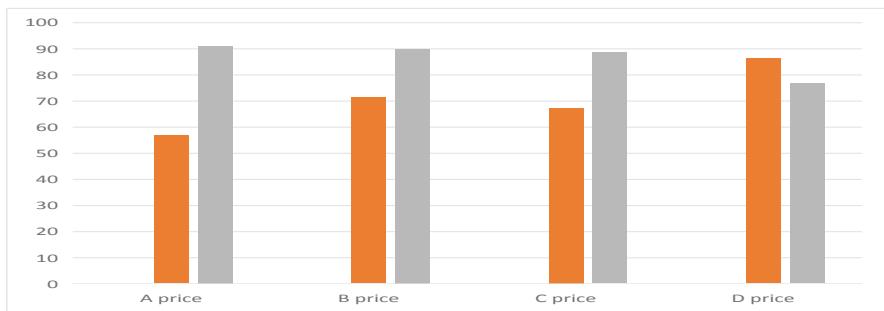
The current block forms a chain data structure by including the hash value of the previous block. If you try to modify a block on a block, you will inevitably cause the data in the following blocks to change. With the continuous expansion of the block chain network, the cost of such modification will be huge. The block consensus mechanism ensures the verification of block transactions, and the consensus mechanism is consistent with the decisions on the block chain [9]. At present, the mainstream consensus mechanisms include pow, POS and dos. Table 1. Compares the mainstream consistency algorithms.

**Table 1.** Comparison of mainstream consensus algorithms

Consensus mechanism	Consensus cycle	Node	Block difficulty	Degree of decentralization
Proof of pow workload	Hash calculates random numbers	Free participation of nodes	Consensus cycle is long	Higher
Proof of rights and interests of POS	Reduce block difficulty	The consensus period is short	Third party verification	Lower
Dpos authorization certificate	Appropriately reduce the degree of decentralization	Second level consensus verification	Rely on token	Higher
Pool validation pool	Distributed combined data verification mechanism	Second level consensus verification	Low degree of decentralization	Lower

Although each work is composed of four or five systems, these systems are not executed in parallel, without integration and compatibility. The whole work flow adopts a series structure, which is very inefficient. The staff's whole day's work experience is consumed in the mutual adjustment and communication between different systems; the input, query, and switching of different systems require specialized staff to repeatedly provide corresponding information to personnel in various departments, which leads to the inability to share information, leading to work Low efficiency and

constant complaints. The purchase cost is too high, and the enterprise cannot make ends meet, as shown in Fig. 1.



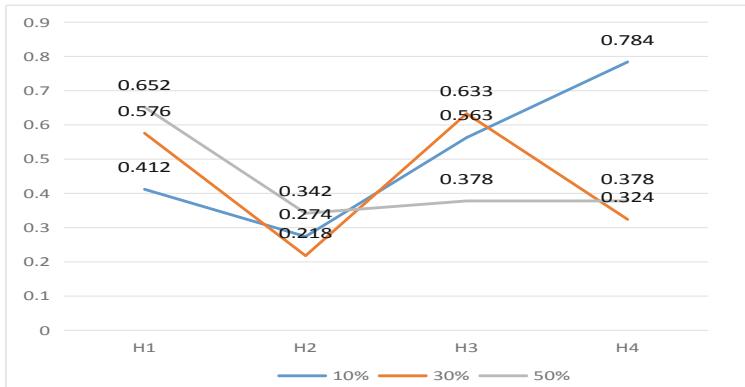
**Fig. 1.** Purchase price analysis chart

The result of the continuous development of information distortion is that price B is higher than price A, price D is higher than price C, and procurement cost is not high. Employees work overtime all day, and as a result, the enterprise can't make ends meet.

\*\*The company said it lost an average of \$1.1 billion a year, and it is not surprising that some of the components currently paid to the group are \$1.4 billion higher than the market price. When the same organization index is 10%–90%, it represents the manufacturer's own share of value elements under the traditional supplier management structure. The higher the index, the greater the proportion of manufacturers. Taking automobile enterprises as an example, engine production generally belongs to the main engine factory. In this case, the corresponding proportion of engine and its parts in the total value element system is the value element occupied by the same organization index [10]. This paper analyzes the entropy of traditional manufacturing supplier management service structure, and the change of order degree caused by service innovation (through the development of logistics value index and information value index) under the same organizational indicators of 10%, 30%, 50%, 70% and 90% respectively. As shown in Table 2.

**Table 2.** Analysis table of entropy and order degree of different belonging values

Index	H1	H2	H3	H4	H5	H6
10%	0.412	0.274	0.563	0.784	0.785	0.826
30%	0.576	0.218	0.633	0.324	0.837	0.855
50%	0.652	0.342	0.378	0.378	0.326	0.673
70%	0.843	0.356	0.476	0.344	0.734	0.837
90%	0.487	0.483	0.834	0.475	0.438	0.348



**Fig. 2.** Analysis chart of entropy and order degree of different same value

From the calculation structure table, it can be seen that when the same organization index is 90%, all parts are produced by the manufacturer itself, and each index of the parts can be controlled comprehensively. At this point, the order degree of the structure is 1, reaching the maximum value. In practice, this kind of situation will happen in small workshops and other manufacturing industries, whose production cycle is short, the product process is relatively simple, the product parts are less difficult, or the parts processing technology needs to be completely confidential; as far as the automobile manufacturing industry is concerned, the value index of contemporary pure momentum vehicles is also very high, such as luxury cars such as Ferrari and Bugatti.

## 5 Conclusion

With the continuous development and expansion of the automobile market, the competition among automobile manufacturers has evolved into the competition between supply chains and supply chains. Only when competition in the automobile market is intensified, the supply chain companies will seek new ways to improve supply chain management. In order to improve their competitiveness, they will actively explore channels of mutual trust and cooperation, establish long-term and stable strategic partnerships, and compete in the leading position. This is not only the key to improve the long-term operation and stability of the automobile supply chain, but also the key to create a more efficient and stable supply chain. Due to the limited ability and research level of the author, this case mainly focuses on the benefit distribution of the three-level supply chain (including suppliers, logistics suppliers and manufacturers) of the automobile supply chain, and does not further study the more complex situation of the automobile supply chain. In this paper, the research on the influencing factors of benefit distribution is preliminary, and there are many secondary influencing factors that need to be further studied.

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# Application of Artificial Intelligence and Data Analysis Technology in Risk Management of Automotive Engine Project Schedule

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**Abstract.** At present, after more than ten years of development and application, China's Internet technology has gradually become an area where many other industries urgently need cooperation. Taking the application of artificial intelligence in the automotive industry as an example, analyzing the impact of big data on intelligent travel in the information age, and improving the artificial intelligence control system in the information age will have a positive impact on my country's information traffic construction. Based on the development trend of intelligence, the application of artificial intelligence and data analysis technology in automobile engine projects is analyzed. The results show that the application of artificial intelligence and data analysis technology in risk management of automotive engine project schedule has been greatly developed.

**Keywords:** Artificial intelligence · Data analysis · Automobile engine · Risk management

## 1 Introduction

Today's China has officially entered the golden age of big data comprehensive analysis. From 2017 to 2020, for China's big data market, its scale has been growing, and it even increased by more than 30% every year. In 2016, China Academy of Information and Communications Technology investigated 1465 companies. According to its report, 59.2% of the companies have built a department dedicated to data analysis. Although 27.3% of the companies have not yet established this department, they are planning to establish a data analysis department. Only 13.5% of the companies have no such plan, the report also mentioned that considering the company's future development, most companies have fully realized the huge importance of data analysis.

The application of artificial intelligence and data analysis technology in modern life is becoming more and more extensive, which has also aroused the interest of many experts, and many teams have also conducted related research. At present, artificial intelligence technology has been effectively applied in many fields. Taking the field of vehicle feature recognition as an example, artificial intelligence technology has achieved excellent application effects [1]. Some teams analyzed the value of artificial intelligence technology in vehicle feature recognition, and explained the specific

application and development of artificial intelligence technology in vehicle feature recognition. This provides an effective reference for improving the level of vehicle feature recognition and also promotes the further development of artificial intelligence technology [2]. In the field of vibration analysis, some teams have analyzed the mechanism of vibration failure of large-scale engine gear bearings. First, analyze the various characteristic parameters of the principal vibration component signals in the time domain and frequency domain, and use the traditional principal vibration component characteristic analysis method to quickly extract these vibration characteristic parameters. Then use the bearing vibration damage signal analysis to draw the conclusion that the vibration damage of the inner ring, outer ring and rolling element surface of the rolling bearing caused the failure. In the field of battery research, some teams combine of traditional hierarchical data and the design ideas of classification and merging methods to classify and layer the fault data types according to the size of hardware damage characteristics. Then, cluster merging algorithm is used to classify and merge the hardware fault data with similar damage characteristics, and the support vector machine and regression model are used to comprehensively estimate and predict the long-term health of the vehicle power battery [3]. In the business field, a large American company found that someone was willing to re-measure the business value that the company can create at present, mainly because it has basically formed a virtuous circle of data analysis. That is to say, when a large enterprise adds more user data to the data analysis service platform, it can not only produce better data analysis research results, but also create greater business value, which can drive the enterprise to be more successful [4].

The future development trend of artificial intelligence and data analysis technology is not going to decline. This is because with the continuous and rapid growth of global data volume, data analysis technology is also improving. In addition, the comprehensive analysis of current market data through the full use of three technologies: enterprise data mining, machine learning, and enterprise artificial deep intelligence, has successfully and effectively helped the organization of enterprise marketing activities. All these different types of technology are closely linked with artificial intelligence technology, which is profoundly changing our daily learning work and lifestyle, and there are more technological changes that have yet to come [5].

In order to in-depth study and analyze the application of new technologies such as artificial intelligence and data analysis in the construction schedule and risk management of my country's automobile special engine manufacturing project, this paper has carried out tracking investigation and data analysis on the progress data, and conducted risk analysis and evaluation.

## 2 Method

### 2.1 Artificial Intelligence Will Affect More Vertical Fields

Manufacturing, services, finance, medical care, transportation, etc. have all been greatly affected by artificial intelligence. After the successful listing of autonomous driverless commercial vehicles, artificial intelligence will continue to affect more business areas

[6]. The following cases are simple application cases where industry and artificial intelligence work together: Industrial insurance-industrial artificial intelligence will help improve the insurance claim processing process through various automated procedures; pr-virtual media-industrial artificial intelligence will help fast and accurate processing Media data; various personalized virtual education and training projects provided by industrial artificial intelligence companies will help change the various interactive learning methods of real students and virtual teachers.

Uncertainty reasoning formula [7]:

$$P(A_i|B_i) = P(A_i) * P(B|A_i) \div \sum P(A_i) * P(B|A_i), i = 1, 2, \dots, n \quad (1)$$

## 2.2 Human-Computer Interaction Will Be Improved

With the development of artificial intelligence technology, human-computer interaction will be greatly improved. For example, although this machine has been used by many programmers for your voice analysis and facial recognition, with the development of artificial intelligence technology, it will also be able to automatically recognize your various emotions based on your face and voice in the future. In other words, it can perform sentiment analysis. Manufacturing companies' solutions for automated and non-customized consumer products will first enable significant improvements in human-computer interaction. The automation of the manufacturing industry mainly lies in the adoption of advanced manufacturing technologies, including equipment automation technology, robotic manufacturing technology and advanced equipment manufacturing technology, which can greatly save enterprises' human resource cost. Human-computer interaction has also been widely used in the fields of modern agriculture and biomedicine [8]. In the era of big data technology, human-computer interaction is also one of the necessary research methods to study artificial intelligence and machine learning. The famous Bayes formula [9]:

$$P(A|B) = P(B|A)P(A) \div P(B) \quad (2)$$

$P(A|B)$  can be expressed as: in a case of B, all the possibilities of A,  $P(B|A)$  can be expressed as: in a case of A, all the possibilities of B.  $P(A)$  is all the possibilities of A, and  $P(B)$  is all the possibilities of B. This formula is called the total probability function formula, which can be directly translated into a mathematical language: the total probability formula of the prior consequence = the prior probability \* the adjusted factor of the function.

## 2.3 There Will Be More and More M&A

According to CBIA data, it can be found that the market competition of artificial intelligence technology companies has begun. When these companies try to compete for more intellectual property, capital and professional talents, we may continue to see more and more company mergers and acquisitions. Now all small data companies in the field of artificial intelligence will be successfully acquired by large data companies.

The main reason is that if there is no independent data set, the artificial intelligence system will not be able to work independently. Because large data companies have large and massive data sets, they have a great competitive advantage for small data companies. The relationship between data and algorithm is complementary. Complex algorithm analysis without a large amount of data is completely useless, and vice versa. One of the core functions of an algorithm is to analyze data. It is also very important to obtain a large amount of new data. Hodlipson said: "Data is the fuel, and algorithms are the engine." The artificial intelligence algorithm tool set will become more open to increase its market share. Most companies will have the opportunity to begin to open up their smart algorithms and other smart tool sets in large numbers. So as to make it gain more market share. Market access for data and scientific algorithms will continue to decrease, and new technology applications of artificial intelligence will continue to increase [10].

M&A pricing formula: Net cash income and expenditure calculation flow = depreciation enterprise annual net cash income and expenditure calculation inflow - depreciation enterprise annual net cash income and expenditure calculation outflow = depreciation enterprise net profit.

### 3 Experiment

#### 3.1 Experimental Data Sources

Based on the engine production line construction project of Company A, this paper mainly introduces the practical application of modern project management theory and method in project development from two aspects of schedule control and risk management. Through the flexible application of project management, the complex internal resources of project organization are mobilized, and the powertrain development process is effectively combined with the lean production values of the company, which has achieved good results and ensured the implementation of the project, which has certain reference significance for similar project management. This article mainly adopts a combination of macro and micro industry analysis and statistics methods, and adopts systematic and scientific industry statistical data analysis methods, and uses a large number of charts to intuitively and fully clarify the application of new technology such as artificial intelligence and data analysis in our country's automotive industry engine manufacturing projects and risk management work, it is an indispensable reference material for auto companies and key technology companies who want to have a deep understanding of the auto industry. The market and market size are important data necessary for Chinese companies to gain a deep understanding of key industries and key services. This article in-depth analyzes the scale and prospects of domestic market demand, the development trend of prices and the actual demand of the domestic market, the introduction of relevant emerging industry policies by enterprises and relevant countries. First, this article analyzes the long-term development market environment of the entire industry in depth, gradually analyzes the economic regional structure distribution of the entire industry, the supply and demand of market resources, the status quo of the development of upstream and downstream technologies in the

industry, analyzes the future development of the entire industry's key technologies and application fields, analyzes the development trend of the comprehensive degree and competitiveness of the industry market economy, analyzes and judges the long-term investment development prospect of the whole industry and the existing market resources of the industry. It provides managers with accurate capital market analysis information and a more scientific basis for decision-making, laying a foundation for them to choose appropriate investment opportunities and for the company's strategic planning, and it also has great reference value for the bank's credit department.

### 3.2 Experimental Design

(1) Formulate risk management plan; (2) Identify risks; (3) Analyze risks and formulate countermeasures; (4) Monitoring risks.

## 4 Result

### 4.1 Machine Learning ML

For the aforementioned artificial intelligence technology, machine learning is a very good implementation method. From the most basic point of view, machine learning is to input valid data first, then use various mathematical algorithms to analyze the data, and summarize and learn the distribution of these data, and finally achieve the purpose to predict and decide in real life. The core of machine learning is data and algorithms. It uses a large amount of data to build algorithm models and learn how to use various algorithms to solve data tasks. It is similar to the "experience" and "regulation" that human beings obtain after being exposed to many things and experiences. This is very different from traditional programming that is just to solve a specific task. Although in the areas of fingerprint recognition, face detection, and machine vision, traditional machine learning algorithms have basically achieved commercialization requirements, or have reached the level of commercialization under specific situation, but until the emergence of deep learning algorithms, their commercialization can be achieved. Machine learning has been widely researched and applied in industrial applications based on data mining, computer graphics vision, natural language processing, biomedical feature image recognition, speech recognition, handwriting recognition and intelligent robots. The specific results are shown in Fig. 1.

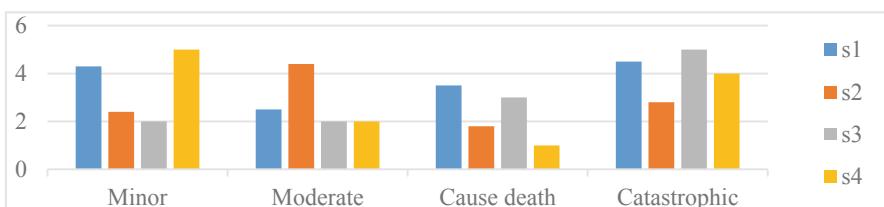


**Fig. 1.** Relationship diagram of artificial intelligence-related fields

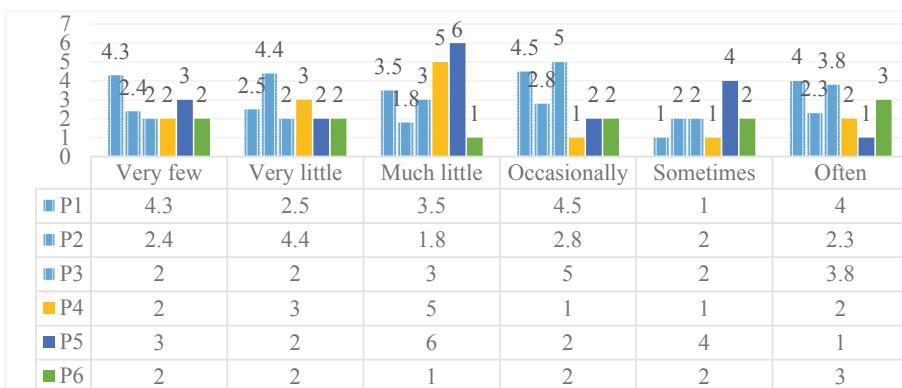
As shown in Fig. 1, although the scope of artificial intelligence is the largest, data mining is the core problem. The basis of data analysis is the input data, and its data processing method is a priori constraint. In short: data analysis is a means or algorithm for manipulating data. Its goal is to arrange, filter and process prior constraints to obtain information.

## 4.2 Risk Assessment

The production department, quality department and sales department are responsible for cooperating with technical researchers to analyze damage probability and severity of the risk. Finally, it is judged to be acceptable according to the acceptable risk standard determined by the plan. Keep evaluation records for 2 months. The following is the risk criterion of risk acceptability, in which the damage degree is qualitatively analyzed and the probability of loss is semi-quantified. The risk acceptability is represented by a bar chart, and the specific results are shown in Fig. 2, 3 and Table 1.



**Fig. 2.** Severity level of damage



**Fig. 3.** Probability levels of damage

**Table 1.** Criteria for risk assessment

	Catastr-ophic	Deadly	Moderate	Mild
Sometimes	U	U	R	R
Occasionally	U	R	R	R
Much little	R	R	R	A
Very little	A	R	A	A

A: Acceptable risk; R: Reasonably practicable risk reduction (ALARP); U: A risk that is deemed unacceptable without risk/benefit analysis.

Through risk analysis and evaluation of risks, all risks in the product should be able to be reduced to an acceptable range. When the risk is judged to be unacceptable, relevant information and literature should be collected for risk/benefit analysis. If the risk is greater than its harm, the risk is acceptable, and if the risk is greater than its benefit, the design should be abandoned. When the probability of injury cannot be estimated, a list of possible dangerous consequences should be compiled to lay the foundation for risk assessment and control. All departments of the enterprise should work together with the technical department to adopt appropriate methods to reduce the risk until it reaches a reasonable minimum level. Analyze the risk that can't be reduced until the goal that the risk cannot be reduced is achieved. If the benefit exceeds the risk, it is acceptable; if the risk exceeds the benefit, it is unacceptable.

## 5 Conclusion

Although it has been many years since the emergence of artificial intelligence technology, the artificial intelligence technology we are now familiar with is still in its infancy. Around the various applications of artificial intelligence technology, whether it is autonomous driving, virtual personal secretary, or other real-world applications that apply artificial intelligence technology, although the list of AI use cases is very long, most of them are to improve specific processes and take some time to successfully deploy AI. Artificial intelligence still has a long way to go in the future. Artificial intelligence will promote data analysis to a new golden age. Only when artificial intelligence technology is combined with data analysis technology can it truly create commercial benefits. For a company that wants or is formulating an artificial intelligence development strategy, the above sentence must be recognized. On the whole, artificial intelligence is an industry, and the realization of artificial intelligence mainly relies on machine learning algorithms. Among machine learning algorithms, deep learning is a particularly intelligent algorithm. With the development of big data technology and cloud computing technology, neural networks and deep learning have been widely used in real life. In the era of big data, the most valuable asset of an enterprise is not money but data. However, more data is not always better. A large amount of data is not necessarily valuable. For how to mine useful data and turn it into commercial value, we need to use machine learning algorithms to realize it. In the future, big data and machine learning will subvert the operation of traditional industries and drive the development of enterprises.

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# Investigation and Research on the Survival Status of Hu Opera from the Perspective of Virtual Reality Technology

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**Abstract.** As a branch of traditional Chinese opera, Hu Opera has achieved certain periodical accomplishments in its inheritance and protection. The focus of this research is that advanced science and technology brings new changes and development directions to the survival and development of Hu Opera and it also brings the intangible cultural heritage to life, and develops new ideas and methods. This is a new angle found by scientific progress, and it has a distinctive epochal character. The inheritors of Lake Opera have been cut off, and the few inheritors are no longer suitable for regular stage display as they age. The death of the old artist has already sounded the alarm for the endangerment of the drama, so the research on the survival of the lake drama is also urgent.

**Keywords:** Virtual reality technology · Intangible cultural heritage · Heritage protection

This article is a research report of the Philosophy and Social Science Planning Project in Huzhou City in 2020, Research on the Survivability of Hu Opera from the Perspective of Virtual Reality Technology (project number: 20hzghy110). Until the beginning of the last century, this kind of small drama was influenced by the development of the beach springs in the Suhu area, and combined the singing styles of local folk art and folk songs, combined with the characteristics of the local dialect, and formed a form of opera with local characteristics of Huzhou, namely “Huju Opera” [1]. The aging of the inheritors and the disconnection of the heirs are already at stake for the drama. As an endangered drama, the Hu drama has a similar background to other small domestic dramas. The protection has already achieved initial results, and the inheritance has also been valued. This type of drama not only survives in museums, but more importantly, how to return to the lives of ordinary people and increase the participation of the masses and audience coverage. This is also the core of the research of this subject, including. The primary and middle school training of inheritors of Hu Opera cannot solve the fundamental problem of the development and inheritance of Hu Opera. I hope that Hu Opera will not fall into the predicament of living only in the museum. It is necessary to cultivate audiences and expand the audience.

This paper reports from three main aspects: the basic situation of Hu Opera, the investigation of the current status of Hu Opera, and the progress of a series of research work carried out around the current situation. It also discusses the school inheritance of

Hu Opera, focusing on the new situation of Hu opera protection and inheritance under the condition of virtual reality technology.

## 1 The Basic Situation of Hu Opera Hu Opera is a Local Traditional Opera in Huzhou

Tracing back to its roots, Hu opera originated in the Daoguang and Xianfeng years of the Qing Dynasty. A small drama appeared in the fields and streets of Nanxun and Shuanglin Town in Huzhou, which mainly showed anecdotes about the production and life of local farmers. The prototype of “Huzhou Beach Spring” is also called “Huzhou Beach Spring.” The development of Huzhou Tan Spring has gone through three stages: the coexistence of small dramas, small dramas and major dramas, and the final formation of the big drama, namely the final formation of the Hu drama; the actors have only joined the male class to the actress before; the roles have also changed from the earliest “sheng, dan, ugly” “After the actress joins the three categories”, it breaks through this three-legged (corner) play model and initially moves towards the development path of the big play. In the twenty-eighth year of the Republic of China, the small opera artist Tong Junyong sang in Huzhou for one and a half years and summarized the “eighteen half-rhyme” that was later used in Hu opera singing. The vocalization has also developed from the previous seventy-two small opera tunes to the beach tune., Burning incense, etc. The repertoire has also been greatly expanded, from the small drama “Pulling the Orchid” and “Selling the Grass”, which reflects the local people’s life emotions and the love festival of young men and women, to the later development of “He Wenxiu” which integrates a variety of sister songs. “Borrowing Huangzhan” and other “Ninety-six Big Plays”. Before the liberation, Hu Opera still maintained the coexistence of major and minor dramas. After the founding of the People’s Republic of China, the Huzhou and Jiaxing districts successively established the Hu Opera Troupe to “set up the stage and sing operas.” In 2011, Hu Opera was included in the third batch of national intangible cultural heritage list, which provided a solid guarantee for the further protection and inheritance of Hu Opera at the national level and policy support.

## 2 The Status Quo of Survival

### 2.1 The Current Performance of the Lake Drama

The current situation of Hu Opera Hu opera performances generally only have one or two small programs organized by the cultural center to send literature and art to the countryside. The frequently performed repertoire is “Eating Vegetables in the Morning-Eating Snails”, etc. It is difficult to organize large-scale Hu opera performances. The main reason is: on the one hand, due to the lack of actors; on the other hand, there is currently no fixed theater for Hu Opera. The performances are mostly small stages in towns and villages, gatherings and other simple venues, which restricts the form of performance, most of which are Small fragments, which make the singing and content of the performance very limited. At the same time, there are very few creators of Hu

Opera and lack of scripts that keep pace with the times. It is difficult for the theme to resonate and interest in the lives of the people now; traditional dramas are limited to venues and props. The requirements of the scene and the set cannot be expanded. In addition, most of the actors of the Hu Opera Troupe have retired or are about to retire, and the number of actors cannot be guaranteed to complete the requirements of the traditional drama. Although this is also a common phenomenon in endangered dramas, it is like a lake. The crux of regional folk operas like dramas is more prominent.

## 2.2 The Current Status of the Inheritance of Hu Opera

- (1) The inheritance of Hu Opera is carried out around the inheritance and protection of Hu Opera in elementary schools, middle schools and universities in the education system. Primary schools include Aishan Elementary School, Tangdian Elementary School, Bennan Middle School and so on. For example, Tangdian [2]. Primary School in Wuxing District, as the provincial inheritance base of Hu Opera, has been serving as the provincial base for the inheritance of Shanghai Opera since 2007. The inheritance of Hu Opera has been implemented as the school's characteristics. It is quite distinctive in the art teaching of primary and secondary schools in Huzhou. In the daily teaching and the construction of campus culture, the integration of the characteristics of Hu Opera is the first implementation; the Hu Opera club invites the team of the inheritor of Hu Opera, Mr. Xinxingfa, Mr. Xiao Mingfang, Mr. Feng Xuenan, and Mr. Gao Yundi to complete daily training. As a routine, it has been adhered to for more than ten years. The textbook plays, school songs, and inter-class exercises on the theme of Hu Opera have all subtly cultivated children's attention and interest in intangible cultural heritage [3].
- (2) The Art and Design School recruited a Hu opera class in 2018 to try to train full-time performers for Hu opera. This group of students offered basic opera courses and Hu opera performance-related courses in the school, and signed a targeted employment agreement with the Huzhou Culture, Broadcasting and New Bureau. A new exploration of the training of Hu Opera actors. However, this model only has one class of students. The reason is that the author believes that it is affected by multiple factors. The first is the lack of coherence of government policies, and the second is that the model has found many difficulties in actual operation. The problem to be solved, such as the uneven quality of the students, among the twelve students, after nearly two years of training, only a few actors are capable of performing. There is a certain gap with the original intention of training. The growth of opera actors is extremely difficult, and it is necessary to learn from children. I started training without changing my voice. As the saying goes, "One minute on stage, ten years of work under stage" Huzhou Normal University promotes the popularization of Hu Opera in the form of a student club theater. The Hu Opera inheritor of the Cultural Center, Teacher Chen Wei, is responsible for professional guidance and inheritance. At work, the student clubs perform opera singing and performances at a fixed time and place every week, perform on the stage of school club performances and major festival performances, and often show and share operas including Hu opera to students, and follow The performance team

of Huzhou Cultural Center performed cultural performances in the countryside. It is difficult for the theme to resonate and interest in the lives of the people now; traditional dramas are limited to venues and props. The requirements of the scene and the set cannot be expanded. In addition, most of the actors of the Hu Opera Troupe have retired or are about to retire, and the number of actors cannot be guaranteed to complete the requirements of the traditional drama. Although this is also a common phenomenon in endangered dramas, it is like a lake. The crux of regional folk operas like dramas is more prominent.

### 3 Research on the Survival of Hu Drama Research on Hu Opera

Following the successful declaration of the second batch of intangible cultural heritage in Zhejiang Province in 2007, “Hu Opera” was selected as the third batch of national intangible cultural heritage list in 2011, which included Hu Opera artists and opera researchers, A lot of hard work by non-heritage researchers has attracted more opera music researchers to study Hu opera. Some of the existing researches are for the development history and process of Hu opera, as well as Hu opera and Huzhou local folk songs and folk art. There are some books and literature on the relationship between the operas in or nearby, the compilation of the music scores of the traditional plays of the Hu opera, and the suggestions for the protection and inheritance of the Hu opera.

#### 3.1 Analysis of Virtual Reality Technology

- (1) At present, the application of virtual reality technology in the protection of operas and the more significant achievements has been made. Virtual reality (VR) is a simulation technology in the computer field that has been developed comprehensively from multiple sciences and technologies, including comprehensive applications in various disciplines such as mechanics, mathematics, optics, and mechanism kinematics [4]. The earliest application of virtual reality technology was mainly in the field of game experience and aerospace, and later extended to product development and military training. With the continuous improvement of technology, its application range has gradually expanded. At present, the application range of virtual reality technology basically covers military, medicine, psychology, education, scientific research, business, film and television, entertainment, manufacturing, engineering training, etc.
- (2) The feasibility of applying virtual reality technology to the protection and inheritance of Hu OperasResearch on the application of virtual technology as a new technology to endangered intangible cultural heritage has been carried out extensively at home and abroad, and the depth of research has been continuously strengthened. There are also many results of research that have achieved good results in practical application and transformation; and A consensus has been formed in related fields that the technology will play a huge role in the inheritance and protection of intangible culture, and virtual technology can also provide more

interest and attention to the development of intangible cultural heritage; the state has paid more attention to some traditional operas. Operas such as Peking Opera, Yue Opera, Henan Opera, etc. have all carried out theoretical research and data experiments in the application of virtual technology. In May 2017, the famous Peking Opera virtual reality experiment was conducted in Beijing. Traditional plays were selected and the well-known Congratulations, using data modeling to present the dressing room, clothing room, and backstage in the form of data in a specific device. With the help of the wearable device, the audience can experience the audiovisual experience that is different from watching in the theater, which is more vivid and realistic. On the scene, the experiment obtained feedback in the form of questionnaires, and the satisfaction reached 90%. This is a milestone in the use of virtual experiment technology in Xiqu, and it will provide new ideas for the protection and inheritance of Xiqu [5].

### 3.2 Combination of Virtual Technology and Hu Drama

- (1) Gameplay of the subject with the help of the characteristic of simulation immersion of virtual technology, design the simulation game project of Hu drama. The simulation immersion of virtual technology in the game is a relatively mature application, which is widely used in many games. There are many games in common CS and other games. Scene switching can use virtual technology to reproduce the humanistic environment of the scenes involved in the Hu show, such as how to choose suitable props for the Hu show in the game, and feel the characteristics of different props through wearable devices; it can also be designed with different content of the show Different scenes, with the interest of the game to cultivate the audience's interest in Hu Opera [6].
- (2) The old artists of the Hu opera are all old and some are no longer able to perform the whole scene or the complete repertoire of the Hu opera. They can only sing some small fragments or perform in the mode of small village dramas. As time goes by, the old Hu operas on the stage Artists will slowly fade out of the stage. The digital record of Hu dramas has been basically completed. Most of the Hu dramas and existing concerts have been saved in the form of data. This is achieved by the work of artists and the government to actively protect and promote. Valuable results can be used for virtual digital recording with the help of virtual equipment, which facilitates the viewing of the audience and the learning of the students in the inheritance, and more intuitive and accurate observation of the gestures, eyes and performances of the actors is conducive to the imitation learning of the students.
- (3) Appreciation of drama the use of virtual equipment will make the virtual simulation of the stage background more convenient and faster. It is no longer dependent on the closing and transformation of the big screen, and the technology of artificially going up and down the stage has become more popular in other forms of performance. Digital the design can make the stage background more gorgeous and lifelike, and the conversion is very convenient. It can also be economical by attaching to the Internet database. The advancement of virtual technology over 3D

technology is the increase of space gravity, making the simulation effect more realistic; The viewing place is not limited to the traditional theater. It can be watched at home, school, and any place. It can be realized by only wearing the device; in the teaching, different scene modes can be set for teaching exercises, so that students can be more involved in the practice of performance, Not affected by the teaching environment.

- (4) Posture is the most basic training for opera actors. Traditional Chinese opera training methods have always been taught by masters, that is, demonstration, demonstration, imitation, and correction to achieve the purpose of training. This method has existed in China for hundreds of years and is also an opera. The main training method, these basic trainings consume a lot of time for teachers. Jacky CP Chan of City University of Hong Kong and Ryerson University of the United States have respectively developed virtual simulation ballet dance learning systems. This system uses virtual equipment to capture bone movement data in real time and conduct information feedback, instruction execution and performance evaluation through the CAVE sphere. In the virtual environment, you can observe the trajectory of gestures and the spatial trajectory of motion, and you can use equipment to reshape [7] the action. If there is a deviation, the system will prompt the trajectory.

### 3.3 Provide Scientific Support for the Reform of Lake Drama Research

- (1) The immersive interface of the system enables students to examine the performance of virtual actors from multiple angles, each angle provides a unique perspective and spatial background, prompting students to enter different scenes and changes in their roles. This provides the possibility for the realization of stage participation. Virtual equipment will bring new space to both actors and audiences. Both parties can understand the changes of emotions more realistically. The performance and emotions of actors will make their desire to perform more intense, and they can also get timely feedback from the audience. Emotions; the audience can also have a more intuitive expression of the actor's emotions; it is no longer a flat display of the audience or showing the actor, it can be rotated 360° through the device, and the actor can be viewed from multiple angles, and the audience can even be on the stage Become one of the actors' perspective to participate in the performance, which is unmatched by the role of traditional actors and audiences [8].
- (2) Provide strong support for scientific research on the reform of Hu Opera The most special application of virtual technology in the field of education is the test of learning attention, that is, the student's staying state in a certain angle or a teacher's language can be analyzed through the device to analyze the changes in their attention and interest. Reversely improve the teaching content and teaching methods. In the Hu Opera, we can also learn from the analysis of the attention degree to find out which performances the audience stayed for a long time or did not pay attention to, and find out the part that the audience is interested in and the

part that has not been paid attention to. Perform analysis and comparison, and propose changes to the performance and script.

- (3) American scientists G. Burdea and P. Coiffet put forward in the book “Virtual Reality Technology”, “Virtual reality technology” has the following three important characteristics, namely Immersion, Interaction and Imagination. Often referred to as the three characteristics of virtual reality. For opera art itself, the characteristics of virtual reality technology and its ability to produce natural adaptability, the immersion in virtual reality technology can enhance the audience’s experience when enjoying opera performances. The kind of immersive feeling produced; the interactivity of virtual reality technology will make the interaction between actors and the audience more possible and convenient, making the mood of watching movies and the immersive touch more real.
- (4) You can also score and evaluate the completion of the action, and simulate dance. The learning system has played a huge role in the breakthrough of dance teaching, and it has also received good training results. It is a successful attempt of virtual reality technology; dance and opera are both performing arts and have a great relationship with movement training. In 2018, Ye Mingsheng from Anhui University conducted a tentative study on the simulation system to train Huangmei opera figure, and achieved initial results [9]. He has used highly immersive VR technology to develop a training system suitable for opera figure teachers and beginners. In summary, virtual technology can also bring new perspectives to the teaching of Hu Opera with the help of wearable devices [10].

The primary and middle school training of inheritors of Hu Opera cannot solve the fundamental problem of the development and inheritance of Hu Opera. I hope that Hu Opera will not fall into the predicament of living only in the museum. It is necessary to cultivate audiences and expand the audience. First, we must re-establish a professional Hu Opera troupe. The role of the theater is not only the simple function of cultivating several actors, but also the function of researching and protecting publicity. At the same time, there are a large number of teams of stage art, band, songwriting, director, and actors to support the development of a drama. The role of development; second, it is necessary to use advanced technological development such as virtual simulation technology to study and protect Hu operas, provide better conditions for the survival of Hu operas, establish professional fixed performance venues, fixed opera theaters and performance times. Using media to broadcast regularly and regularly, with the help of publicity tools such as TV, radio, WeChat, mini programs, etc., to expand the publicity. Looking at the Shao Opera, Yong Opera, and Wu Opera in the province, they have successfully stepped out of the endangered types of operas and are active on the stage again. Their valuable experience hope that advanced science and technology will inject fresh blood into the development of Hu drama.

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# A CiteSpace Analysis of the Hot Topics and Frontier Research of Toni Morrison

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**Abstract.** Toni Morison is one of the brightest stars among the contemporary black American literary world. Many scholars show interest in the text of her novels. By employing Citespace, a scientometric method, this paper analyzes the 2132 Morrison-related papers included in China National Knowledge Infrastructure (CNKI) between 2009–2019. Based on CiteSpace visual analysis, this paper discusses the hot topics and frontier research (2009–2019) on Morrison research. Through the visual atlas of the researchers, institutions, and the key words clusters map in this fields, this paper traces the development, key topics and dynamic trends on Morrison research in the past 10 years, in an attempt to facilitate researchers to deepen their understanding of Toni Morrison, provide for researchers a visual atlas about Morrison. The number of published papers of domestic Morrison research is large and the quality is at different levels; the research scope is limited and lacks systematization and integrity.

**Keywords:** Citespace visval analysis · Scientometric method · Toni Morrison · China National Knowledge Infrastructure

## 1 Introduction

Toni Morrison is a famous black woman writer and literary critic in contemporary America. With its unique writing style and rich black culture, Morrison's works have reached the pinnacle of American black literature both ideologically and aesthetically. By 2012, Morrison had published ten novels. With these works, Morrison has made great contribution to the dissemination of African American literature and culture, and at the same time, since Morrison won the Nobel Prize for Literature, a large number of research monographs and research papers related to her have emerged. For the last years, there are about 2400 research papers on Morrison and her works.

In the face of such a large number of papers, if we still employ conventional manual collection and subjective analysis, it is difficult to grasp the overall trend, which leads to one-sided and superficial research, and cannot sum up the hidden problems behind such big data. Knowledge mapping become increasing important in science and literal fields [1]. Therefore, with the help of Citespace, a new scientific metrology method, we will systematically sort out and analyze the research related to Morrison (CNKI) in the past 10 years.

By drawing the knowledge graph, co-occurrence network of hot keywords in Morrison research, it is expected to visually present the basic situation and hot trends in this research field, and help domestic researchers clarify the development context and frontier issues of Morrison research.

## 2 Data Sources and Research Method

### 2.1 Data Sources

This paper takes the full-text database of CNKI as the data source. On December 5, 2020, with the keyword “Toni Morrison”, the classified category “Philosophy and Humanities”, the search scope set to “Advanced search”, the author searched 2446 research papers. After removing extraneous options and further screening, we finally obtain 2132 valid papers. Each paper contains the author, the workplace, the name of the journal, title, keywords, year of publication and other information.

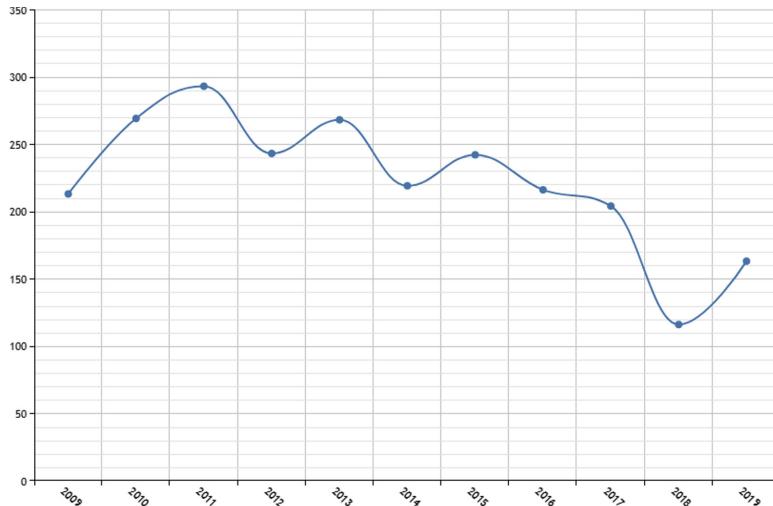
### 2.2 Research Method

This research is based on CiteSpace, a freely available Java application for visualizing and analyzing trends and patterns in scientific literature. It is designed as a tool for progressive knowledge domain visualization [2–4]. It focuses on finding critical points in the development of a field or a domain, especially intellectual turning points and pivotal points. CiteSpace provides various functions to facilitate the understanding and interpretation of network patterns and historical patterns, including identifying the fast-growth topical areas, finding citation hot spots in the land of publications, decomposing a network into clusters, automatic labeling clusters with terms from citing articles, geospatial patterns of collaboration, and unique areas of international collaboration. CiteSpace supports structural and temporal analyses of a variety of networks derived from scientific publications, including collaboration networks, author co-citation networks, and document co-citation networks [5–7]. It also supports networks of hybrid node types such as terms, institutions, countries, keywords, sources and hybrid link types such as co-citation, co-occurrence, and directed citing links.

In this study, we use the “Export/reference” tool of CNKI to format 2132 documents in Refworks document type format. When downloading, name the export document as the “Download txt.” document in the format required by CiteSpace, and then starts CiteSpace V (Version 5.7. R2) data conversion function “Data (Import/Export)”, converts the data of the exported document and saves the converted data. Finally, the key words of 2132 papers are analyzed by using CiteSpaceV, and the research of Toni Morrison between 2009 and 2019 is drawn. The annual word frequency distribution map, keyword co-word network cluster map, keyword surge list, keyword cluster network and the time zone map are processed, analyzing hot changes, research trends and development frontiers of Morrison research [8–10].

### 3 Data Processing and Analysis

#### 3.1 Time Distribution of Research Papers



**Fig. 1.** Statistics of the number of articles published with “Toni Morrison” as subject word in CNKI (2009–2019)

Figure 1 is the overall statistics of research papers related to Toni Morrison between 2009–2019, using “Toni Morrison” as subject word, and the search scope is set to “Journal”. Finally, a total of 2446 research papers are sorted out. After filtering out irrelevant ones, 2132 papers are obtained.

As shown by Fig. 1, from 2009 to 2011, research papers about Morrison are about 770, and it reached its peak in 2011, with the a number of 290 research articles. Between 2012 to 2015, the research on Morrison entered into a peaceful development period, with an average of 240 article each year. Since 2016, the research on Morrison shows a downward trend; we can see a sharp decrease in the research on Morrison, with only 116 in 2018; however, in 2019, with the death of Morrison, Morrison research is on the increase.

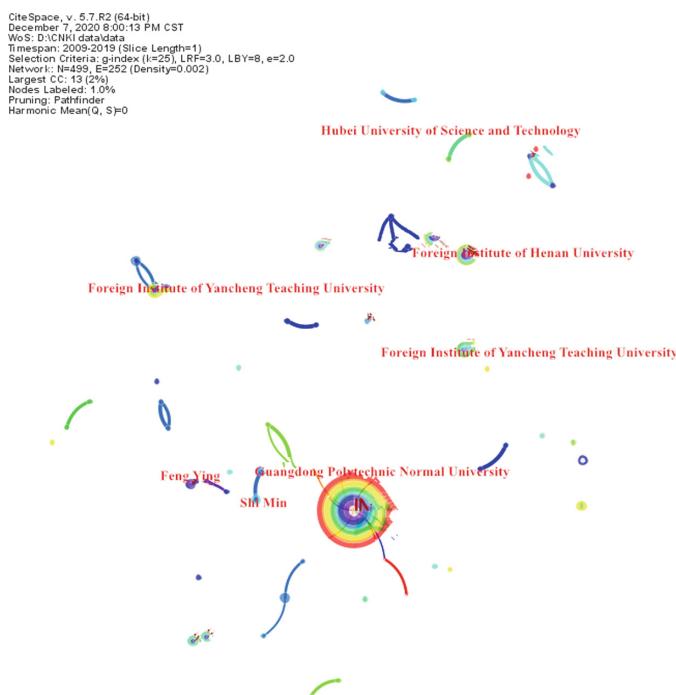
#### 3.2 High-Yielding Authors and Institution Distribution

The Node type is set to the “Author” and “Institution”, time slicing is set between 2009–2019, the time slice is set 1 year, select top 50 levels of most cited or occurred items from each slice, and thus 406 nodes and 225 links are obtained by running CiteSpace. The circle (that is, node) in the picture represents the author and research institution. The size of the represents the number of papers published by the scholar or

institution: the more the number, the larger the node. The link between authors shows the relation among authors and also the relation between authors and institutions.

The author draws the map of major authors and institutions (see Fig. 2) with the help of CiteSpace visual atlas software. As shown in the map, for the last 10 years, Feng Ying of Xianning College (now Hubei University of Science and Technology) has published 13 papers, followed by Song Yinmiao of Lianyungang Normal College) with a total of 12, and Shi Min of Guangdong Polytechnic Normal University ranks 3 with 11 papers. As for the institutions, in the past 10 years, Foreign Institute of Henan University studies Morrison most, followed by the Foreign Institute of Yancheng Teaching University, Foreign Institute of Liaoning Normal University, etc.

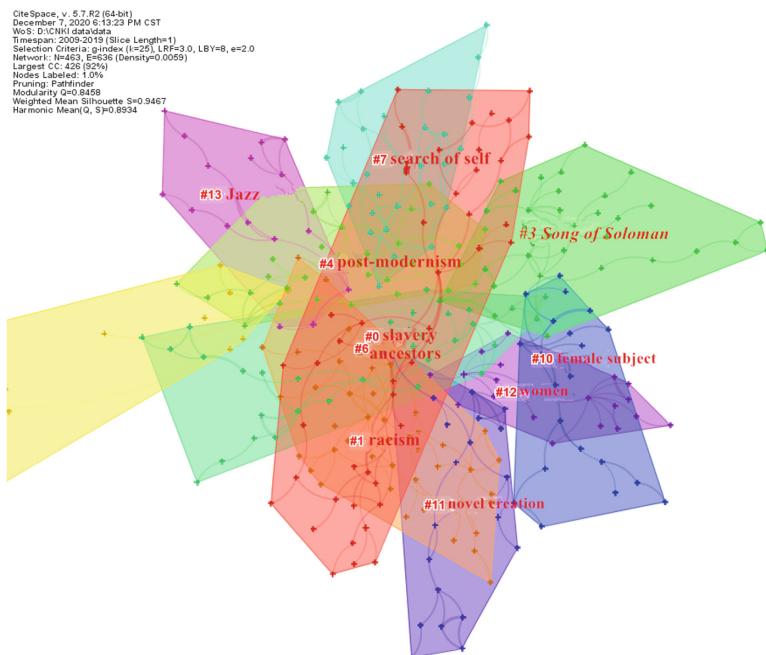
It is obvious from the network that the author is relatively fragmented, and there are only a few connections between the author nodes, which shows that there is less cooperation between the authors in this research field, only two people are in cooperation with each other on this field. Most of the authors are doing independent research. In the aspect of cross-Institution research, the research institutions are scattered, with only 10 links; there is no obvious clustering, only a few institutions have cooperation.



**Fig. 2.** Major authors and their institutions map

### 3.3 Research Hotspot

Figure 4 is a knowledge graph of keywords with high frequency on the research of Morrison based on CiteSpace. The keywords are the refinement and generalization of the core content of the article, which reflects the research value and direction of the article; the high frequency of keywords in a certain field reflects the research trend in this field. The keyword clustering knowledge graph (see Fig. 3) is generated by keyword clustering analysis of CiteSpace software. These keywords clusters reflect hot-topics of Morrison research in China, including “slavery”, “racism”, “Song of Solomon”, “post-modernism”, “search of self”, “ancestors”, “Jazz”, “novel creation”, “female subject”, “women”, etc.



**Fig. 3.** Keywords clustering network graph

Based on the above figure, we get a knowledge map of keywords network clustering by selecting LLR algorithm. The current research contents in the field of Morrison research are roughly summarized as the following six aspects:

1. “Slavery”, most scholars focuses on the slavery and black culture of black women in Morrison’s works like *Song of Solomon*, *Beloved*, *Sula*, etc. Black women, no matter where they live, are doubly marginalized because of their economic disadvantage and gender subordination. The history of black Americans is a history of enslavement and exploitation.

2. “Racism”, For a long time, the black race has been placed on the edge of all kinds of power discourse. in addition to political exclusion, economic exploitation and other injustices, they have also suffered from the mental damage caused by racial discrimination, which alienates the black people from their healthy and complete self and becomes an inhuman being without autonomy.
3. “Song of Soloman” “The Bluest Eyes” “Tar Baby” “Sula” “A Mercy” etc., are novels of frequent analysis. Most researchers focuses on the culture hegemony, tragedy of the black community, female identity, deconstruction and reconstruction of self identity in Morrison’s novels.
4. “Postmodernism” is often used to analyze Morrison’s works. Through the analysis of narrative strategies, researchers find that the black women dare to express their female desire, gradually developed their own leadership skills and action guides, combining the attempt of self-casting with the efforts to awaken national consciousness and establish their culture identity, which contributed to the reconstruction of the national identity of black female subjects.
5. “Ancestors” and “tradition” are the source of blacks in Morrison’s novels. The main reason for the lack of female subject of black females in Morrison’s works lies in the invasion of white culture and the loss of traditional aesthetics of African Americans.
6. “Female subject” and “female consciousness”: Black women have been influenced and eroded by American white hegemonic culture for a long time, they have formed distorted values, aesthetic “alienation” and lost their dominant position of women. Morrison always concerned about the existence of the subjectivity of black women, trying to show the erosion and infection of white mainstream culture and the lack of subjectivity of black women under the traditional patriarchal system, focusing on the exploration and reshaping efforts after awaken.

### 3.4 Research Trends

In order to make a thorough analysis of the research trends of Morrison research in China, it is necessary to investigate the research trends in this field. With Citespace, we can extract burst terms from the title, abstract, key words, descriptors and references by using mutation detection algorithm. With the help of CiteSpace software, the author sorts out the top 10 keywords with strongest citation bursts. (See Fig. 4). From the figure, it is shown that between 2013–2016, the research trends on Morrison focuses on identity and black culture; between 2015–2019, the research trends on Morrison focuses on redemption, ecological feminism, feminism and trauma, and the novel *Home, A Mercy* attracts much attention.

## Top 10 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2009 - 2019
symbolism	2009	4.91	2011	2012	
identity	2009	5.3	2013	2015	
black culture	2009	4.55	2013	2016	
<i>The Bluest Eye</i>	2009	4.59	2014	2019	
redemption	2009	4.39	2014	2015	
ecological feminism	2009	4.11	2014	2016	
<i>Home</i>	2009	11.76	2015	2019	
Feminism	2009	7.41	2015	2017	
<i>A Mercy</i>	2009	6.91	2015	2019	
trauma	2009	10.39	2016	2019	

Fig. 4. Top 10 key words with the strongest citation bursts

## 4 Conclusions

Since the 20<sup>th</sup> century, a large number of research documents have emerged in the study of Morrison in China. The coming of big data era has given birth to the development of visualization research. Based on the visualization software CiteSpace, this paper draws the knowledge graph of Morrison research. First, judging from the current volume of research papers published (CNKI), the research on Morrison is at a stage of little fluctuation before the year of 2018. Second, from high-yield authors and institutions, there is a large gap. There is a lack of cooperation among authors and institutions. In the future, institutions should strengthen their sense of cooperation and share their experience with each other, so as to promote the progress and efficiency of Morrison research. Core authors should also strengthen their cooperation with each other. Third, based on high frequency of keywords and its network map, from the perspective of research hot topics and trends, the study of Morrison in China (2009–2019) mainly focuses on the themes of slavery, racism, post-modernism, search of self, ancestors, Jazz, novel creation, female subject, women, etc. Trauma and feminism are the major topics of concern in recent years. Through CiteSpace, a visual analysis tool, we are clear about Morrison's main research areas; domestic researchers have carried out multi-dimensional scanning and examining of Morrison's works. We look forward to more research in this area and further reveal Morrison's role in presenting her initial concern for the growth of black women and the construction of black female identity.

**Acknowledgements.** This work was supported by JJKH20200199SK. (Jilin Provincial Department of Education “13th Five-year” Social Science Project: Trauma and Identity Reconstruction of Black Women in African American Literature).

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# Development Trend of Blockchain Technology in Large-Scale Sports Events in the Information Age

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**Abstract.** With the arrival of the data era, the rapid development of Internet of Things technology, block chain technology was proposed. Blockchain has received extensive attention since its publication. Its tamper-proof, traceable, anonymous and open features have attracted more and more people's interest, and many researchers and relevant practitioners have stepped into this field. In this paper, the relevant technological concepts of blockchain are expounded, and the blockchain technology is integrated into the industrial innovation of sports events, so as to provide new ideas for the sports industry economy. This article through to our country sports industry and the scale of chain industry development, and the block distribution chain industry data statistical analysis, obtained about block chain used in the sports industry can have very good development prospects, through the study of the data transmission rate and success rate of platform test, rate can be stabilized at about 0.17 S, the success rate can be stable at more than 95%, fully meet the market demand for technology.

**Keywords:** Data era · Block chain technology · Sports industry · System test

## 1 Introduction

With the development of Internet technology, more and more attention has been paid to big data. Wealth is worth and not just money. Data is becoming a new wealth in the contemporary world. To develop the value behind the data, start sharing data among national administrations and across industries to achieve win-win results. Mining the value behind data and sharing wealth with others has become a hot topic in contemporary society. The original common method of data resource sharing is to store and provide data for use through centralized third processing. Users themselves cannot directly retrieve data for use, and there is a certain risk of data leakage. In various industries, data leakage means confidential disclosure. Therefore, in view of the serious problem of data leakage, scholars and experts began to conduct research in the direction of data storage security, hoping to meet the basic demand of data security on the basis of data communication and sharing. With the emergence of blockchain technology in the 21st century, it has features such as related decentralization and trusted accounting, which meet the requirements of both data sharing and security

protection, and provide relevant experts and scholars with new solutions for data security and sharing [1].

In the second half of the 20th century, with the development of Internet infrastructure and software and hardware, the efficiency of human communication of information has been explosively improved, bringing rapid development of various industries, and human beings have entered the information age [2]. Blockchain technology is actually a collection of distributed storage, P2P networks and secret algorithms. Bitcoin is based on blockchain technology. With the advent of smart technology, blockchain is believed to be able to establish information and improve transparency, reliability and security in a variety of practical business scenarios due to its decentralized and non-falsifiable nature. The combination of blockchain and cloud computing, artificial intelligence, Internet of Things and other fields will also bring huge development opportunities. One day in the 21st century, a group of people put forward the concept of Bitcoin, and pointed out that the blockchain technology is the basic technology to build the bitcoin system. With the popularization of Internet, sports industry has broken through the traditional single form, network management has been promoted. However, these new forms of management are facing a serious crisis of confidence. In addition, in the traditional sports field, there are still problems such as incomplete process records and opacity, etc. Blockchain technology can be used in the pharmaceutical industry and public medical management [3]. With its information traceability characteristics, drug traceability management can be realized and counterfeit drugs can be combated. Therefore, it is particularly urgent for storage technology to meet the needs of distribution. In order to change the problems of service scope and quality decline, the resources caused by decline will increase with the increase of population. By analyzing the problems faced by health educators, this paper points out that block chain technology may significantly change the future of health education and fundamentally change the interaction around safe, effective and responsible information among patients, professionals, educators and learners [3]. Blockchain technology is able to meet the basic requirements of security while opening up and sharing to all network terminals, which can be fulfilled by this technology in various forms of recording functions. The discovery and use of blockchain technology can not only bring irreplaceable convenience to social information sharing, but also pave the way for the development of centralized information processing [4]. At the same time, it also provides recognition opportunities for these industry certifications, and blockchain technology is widely accepted by all industries.

At present, the sports big data research and development and application upsurge has arrived, the existing sports data storage and use methods are facing many challenges. Platform optimization, value mining and transmission of sports big data are changing with each passing day. Big data applications and related security issues are becoming more prominent in sports events, brokerage and copyright transactions. We should use blockchain technology to innovate sports. It points out that the next step is to collect and integrate sports data and technology, which is very important for sports communication. This article is based on the era of information block chain technology development trend of exploration in large-scale sports event, through the way such as books, documents, access to relevant information about the subject, organizing analysis, next the paper expounds the relevant block chain technology and the development

trend of sports concept, through the way of questionnaire survey and data analysis to analyze the block chain technology in the development approach of application of large-scale sports events and trends.

## 2 Application of Blockchain Technology in Large-Scale Sports Events in the Information Age

### 2.1 Block Chain Technology

Distributed shared digital integration is generally suitable for the characteristics of blockchain, which is supported by cryptography and is simultaneously stored centrally in chronological order. Due to the numerous features of blockchain, the information that cannot be changed at will and the traceability of transactions, more and more enterprises, companies and institutions start to focus on the research of this technology. Blockchain is based on P2P networks. Each node in the network maintains a common ledger. The public ledger is a chain in which all data blocks (chunks) are connected in chronological order [5]. The public ledger ensures that all data is open and transparent. There is no denying it. The nodes reach a consensus on the transaction through consensus algorithm, record the transaction in the block, and ensure that the transaction will not be tampered with by cryptography. Bitcoin based on blockchain also proves that the main reason why blockchain attracts wide attention is that it has the following characteristics:

**Centralization:** The entire blockchain network is maintained by all participants and there is no third party organization. Through distributed storage and P2P network mechanism for information transmission and verification. A problem at any node does not affect the operation of the entire network.

**Detrust:** A trust-based and value-based encryption algorithm that does not require both parties to exchange data.

**Inter-sharing:** All consumers can view data on the blockchain to ensure that data is shared on the chain and facilitate data exchange between nodes.

**Trusted databases:** Each node has a complete data account. Unless most nodes can be controlled, data loss or modification from any node is insufficient to affect the data of the entire blockchain network [5].

**Traceability:** Block chain adopts a chained data structure and marks a timestamp on the block to make the data traceable [6].

### 2.2 Ether

Ethereum is the cryptocurrency of Ethereum. Users can acquire ether by mining, buying from the market or other users. Token is a cryptocurrency, which is implemented in the form of smart contract and runs on Ethereum [7]. The development of token contracts should follow a standard (e.g., ERC < 20 [52]) so that the front end (e.g., wallet) can identify token activities (e.g., token transfers) [8]. The token contract

maintains a mapping table, and each entry records a token holder (that is, an account) and the token balance that belongs to him. Unlike ether transactions, token holders transfer their tokens to another token by calling specific functions implemented in the contract. If some tokens are successfully transferred, the mapping table is updated accordingly. Token contracts should issue event notifications to inform other applications of token changes, such as wallets, trading markets, etc. Any application can know the execution result of token contract by listening for the event sent out. In addition to standard functions and standard events, the token standard also allows developers to implement nonstandard functions and nonstandard events. The ERC-20 standard defines six standard function interfaces and two standard events. For example, the declaration of the event transfer is “event transfer (address indexed\_ from, address indexed \_ to, uint256 \_ Value)” means the address\_ From will\_ Value token transferred to address\_ to. In addition, ERC < 20 requires that whenever tokens are transferred, whether standard or non-standard functions are used, the event notification should be issued [8].

### 2.3 Challenges Faced by the Application of Blockchain Technology in Sports

#### (1) Key technology challenges

The first is system management. Record all transactions of each system member, and have hundreds of millions of users ticket sales network and tens of millions of fans stars, if the transaction data is too large, there will be congestion; second, the security of sports block is affected by system design, technology update, privacy, etc. Technical and administrative adjustments are necessary to maintain application security; third, technical standards and specifications. In the blockchain system, a globally unified standard is needed to check whether each node has reached a consensus, and to screen whether the information disclosed by the company is true. At present, the lack of sports blockchain technical standards makes it difficult to ensure the quality of relevant sports services [9].

#### (2) Challenges of technology application

First, the concept of application. Although decentralization is the embodiment of blockchain innovation, decentralization is still an ideal choice. On the one hand, decentralization means that it is difficult to clarify and supervise the theme; on the other hand, in the case of token trading platform, as long as more than half of the nodes are controlled, most of the work can be completed; second, the issue of empowering the sports industry. The influence of the sports industry is far greater than the profit, coupled with the characteristics of high sports barriers, it is difficult to exchange and break through, and the fund-raising of the sports industry is even more difficult.

#### (3) Challenges faced by industrial management

The most important design and construction issue: in recent years, China has adopted a variety of policies to promote the development of blockchain technology. The State Council issued a notice on the national informatization plan. This paper introduces the importance of the development and application of block chain

technology. Moreover, some central and local self-government organizations have also published relevant policies [10].

### **3 Development Trend and Practice of Blockchain Technology in Large-scale Sports Events in the Information Age**

#### **3.1 Practical Purpose**

At present, the application of blockchain technology in sports industry is still in the early stage of exploration, and many innovative applications are still in the stage of imagination and concept. Although scholars have different expressions on the application risk of sports industry blockchain, it is mainly due to immature technology, poor supervision, poor operation and legal application. The development of all things is full of dialectics, which has both advantages and disadvantages. In the process of blockchain technology development, technology risk is inevitable. Only by recognizing this basic fact, learning to live in harmony with technical risk, and reconstructing risk rationality and technical rationality can we effectively avoid the technology application risk of sports industry blockchain. This paper mainly through the way of investigation to avoid the risk of blockchain technology in sports application.

#### **3.2 Practical Steps**

Through the actual test of sports platform related projects based on blockchain technology, including:

- (1) Data transmission speed;
- (2) Data transmission security rate.

At the same time, the distribution of China's blockchain enterprises, sports industry and the changes in the size of the blockchain industry were investigated, so as to analyze the data.

### **4 Analysis of the Development Trend of Blockchain Technology in Large-Scale Sports Events in the Information Age**

#### **4.1 Distribution of Blockchain in China**

As shown in Table 1, by the end of the survey, China's blockchain enterprises are mainly distributed in finance, supply chain, traceability, hardware, public charity, medical health, culture and entertainment, social management, copyright protection, education and other industries. The distribution numbers were 159, 77, 63, 55, 47, 44, 34, 28, 22, 14 and 129, respectively, accounting for 23.66%, 11.46%, 9.38%, 8.18%, 6.99%, 6.55%, 5.06%, 4.17%, 3.27%, 2.08%, 19.19% respectively. According to the

survey data, the application of blockchain in sports is very small, and the market development scale and development prospect are very good.

**Table 1.** Number and proportion of application and distribution fields of blockchain enterprises in China

Field	Finance	Supply chain	Traceability	Hardware	Charity	Health care	Cultural entertainment
Quantity (unit)	159	77	63	55	47	44	34
Proportion (%)	23.66	11.46	9.38	8.18	6.99	6.55	5.06
Field	Social management		Copyright protection		Education		Other
Quantity (unit)	28		22		14		129
Proportion (%)	4.17		3.27		2.08		19.19

## 4.2 Development of Sports and Blockchain Scale

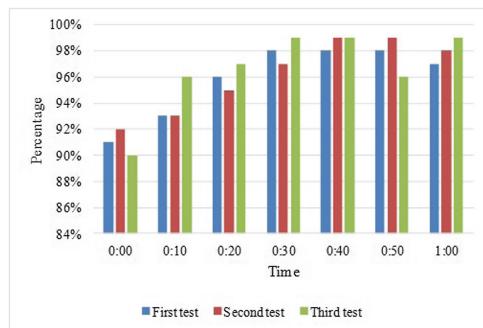
According to Table 2, China's sports industry has developed steadily in the first four years, from 1717.7 billion yuan at the beginning to 2657.9 billion yuan now, with an increase rate of more than 800 billion yuan. In the next two years, the scale of blockchain has increased by about five times, from 240 million yuan to 1 billion yuan, which is expected to be greatly improved in the next few years. This rapid growth reflects the development trend of these two industries, Blockchain can effectively provide relevant technical support for users' free trade, which means that for traditional sports, sports consumption can be more reasonable and scientific, which is conducive to the synchronous development of sports industry and blockchain technology industry.

**Table 2.** Changes in the scale of China's Sports Industry and blockchain industry

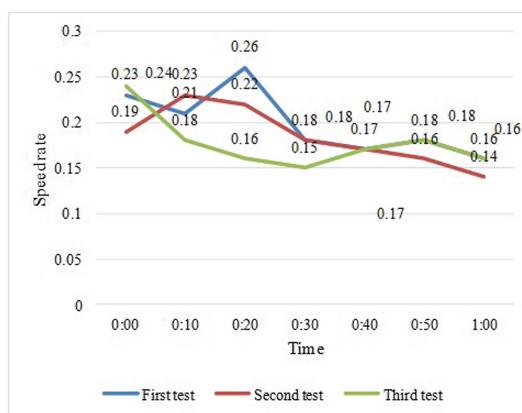
Particular year	2017	2018	2019	2020
Sports industry (100 million yuan)	17107	19011.3	21987.7	26579
Blockchain industry (100 million yuan)		1.3	2.4	10

## 4.3 Platform Data Transmission Security Rate and Rate

As shown in Fig. 1 and Fig. 2, through the actual test, the sports platform based on blockchain technology can meet the basic data transmission requirements; in terms of speed, the transmission rate tends to be stable with the increase of time. Through three tests, it is found that the rate is basically stable at about 0.17 s, meeting the basic requirement of less than 0.3 s.



**Fig. 1.** Platform transmission success rate test



**Fig. 2.** Platform data transmission rate test

## 5 Conclusion

Based on blockchain technology, a sports data value system can be established in a data decentralized manner, which is composed of different system logic and market logic. This system can solve the long-term information and data risk problem for the Chinese sports industry, and to a certain extent can contribute to the creation of a new industry that integrates blockchain technology and sports data. Only by actively promoting the combination of blockchain technology and sports industry can we better meet the high-quality development of sports industry.

**Acknowledgements.** This work was supported by Science and Technology Research Project of Hubei Provincial Department of Education. (B2019252), Wuhan Institute of Jianghan University Open Key Projects (IWHS20181004).

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# Innovative Development of Combination of Digital Media Technology and Virtual Reality Technology

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**Abstract.** The development of science and technology has brought tremendous changes to people Research and experiment of thermal water de-icing devices lives, and at the same time has brought information dissemination and media styles to a new stage. The purpose of this article is to conduct targeted research on whether the combination of digital media technology (DMT) and virtual reality technology (VRT) can be innovatively developed. This paper firstly analyzes the development of the VRT market and the application of the latest DMT in VRT, and clarifies the focus and direction of the research on the problems that need to be solved in running high-quality VRT under low energy consumption. The technology that consumes the most computing power in the operation of high-end VRT is the key to solving the problem. VRT uses many of the most popular algorithms at the moment, applying graph theory and ID3 algorithm, and uses post-pruning technology to realize the pruning of classification decision trees, generate classification rules, and complete the classification of DMT in VRT application scenarios. The experimental results show that the application analysis of innovative development research combining DMT and VRT in this article is more recognized and liked by consumers and experiencers. According to statistics, 50% of consumer experiences express their love for this.

**Keywords:** DMT · VRT · Computer efficiency

## 1 Introduction

Digital media is a part of new media, and it is a form that has emerged with the development of science and technology. It is not only interactive, but also uses network media as a communication medium. It covers film and television animation, online games, virtual reality, multimedia, digital music, video and interactive installations [1]. With the development of science and technology, the media revolution has led to the emergence of new media styles. The continuous development of digital media art has continuously updated people's real experience, and also changed people's experience [2]. Compared with the virtual space constructed by traditional media, the virtual world constructed by digital media is more emulated and more immersive [3, 4].

The definition of “virtual reality” in different fields is different. Domestic scholar Liang G believes that “virtual reality” belongs to the research scope of digital media. It focuses on people’s subjective feelings to study how people experience What kind of perceptual experience is, what kind of psychological and aesthetic experience will appear in the simulation environment in front of you [5]. In the created virtual space, people’s experience mode and participation method are what we want to discuss here [6]. Foreign scholar Yetisen AK believes that designers add artistic speaking language to the virtual environment constructed by technical design. This addition is by no means pure technical stacking, but a vivid form of experience [7, 8]. In this constructed virtual art space, how to establish the scene, how to develop the plot, and how to interact with each other are all issues that designers need to consider [9, 10].

This article hopes that when the experiencer enters the perception system constructed by digital media, people will feel as if they have entered a broader and infinite space, in this space, people can experience that they cannot feel emotional experience in the real world, and people’s bodies The organs will be more sensitive and the psychological experience will be richer. This is an artificial virtual environment created by digital technology that is derived from reality and is different from reality. It also has the interactive nature of resource sharing. In many cases, the experience mode he constructed has far exceeded our previous experience. Perceive experience in the world.

## 2 Technical Research on Innovative Development Combining DMT and VRT

### 2.1 Use of VRT

Using DMT to present the images that we want to present to the experiencer in a digital form, using different algorithms to simulate the scene and details, and using VRT to finally present it in the eyes of our experiencers.

#### (1) Logical reasoning and theorem proof

Logical reasoning is one of the most enduring sub-fields in artificial intelligence research. Among them, it is particularly important to find some ways to focus only on the relevant facts in a large database, pay attention to credible proofs, and revise these proofs when new information appears. It is indeed an intelligent task to find a proof or counter-evidence for the theorems speculated in mathematics. This requires not only the ability to deduce based on assumptions, but also some intuitive skills.

#### (2) Scene Simulation Search Algorithm

In an AND or tree, the “and” or “or” mark added to a node depends on the relationship between the node and its parent node. The tasks of the production system can be Think of it as looking for a solution graph from the start node to the end node. Roughly speaking, a solution graph from a node of an AND-OR graph to a set of nodes is similar to a path in an ordinary graph.

The recursive definition of solution graphs is defined as a solution graph from node n to a set of node N in some and or graph G. It of G. If n is an element of N, it is  $\{n_1, n_2, \dots, n_k\}$  composed of a single node n; if there is an outward connector K pointing to node, there is a solution graph from each to K, where  $I = 1, 2, \dots$ , are composed of node n, connector K, node  $\{n_1, n_2, \dots, n_k\}$  and the solution graph from each node in  $\{n_1, n_2, \dots, n_k\}$  to N, otherwise There is no solution graph from n to N.

## 2.2 Detail Calculation Algorithm

Describe the search process of an evaluation function with heuristic components, which can be designed for AND-OR graphs.  $h(n)$  is an estimate of  $h^*(n)$ , and  $h^*(n)$  is the cost of an optimal solution graph from node n to a set of end nodes. Just like search in the figure, if h satisfies a certain limit, Then the search process sentence may be simplified to impose a monotonic restriction on h, that is  $n_1, n_2, \dots, n_k$ , to impose restrictions on each connector in the implicit graph from node n to its successor. Assumptions.

$$h(n) < c + h(n_1) + \dots + h(n_k) \quad (1)$$

Where c is the cost of the connector. This restriction is similar to the monotonic restriction on heuristic functions in ordinary graphs. For the case where n is in the set of terminal nodes, if  $h(n) = 0$ , then the monotonic restriction means that h is a lower bound of  $h^*$ , that is, for all nodes n,  $h(n) < h^*(n)$ .

## 2.3 Virtual Scene Realization Algorithm

The core of ID3 algorithm is to determine an optimal splitting attribute. The information gain metric is usually used to select attributes. Select the attribute with the highest information gain as the test attribute of the current node. Before giving the specific calculation formula of information, it is necessary to clarify the two basic conditions that the formula should meet:

- (1) If there is no instance of a certain class, information = 0;
- (2) If the number of instances in each class is equal, information = 1.

Let T be a set of t samples, and the target attribute has m values, namely  $\{C_1, C_2, C_3, \dots, C_m\}$ . Let  $S_i$  be the number of samples of class  $C_i$ . Then the information entropy required when classifying a given sample is:

$$\inf o(T) = - \sum_{i=1}^m p_i \log_2(p_i) \quad (2)$$

Where  $p_i$  is the probability that any sample belongs to  $C_i$ , that is,  $s_i/t$  estimation. Under normal circumstances, the logarithmic function takes 2 as the base, and the entropy uses bits as the unit.

Let attribute X have n different values  $\{C_1, C_2, C_3, \dots, C_m\}$ . Then the information entropy divided into subsets by X is:

$$\inf o_X(T) = \sum_{i=1}^n \frac{|T_i|}{|T|} \inf o(T_i) \quad (3)$$

$\frac{|T_i|}{|T|}$  serves as the weight of the subset. The smaller the entropy, the higher the purity of the subset. Among them, the information entropy of subset  $T_i$ .

### 3 Experimental Research on the Innovative Development of the Combination of DMT and VRT

#### 3.1 Experimental Data

The research object of this article is a random sample of 200 passers-by from the society, of which 120 are male and 80 are female. Then divide them into two groups A and B. Group A is the experimental group and group B is the control group.

#### 3.2 Experimental Process

First of all, the randomly selected passers-by in this article first experience the DMT combined with VRT and then conduct a questionnaire survey, and then use the artificial intelligence big data method to obtain the 200 passers combination of DMT and VRT. The level of understanding of new technologies, so as to more truly understand the views of many people in the society on the innovative development of the combination of DMT and VRT. Then use the innovative development of the combination of DMT and VRT proposed in this article to experience the 30 field of DMT combined with VRT for group A passers-by, and use traditional DMT for group B college students under the same. Finally, conduct a questionnaire survey and compare experimental.

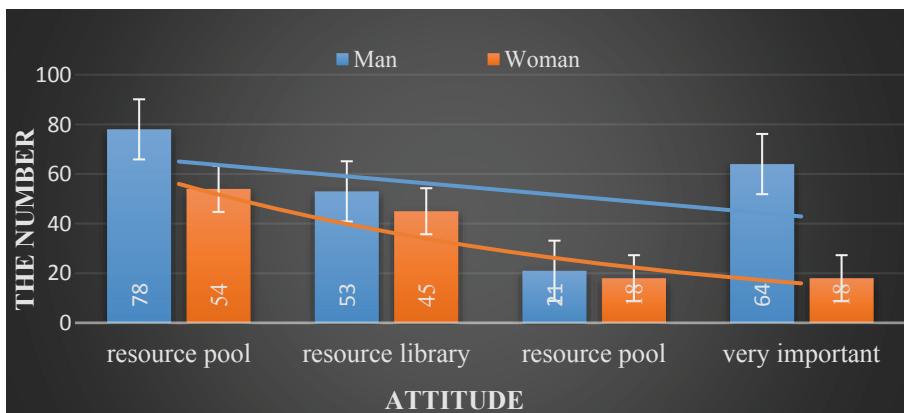
### 4 Experimental Analysis of the Innovative Development of the Combination of DMT and VRT

#### 4.1 View Analysis of Innovative DMT Combining Traditional Digital Media and VRT

This paper uses the questionnaire method to conduct a questionnaire survey on 200 randomly selected passers-by. In this way, they can gain an understanding of these people's new technologies that combine DMT and VRT, and get understanding of the general public's views on the innovative development of the combination of DMT and VRT. The purpose of the first questionnaire survey is to understand the degree of affection experienced by the innovative technology combining DMT and VRT. The second questionnaire survey is to understand the general public's perception of the traditional digital media and VRT proposed in this article. Combining the views of innovative digital media technologies. The survey results are shown in Table 1 and Fig. 1.

**Table 1.** Degree of love after experiencing and feeling innovative technology

	Understand resource pool	Used resource library	Like resource pool	Think resource pool is very important
Man	78	53	21	74
Woman	54	45	18	39

**Fig. 1.** Views on innovative DMT of VRT

It can be seen from the survey data that most of the innovative digital media combined with VRT under the new model have little knowledge, little understanding, and little contact. Therefore, only a small number of students expressed their optimism about it. On the other hand, students cannot realize the importance of innovative digital media combined with VRT under the new model to the future development of VRT. Therefore, everyone is not very fond of traditional digital media, nor is they aware of thsse importance of innovative digital media combined with VRT under the new model.

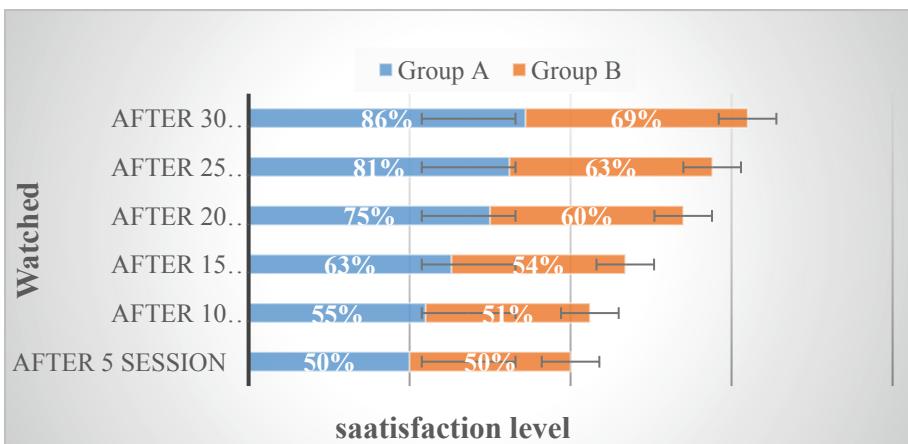
After using the DMT in the two modes to experience the impact on the experiencers, after experiencing 30 different modes of DMT in the two groups A and B, most of the college students in the A group think that this article proposes The new model of innovative development using the combination of DMT and VRT is more effective, more interesting and more comfortable for the development of digital media. However, group B students who used traditional DMT generally gave low evaluations. This is mainly because the new technology used in the innovative development of the combination of DMT and VRT proposed in this article adopts the hottest VRT today, which also makes the experience more experiential.

## 4.2 Changes in Experiencers' Preference for DMT Under Different Methods

This article allows group A college students to use a new model of innovative DMT combined with VRT to watch 30 games. Under the same conditions, let group B college students use the traditional refereeing method to perform 30 games. Watching the game. In the course of the experiment, the college students were surveyed every 5 games they watched, and the changes in their perception of the tennis match were counted. We visualized the changes in the degree of perception of different digital media technologies by the two groups of college students, A and B, and performed statistics according to the mean value. As shown in Table 2, Fig. 2.

**Table 2.** Changes in the degree of perception of DMT

Time	After 5 session	After 10 session	After 15 session	After 20 session	After 25 session	After 30 session
Group A	50%	55%	63%	75%	81%	86%
Group B	50%	51%	54%	60%	63%	69%



**Fig. 2.** Changes of college students' liking for computer learning

From the experimental results, we can see that the members of Group A who have used the innovative DMT mode combined with the VRT proposed in this article are gradually increasing their experience of digital media, and the increase rate is faster than using traditional new media. Technical group B members are faster. And the experience level of A group members is much higher than that of B group students. This proves once again that the use of innovative DMT combined with VRT proposed in this article has a positive effect on the development of digital media, and greatly promotes the innovative development of DMT and VRT. It is of great significance. The combination of DMT and VRT has an important relationship. Artificial intelligence has

powerful data processing and analysis capabilities, which can improve the experience of VRT and enable innovation in DMT. Therefore, the innovative development of the combination of DMT and VRT plays an important role in the development of DMT.

## 5 Conclusions

In the context of the application of VRT, the combined application of digital media and VRT can enrich the experience mode for audiences to feel the artistic atmosphere. While people appreciate digital media works, the change in experience mode will have more impact on people's lives. If we combine the power of digital media with VRT, this will create a new form of artistic language. DMT can better express certain emotional needs in the creative process, and can make it possible to find new strategies in this new development direction. As for the experiencer, the experiencer's perception, psychological, and aesthetic experience will also be constantly updated with the continuous changes in the way of experience. Let technology be integrated into our experience while evolving, and generate substantial emotions through technology. Of course, for the application of VRT, it is not yet perfect, and there are still many areas that need improvement. With the development of science and technology, VRT will have new breakthroughs in technology development and application skills. We need to work harder to better integrate digital media and VRT to create more and better works.

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# Application of VR Technology in Japanese Education

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**Abstract.** With the continuous development and progress of science and technology, there are many new technologies. As the most advanced technology, VR technology has attracted worldwide attention and attention from its application and development. In order to meet the needs of future development, Japanese education has begun to try to combine education with VR technology to promote the development of Japanese education industry. This paper studies the application of VR technology in the field of Japanese, using the methods of literature review and questionnaire survey, deeply studies the concept, essence and characteristics of VR technology, constructs vr virtual simulation training scene, analyzes the application of VR technology in Japanese education research, and draws a conclusion. At present, VR technology accounts for the highest proportion in the field of education, reaching 50.8%; teachers' understanding of VR technology reaches 80%, which is very helpful for the application of VR technology in Japanese education. The research has certain research significance and practical value, which can promote the reform and innovation of Japanese education methods, better improve the teaching effect and improve students' interest in learning Japanese.

**Keywords:** VR technology · Japanese education · Training simulation model · Effectiveness analysis

## 1 Introduction

As the reform of the education system continues to deepen, in order to adapt to the times, the education sector has introduced newer education technologies and concepts [1]. Among them, virtual reality technology is a kind of virtual reality technology that provides reliable technological innovation for the reform of professors. The role of support cannot be ignored [2]. According to the current application of virtual reality technology in education at home and abroad, good results have been achieved, and the possibilities and space for future development are huge. Although virtual reality technology has been developed for a long time, its impact on Japanese education is not uncommon. Therefore, the detailed discussion on the application of virtual reality technology in the Japanese education field is very important and valuable [3, 4].

Today, with the rapid development of information technology, the application of information technology in education is also playing an increasingly important role [5]. Japanese education combines virtual reality technology with educational activities and

becomes an important demonstration of modern education. Strengthen modern education, especially the establishment of software and teaching materials for Japanese and other foreign language education, expand the application of modern information technology, promote education and education reform in Japan, and cultivate better talents [6, 7].

The innovations of this article are: (1) Combining qualitative research with quantitative research, fully combining research data with practical application value, and showing the practical value of this research; (2) Combining theoretical research with empirical research, in-depth study Based on VR technology and other theoretical foundations, combined with the current actual situation of Japanese education to conduct empirical investigations.

## 2 Methods of Applying VR Technology in the Field of Japanese Education

### 2.1 VR Technology

#### (1) Overview of VR technology

Virtual reality technology not only changes from “computerization” to “humanization”, but also from the “computerized one-way information space” of the previous integrated circuits to “humanized multidimensional information space” [8], to information processing tools or environments Variety. That is a computer, experience skills (implicit knowledge) are stored in a database in digital form, and the advanced technology used is three-dimensional technology [9, 10]. The construction of virtual space requires systematic construction. Now, most of the models used by education departments teach us a cheap, publicized, and simple experimental walking method.

#### (2) The essence and special functions of VR technology

Virtual reality technology is a technology that uses computers to simulate the real world and form a simulated environment. This is a method of processing various complex information, visualization and interaction through computers. Several mainstream technologies of VR technology: 1) VRML technology, which has very strict standards and standards, covering the integration of interaction, dispersion, physics and multimedia. Wait, use 3D poly media to create virtual scenes. 2) Cult3D technology is divided into two parts: 3D materials and 3D interpretation of materials. The final result can be integrated into Html and made on the website of the 3D model. For example, the virtual model of the airplane is shown below. Observation method: Please open doors of various sizes. For ordinary browsing programs, additional input devices can be installed. 3) Flash technology is an accurate two-dimensional application form, which can simulate three-dimensional pictures through new forms and small storage capacity. Initially, the photos were taken separately. Usually about 10 sheets. You can merge, sort, and insert the captured photos into the flash, and use them as a copy plan for the animation. 4) Viewpoint technology is a powerful tool for making 3D photos with smooth interactive functions, which can truly simulate things. This special compression

form can not only compress complex three-dimensional information into small digital form, but also release information quickly.

### (3) Characteristics of VR technology

- 1) Immersion. Let the participants “really” experience that they are the protagonist, and have an immersive feeling in the simulated environment (virtual environment) supported by technology.
- 2) Interactivity. The knowledge information that the user will feel in the virtual world, through multi-dimensional information and environment interaction, and then through the data processing of the feedback system, enables the user to enter the working state of the system and autonomously control the operation of the system.
- 3) Compound perception. It is the most obvious feature of VR technology. It not only makes users immersive, but also makes users accept objective things in a variety of senses.

## 2.2 Application of VR Technology in Japanese Education Skills Training

Through the use of VR technology, help students complete various practical training tasks. Taking into account the high security of the virtual environment produced by virtual reality technology, it can provide students with re-education and ultimately achieve the designated skill training goals. For example, under the guidance of airplane piloting, a virtual environment is established. Students can conduct airplane take-off and landing training at various physical times through simulation and control without being restricted by space. Please practice until you can get it. Let students master the techniques and skills related to the actual situation. Considering that military education equipment is relatively expensive, the use of virtual reality technology can solve this problem and ensure a certain degree of security. The practical value is self-evident. At the same time, it also plays a specific role in clinical education, maintenance and testing of electronic equipment, operation education, virtual reality technology and other educational fields. Especially through the control training of the virtual system, repeated exercises, learning related sports and training, to help students slowly master. Virtual reality technology plays an important role in the training of educational skills, and it is possible for students to make rapid progress and improvement in a short period of time.

## 3 Application Experiment of VR Technology in the Field of Japanese Education

### 3.1 Construction of VR Virtual Simulation Training System Framework

In order to research and develop virtual simulation equipment training equipment, it is necessary not only to establish virtual education and equipment fields, but also to establish the internal logic of multi-professional equipment simulation so as to be able to disperse and adjust “projects” in the network and also need to be installed. In other words, the design of the virtual training system needs to be based on the simulation of

the equipment operation training system, such as the physical simulation of the scene and the object and the mathematical simulation of the object. The corresponding simulation models are physical models and mathematical models. The quality of the physical model directly affects the realization of the virtual scene, and the accuracy of the mathematical model directly affects the effect and quality training of the virtual scene. In order to simulate the shape of training scenes and weapons and equipment as realistically as possible, 3D modeling and performance techniques must be used in image modeling. Establish a mathematical model based on the control relationship between weapons and equipment. The connections between different devices are different, but the mathematical modeling process is basically the same. The key to designing a virtual simulation system is to combine mathematical models and physical models through appropriate technical means to achieve the results that can be felt by the virtual simulation of the virtual simulation system. In the education process in Japan, users can enter the virtual space and have real-time conversations with people and objects in the virtual environment. Using special optical, audio, and touch devices, various objects in the virtual environment can be recognized and operated to achieve physical states. This exciting result has created a good Japanese conversation atmosphere and played a role in daily Japanese communication.

The goal of the virtual simulation education system is to provide students with a self-learning platform, accept operating instructions through computers or the Internet, implement simulated operations, and evaluate skills based on voice, test standby and other processes and operating results to enable them to implement value. At the same time, this system can help maintain, manage and monitor teachers, and provide timely guidance to students. The virtual simulation education system is composed of server, client, client and information database. The information database stores information such as education projects, training guidance, simulation, and skill evaluation.

### 3.2 VR Virtual Training Simulation System Scenario

The physical model is an important part of the simulation system. The creator can directly create object modeling. In the modeling process, the use of fabrics and materials can improve reliability. The details, especially for the simulation system, the details of the solid-state model that are particularly important are very important. If you want to run quickly, you need to reduce the number of physical people. You can use texture mapping. For systems with high-visibility application requirements, there is a flexible way to use other software to make complex models, add lights, and finally run them. If this performance is used as the texture of the model, the visual effect will be better. The degree of freedom node that verifies the degree of freedom model can also verify objects in the environment. To control the movement or rotation of objects in the scene, you must first adjust the corresponding degrees of freedom nodes according to the model. The moving range and direction of each movable part need to be determined by DOF attribute setting. In Creator, the degree of freedom can be set by any moving objects in the model. Related variables such as displacement and rotation and expansion can be used to control the degree of freedom of the node through the simulation program. For example, the control panel has 4 degrees of freedom knobs, including two motion axes, steering fingers and control rods. The degrees of freedom belonging to

rotation are the steering wheel and the control rod, and the degrees of freedom belonging to translation are 2 motion axes. Virtual training can be performed to enhance the actual function of training. The virtual simulation system designed in this white paper simulates actions under specific conditions, helps users get used to performance characteristics as soon as possible in actual use, and plays a good role in education and training.

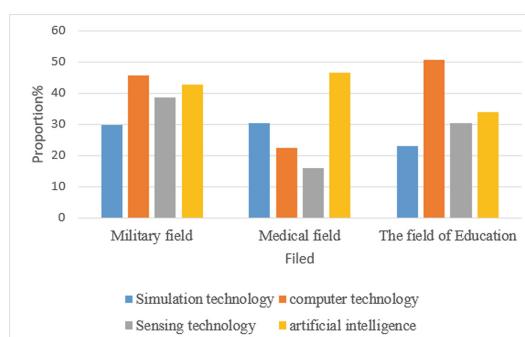
## 4 Application Analysis of VR Technology in the Field of Japanese Education

### 4.1 Coverage Rate of Application Areas of VR Technology

Virtual reality technology is a comprehensive emerging technology, covering many technologies such as simulation technology, computer technology, sensing technology, artificial intelligence, etc., which can generate a specific range of virtual environment integrating realistic vision, hearing, and touch. Has been applied to many fields such as military, medicine, education, etc. It is one of the most creative and important disciplines in the new century. Table 1 shows the application of VR technology in multiple fields.

**Table 1.** The application of VR technology in many fields

	Simulation technology	Computer technology	Sensing technology	Artificial intelligence
Military field	29.8	45.6	38.6	42.7
Medical field	30.3	22.4	15.9	46.7
The field of education	23.2	50.8	30.5	33.8



**Fig. 1.** Shows the application of VR technology in many fields

It can be seen from Table 1 and Fig. 1 that VR technology has a wide range of applications in the military, medical and education fields, especially the application of computer technology in the field of education accounts for as high as 50.8%. The research in the field of education in this article Specifically refers to research in the field of Japanese education. This shows that there are more cases of using computer technology in Japanese education. Because of the development of multimedia technology, teachers are more inclined to use multimedia in class, which is more conducive to improving teaching effects. Except for sensing technology, which accounts for 15.9% in the medical field, other technologies account for more than 20% in any industry. This shows that the application of VR technology in our country needs to be strengthened and expanded to improve the overall VR technology in our country Utilization rate and expansion of coverage.

#### 4.2 Application Analysis of VR Technology in Japanese Education

The application of VR technology in Japanese education is mainly reflected in the following aspects: the application of distance education, the construction of a virtual campus, and a virtual dialogue and communication environment. This article uses a questionnaire survey to investigate a certain university, mainly collecting students and teachers' application of VR technology in Japanese education, including which aspects of VR technology are hoped to be used in Japanese education, and the current VR technology.

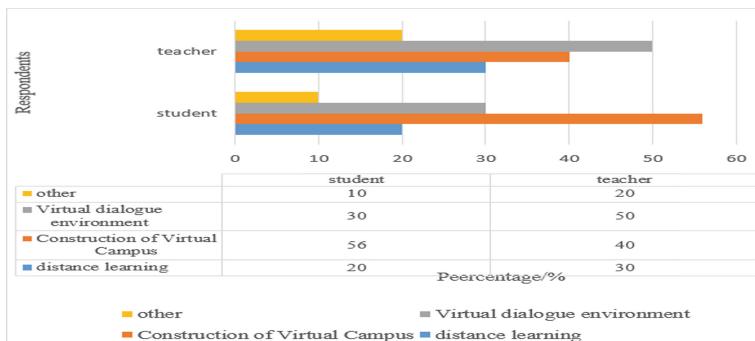
**Table 2.** Understanding of VR technology

Understanding of VR technology	Do not understand	General understanding	Very well
Student	40	20	40
Teacher	20	60	20

It can be seen from the data in Table 2 that the overall level of understanding of VR technology in this school is not high, especially in the fact that only 20% of teachers have a good understanding of VR technology, which is far lower than the level of students' understanding of VR technology. 40%, the reason may be because students are more curious and inquiring about high technology. However, 40% of the students do not understand VR technology. This may be due to heavy academic work and less knowledge acquired outside of class. Therefore, we should improve the crowd's understanding of VR technology and increase the publicity of VR technology, expand the application of VR technology.

**Table 3.** The specific application of VR technology in Japanese Education

	Distance learning	Construction of virtual campus	Virtual dialogue environment	Other
Student	20	56	30	10
Teacher	30	40	50	20

**Fig. 2.** The specific application of VR technology in Japanese Education

It can be seen from Table 3 and Fig. 2 that in the survey of teachers and students, students prefer to build virtual reality campuses, accounting for 56%. This shows that students are more willing to accept Japanese teaching simulation environment in Japanese education, and also I am more curious about the virtual dialogue communication mode in Japanese education. In the research and investigation, teachers are more inclined to construct simulated Japanese dialogues, hoping that students can communicate in Japanese through virtual dialogues, and cultivate a daily Japanese dialogue environment for students, which is more conducive to enhancing the teaching effect of Japanese.

## 5 Conclusion

This article mainly studies the application of VR technology in Japanese education. First, we use the literature method to study the related applications of VR technology in depth, and briefly describe the essence and characteristics of VR technology, and then establish VR in Japanese education Virtual training simulation system scenario. It analyzes the current application of VR technology in various fields, the advantages and disadvantages of VR technology in the field of Japanese education, and the implementation of VR technology that can be added to the Japanese teaching process. There are still shortcomings in this article. First, VR technology is still in the development stage in our country, and there are still shortcomings of immature technology and uncertain technical standards; second, VR technology has a lot of research in the field of education, but in Japanese education The actual application situation is still less, and

there are certain challenges. However, the combination of VR technology and the field of Japanese education, on the one hand, contributes to the sustainable development of VR technology, on the other hand, it will also promote the reform and innovation of Japanese education methods, which is of great significance.

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# Blockchain Technology in Inclusive Finance Under the Background of Big Data

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**Abstract.** Big data finance is prone to cause information asymmetry, which enables it to achieve a better integration with blockchain technology. This research mainly discusses the application of blockchain technology in inclusive finance under the background of big data. First, according to the customer's risk and value, transaction behavior characteristics and preferences, etc., the advanced database system and big data mining and analysis technology are used to make full use of the customer information they have. Then use social network technology and big data technology to realize online collection of customer information and timely processing of transaction data. Finally, in terms of resource allocation, in the GSP financial model based on blockchain technology, the relevant information of the supply and demand parties of funds is directly published on the network and matched by themselves, and the supply and demand parties of funds directly communicate and trade. It can be seen from the comparison of the average value of risk changes after using blockchain technology in the big data scenario: credit risk and operational risk are both lower than 2.5, and these two risks are considered to be overall risk reduction. This research provides active guidance for further improving the inclusive financial service system.

**Keywords:** Big data · Blockchain technology · Inclusive finance · Credit risk

## 1 Introduction

The security of asset securitization in blockchain technology can be automatically performed, which can not only effectively resolve the risk of default, but also eliminate redundant links, reduce manual operations, and achieve the purpose of reducing costs. The traceability of information in the blockchain technology enables asset information in the asset securitization business to be traceable and viewable in real time, as well as real-time monitoring, which facilitates penetrating supervision and prevents financial risks. Specifically, asset securitization based on blockchain technology.

Since blockchain technology has both decentralization and information sharing, and at the same time immutability and traceability, fast training technology can effectively alleviate the problem of information asymmetry and credit mechanism in all links of big data. [1, 2]. It can play a certain role in the bank's pain point management problem, which makes the "blockchain technology + big data finance" model possible [3, 4]. Big data covers not only the multi-layer structure relationship, but also the multi-

layer sales relationship, which reduces the risk and cost of credit collaboration among commercial banks, core enterprises, and small and medium-sized enterprises at the upstream and downstream ends [5, 6]. At the same time, commercial banks, core enterprises, and small and medium-sized enterprises at the upstream and downstream ends can use the same decentralized blockchain big data financial system to share all information [7, 8]. And use the smart contract technology in blockchain technology to make automatic payments under pre-set time and conditions, so that big data finance uses blockchain technology to greatly reduce possible errors in manual transactions and reduce costs. At the same time, the efficiency is greatly improved [9, 10].

As a new type of underlying technology born under the background of the Internet era, in view of the development potential of blockchain technology, plus the development and widespread use of blockchain technology, it should be realized through a series of specialized features. Large financial institutions have established dedicated blockchain laboratories for long-term research.

## 2 Application in Inclusive Finance

### 2.1 Finance Under Big Data

Determine the parameter  $a$  by regression identification or DEA method, and set the macroscopic effect function of the  $q$ -level system:

$$H_q(X, t) = \int_0^T e^{-rt} [a_1 p_E + a_2 p_E + a_3 p_0] F dt \quad (1)$$

Among them,  $w_{www}$  is the bank interest rate, which mainly considers the time value of resource allocation.  $W_{www}$  is the resource optimization period. Then:

$$X_i = \frac{X_i \alpha_1 p_i}{P_1 a_i} \quad n = 1, 2, \dots, N \quad (2)$$

$$\frac{X}{X_i} = \frac{1}{\sum_{n=1}^N a_n} \left( \frac{F}{F_i} + a_1 \sum_{n=1}^N \frac{P}{P_i} - N \frac{P_t}{p} - \lambda \right) \quad (3)$$

It shows that the optimal allocation of resources is related to the price of input factors and the demand of the real economy.

### 2.2 Blockchain

Compared with the traditional data house, the blockchain is different in the following points:

The first point is that the blockchain is a distributed accounting system. It is not managed by a centralized host, but is managed by multiple nodes. Each node has management authority and maintains the same. They work together to maintain the stability and operation of the system.

The second point is that the blockchain adopts multi-node consensus. It no longer needs a centralized host to manage and authenticate each enterprise on the chain. Instead, it uses the consensus layer to cross-verify the uploaded data. No interference, as long as one node has doubts about the data audit, the authenticity of the data can be screened.

The third point is that the blockchain cannot be tampered with. The blockchain system can only add new blocks, but cannot modify the original block information. If you want to modify the information, you can only add one to the original block. The new block is used to modify the original information, and the modified record will always be stored on the blockchain.

### 2.3 Inclusive Finance

The emergence of inclusive finance is precisely the integration on the basis of decentralized microfinance, and the development of financial services to an inclusive financial system. Its goal is to build a complete financial system and to reduce the micro Financial institutions are included in this system and standardized. Since financial services have long favored high-end customers and neglected middle and low-end customers, the emergence of comprehensive financial inclusion is to include people from all walks of life in this system, so that financial services can be truly popularized and developed benefit to everyone.

## 3 Blockchain Technology in Inclusive Finance

### 3.1 Bank Inclusive Finance Customer Relationship Management

According to the customer's risk and value, transaction behavior characteristics and preferences, etc., the advanced database system and big data mining and analysis technology are used to make full use of the customer information they have, and then realize customer segmentation in multiple dimensions.

### 3.2 Use Big Data Technology to Provide Value-Added Services

Use social network technology and big data technology to realize online collection of customer information and timely processing of transaction behavior data, predict customer consumption preferences, and effectively recommend services.

### 3.3 Resource Allocation Based on Blockchain Technology

In terms of resource allocation, in the GSP financial model based on blockchain technology, relevant information about the supply and demand of funds is directly published on the Internet and matched by themselves, and the supply and demand of funds directly communicate and trade. As an information intermediary, the blockchain platform can accelerate the dissemination of information and reduce processing costs. The average monthly transaction amount of bank C settlement account is shown in Table 1.

**Table 1.** Average monthly transaction amount of bank settlement account in C

Time	1 month before	2 months before	3 months before	4 months before	5 months before	6 months before
Transaction amount	215, 864	171,742	370,207	203,024	95,901	67,250
Time	7 months before	8 months before	9 months before	10 months before	First 11 months	Previous 12 months
Transaction amount	1 87,095	116,626	187,320	220, 102	182,81 7	167,603

## 4 Blockchain Technology in Inclusive Finance

### 4.1 Bank Inclusive Finance Business Development

In recent years, Bank C has taken the strengthening of credit support for inclusive finance as an important measure to promote its own business transformation, actively promoted the establishment of the inclusive finance business unit, increased the pace of business and product innovation, and kept pace with the times and took the inclusive finance business as one of the major strategies of the whole bank. The private economy of City A has been active since ancient times, and the scale of private market entities ranks in the forefront of the country. As of June 2018, there are more than 1.45 million business registration market entities in City A, including more than 810,000 individual businesses and more than 570,000 private enterprises. Small and micro businesses with individual businesses and private enterprises as an important part have accumulatively accounted for More than 95% of the research on the risk control of inclusive financial business of Bank C, City A branch. Table 2 shows the development of inclusive banking services of banks.

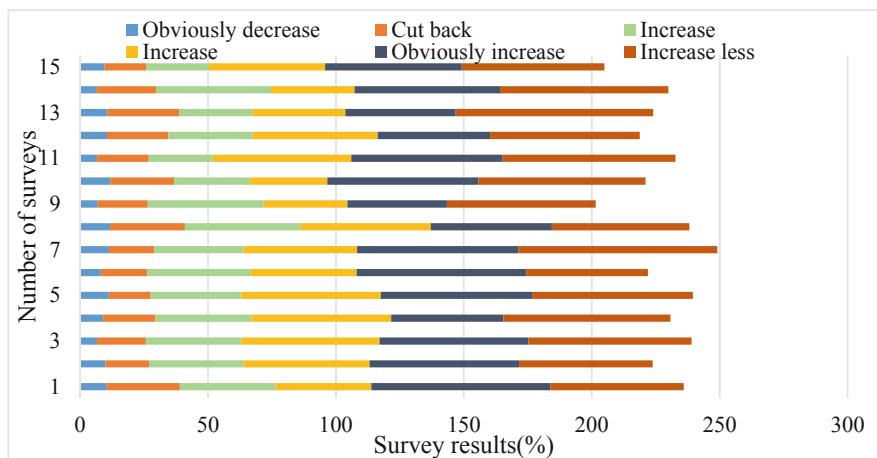
**Table 2.** Development of bank inclusive finance business

Time	Business registration market entities	Individual industrial and commercial households	Private enterprise
2018	103.51	59.41	39.29
2019	122.88	69.28	48.08
2020	145.57	81.52	57.5

### 4.2 Risk Impact Analysis of Big Data Financial Model Based on Blockchain

It is worth mentioning that during actual operation, the big data financial model based on blockchain technology will also have a certain impact on bank risks. Analyzing and collating the results of the questionnaire, it is concluded that the current bank practitioners' influence on the relevant risks of commercial banks under the big data financial

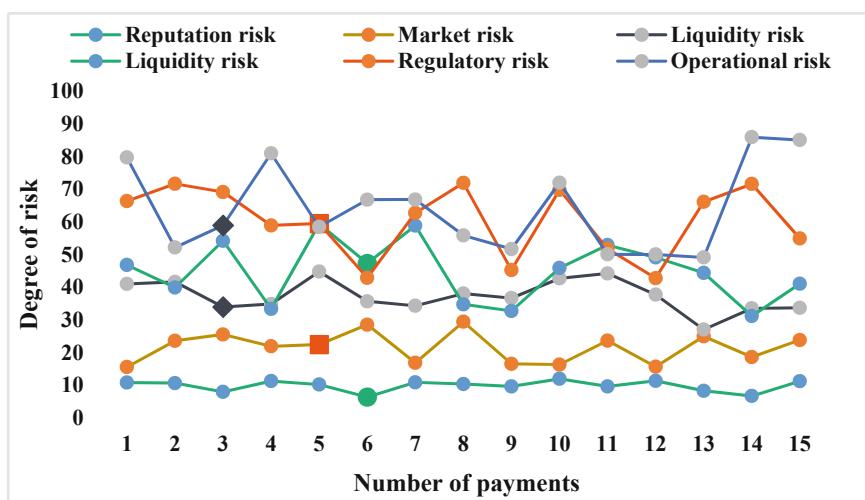
model based on blockchain technology is shown in Fig. 1. As shown in Fig. 1, the risk change analysis of the big data financial model based on blockchain technology: after using blockchain technology in the big data financial scenario, on the whole, more than 50% of bank practitioners believe that commercial banks the risk is reduced. Regarding different risks, basically 1/3 of the banking practitioners believe that the application of blockchain technology has no impact on the risks of commercial banks; less than 20% of them believe that it is an increase, among them, data security risks and II technical risks the two kinds of risks have a relatively high proportion of significantly increased. It can be seen from the comparison of the average risk change after using blockchain technology in the big data scenario: credit risk and operational risk are both lower than 2.5, these two risks are considered to be overall risk reduction; regulatory policy risk and II technical risk are average the relative highest values are 2.61 and 2.62 respectively. These two risks are considered to be an increase in the overall risk, and the other risks are all around 2.5, indicating that basically the risk has not changed much. The distributed credit system established by the application of blockchain technology in the big data financial scene breaks the dilemma of data and information islands where enterprises are independent, solves the problem of trust, improves the credit qualifications of each subject of big data, and reduces credit risk. The distributed general ledger system of blockchain technology truly records the massive amount of information in the entire big data system. By implementing point-to-point transactions, redundant intermediate links can be eliminated, the process is simplified, and the security and reliability of the system are enhanced, even if there are some parts. Participating nodes crash at the same time, and all information of the entire big data system can be retrieved, thereby reducing operational risks. Therefore, overall, credit risk and operational risk are reduced.



**Fig. 1.** The impact of commercial bank-related risks under the big data financial model

### 4.3 Risk Impact Analysis of Cross-Border Payment Model Based on Blockchain

The key to the risk control of the inclusive finance model based on blockchain technology is the accuracy of block data and the confidentiality of information. Analyzing and collating the results of the questionnaire, it is concluded that the current bank practitioners' influence on the relevant risks of commercial banks under the cross-border payment model based on blockchain technology is shown in Fig. 2. It can be seen from Fig. 2 that after commercial banks use blockchain technology in the cross-border payment scenario, the overall bank risk situation is similar to that in the big data financial scenario: more than 50% of banking practitioners believe that the risk of commercial banks (Including credit risk, liquidity risk, market risk, operational risk, compliance risk, and reputation risk) is to reduce; for different risks, basically 1/3 of banking practitioners believe that the application of blockchain technology poses risks to commercial banks. There is no impact; only less than 20% of the proportions think it is an increase, of which the proportion of two kinds of risks, data security risks and IT technology risks, is considered to be relatively high. From the comparison chart of the average value of risk changes after using blockchain technology in cross-border payment scenarios, it can be seen that credit risk and operational risk are both lower than 2.5, and these two risks are considered to be overall risk reduction; regulatory policy risk and IT technology the average risk is relatively highest, which are 2.65 and 2.63 respectively. These two risks are considered to be an increase in the overall risk; other risks are all around 2.5, indicating that basically the risk has not changed much.



**Fig. 2.** The impact of commercial bank-related risks under the cross-border payment model based on blockchain technology

## 5 Conclusions

The advantages of openness, transparency, traceability, and non-tampering of information in blockchain technology can keep the data of all parties in a timely update state, and can provide a certain guarantee for timely reconciliation and settlement. According to the customer's risk and value, transaction behavior characteristics and preferences, etc., the advanced database system and big data mining and analysis technology are used to make full use of the customer information they have, and then realize customer segmentation in multiple dimensions.

Distributed accounting processing, to ensure the integrity and accuracy of data with multiple central nodes, and to allow the effective flow of data; use time stamp accounting, add a randomly arranged and synthesized time stamp string in each block, and request payment the person broadcasts it on the entire network, and the next person who uses digital currency also generates a timestamp, and so on, and finally forms an open and transparent blockchain to ensure the accuracy and traceability of the data.

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# Application of Virtual Simulation Technology in Linguistics Teaching

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**Abstract.** The development of science and technology drives the renewal of education mode. Traditional language teaching methods have been far from meeting the needs of modern teaching development. Multimedia virtual simulation technology is gradually applied to modern language teaching.

**Keywords:** Traditional teaching · Multimedia · Virtual simulation technology

## 1 Introduction

The development of science and technology drives the renewal of education mode. Traditional language teaching methods have been far from meeting the needs of modern teaching development. Multimedia virtual simulation technology is gradually applied to modern language teaching.

## 2 Disadvantages of Traditional Teaching

First of all, the traditional language teaching method focuses on theoretical teaching, but the practical operation has not been promoted to the same level. But in fact, knowledge itself is a vivid and rich practical content, and as his expressive language, symbols, diagrams and so on are abstract and simple. The teaching materials for students' language learning are only book knowledge integrated by Chinese characters and grammar, which requires students to think clearly about the actual contents represented by them through language, symbols and charts, and even want to "live" them. According to the viewpoint of educational psychology, such learning is meaningful learning, that is, understanding learning [1].

Secondly, the traditional language teaching method pays more attention to rational knowledge than perceptual knowledge. In traditional language teaching, perceptual knowledge is considered to be the concrete material that can only provide knowledge, and only rational knowledge can grasp the essence of things. There is a gap between perceptual knowledge and rational knowledge. This idea of emphasizing rationality and ignoring sensibility will affect the pursuit of theorization and abstraction in teaching, and is not conducive to students' mastery of knowledge. The research of educational psychology shows that the process of students mastering knowledge is a combination of perceptual knowledge and rational knowledge. It is easy for students to form rational

knowledge and understand book knowledge if they have rich perceptual knowledge, clear appearance and vivid imagination. On the contrary, it is difficult to master the concepts, formulas and principles in books [2].

From the psychological point of view, sensibility refers to the psychological mechanism and function of human perception, imagination, emotion, inspiration and intuition; rationality refers to the psychological mechanism and function of human reasoning and judgment by using concepts. Traditional language teaching lacks stimulation and satisfaction to human perceptual factors, which makes it lose its appeal and appeal. Thirdly, the traditional language teaching methods attach importance to the conclusion and despise the process. In the learning process of many subjects, the relationship between conclusion and process is a very important relationship in the process of students' knowledge seeking. It is the reflection and embodiment of the traditional static knowledge view that emphasizing conclusion and neglecting process. The teaching of emphasizing conclusion and neglecting process is only a short cut teaching in form, which turns the vivid process of forming conclusion into a monotonous and rigid recitation of articles, which strips the internal relationship between knowledge and intelligence from the source. As far as cognitive activities are concerned, they are mainly the process of students' independent reading and thinking. The study of modern educational psychology points out that the learning process of students is essentially the same as that of scientists, which is a process of finding, analyzing and solving problems. On the one hand, this process is a process of exposing students' various doubts, thinking, obstacles and contradictions, on the other hand, it is a process of displaying students' intelligence, unique personality and innovative achievements.

The language teaching based on book knowledge has lost the function of quality education. In order to reform language teaching, we must first shift the value standard from knowledge based to development based. Taking development as the standard is not to teach book knowledge, but to obey and serve the development of students. Therefore, we must focus on updating the concept of knowledge and learning. Intuitionistic, visualized, emotional, individualized, active and intelligent knowledge is the only way to quality and teaching development.

### 3 Progress of Modern Teaching Methods

Modern teaching methods have made great progress and development, both in form and content are better than traditional teaching. With the development of computer technology, multimedia technology and network technology, virtual technology has gradually moved from business environment to modern education and teaching field. Whether it is kindergarten, primary school, junior high school, high school, University, or various training institutions, all involve the products of modern multimedia virtual simulation technology. The public's cognition of virtual teaching instrument environment and human civilization can't be limited to general browsing. On the basis of experiment, teaching instrument, management, campus life and other factors, three-dimensional simulation education system emerges as the times require. The real and interactive characteristics of a complete virtual campus education system is exactly the essence and charm of virtual simulation technology. It will also play a great role in promoting the reform of education mode, and will add strong vitality to education [3].

Today's society has entered the era of digital science and technology information. Accelerate the development and application of virtual simulation technology in the field of modern education. Such as virtual simulation training platform, network courses, virtual simulation animation (working process simulation software), general material library and other forms of digital education information resources.

## 4 Fast Triangulation of Polygon with Holes

In many cases, the surface shape of the object is modified in virtual environment, and the display of the surface shape modification result often needs a re triangulation process. We assume that the outer surface of an object can always be divided into regions that do not intersect with each other except the boundary. For each region E, there exists a region D in the plane, where  $\sum$  common and D are topologically homeomorphic. In this way, the problem of triangulation on the surface of the object is transformed into a triangulation hole. Because of the real-time interaction in virtual environment, triangulation must be completed in real time, so the algorithm of triangulation must be simple and efficient. In this section, according to the requirement of real-time, a triangulation method of polygon region with holes is given. The problem can be described as follows:

Let o be a polygon region with holes, P0 be the outer boundary, P1, PN, is the inner boundary of the region, P0, P1, PN, are simple polygons, where the vertices of R are arranged in a clockwise direction (it can be explained that if you walk along the boundary, the interior of O is on the right side of the boundary), P1 The vertices of PN are arranged in a counter clockwise direction, which requires that the polygon area o be divided into a combination of disjoint triangles.

### 4.1 Algorithm Complexity

It is assumed that there are  $m + 1$  polygons in the polygon area with holes, and M polygons are internal polygons. The number of item points on each polygon is

$$n^i, \{i = 1, 2, \dots, M + 1\}, \text{order } N = \sum_{i=1}^{M+1} n^i$$

Then the complexity of the algorithm can be considered in the following aspects:

- 1) Calculate and sort the barycenter coordinates::

$$O(N) + (M + 1)O(\log(M + 1))$$

- 2) Each polygon is segmented with binary tree structure according to the spatial position of the edge

$$O(N \log N)$$

3) Polygon segmentation and intersection:

$$O((M + 1)\log N)$$

4) Intersection sorting and simplification:

$$O\left(\sum_{i=1}^{M=1} k^i\right)$$

Where  $k$  represents the number of item points on each dividing line.

5) Split polygon:

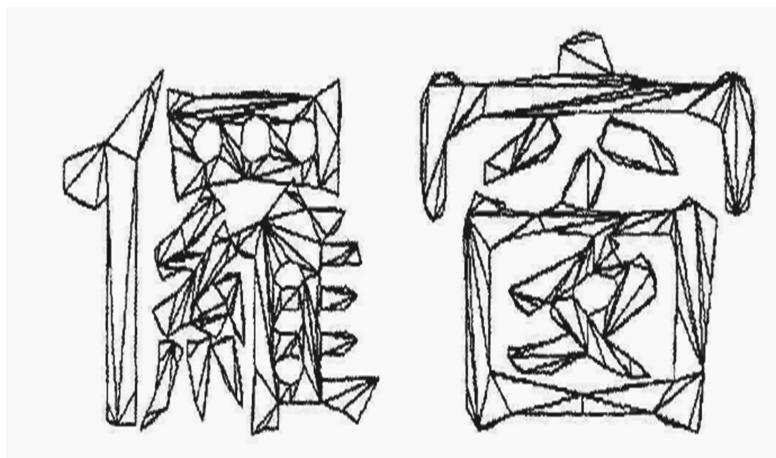
$$O\left(N + \sum_{i=1}^{M=1} \bar{k}^i\right)$$

Where  $\bar{k}$  is the number of reduced intersection points.

In short, the time complexity of segmenting polygon with holes is

$$O(N) + (M + 1)O(\log(M + 1)).$$

The time complexity of segmenting polygon region with holes is  $O(W + (M + 1)O(\log(M + 1)))$ , where  $n$  is the total number of vertices forming the polygon region, and  $M + 1$  is the number of polygons. For each simple polygon, the time complexity is  $O()$ , where  $k$  is the number of concave vertices ( $k < n$ ). Figure 1 shows an example of two Chinese characters triangulated by our algorithm:



**Fig. 1.** Examples of triangulation

## 5 Conclusions

Virtual simulation technology has become an indispensable part of modern education because of its short cycle, high security and strong sense of reality. The time when the teacher wrote on the blackboard and the students wrote on the blackboard has passed. Various kinds of virtual simulation training platform, virtual simulation animation, network courses, enhance the strength of modern education, change the concept of modern education, sublimate the level of modern education. A series of computer virtual simulation technology plays an irreplaceable role in the application of modern education.

The research and development of modern education digitization caters to the development of science and technology. The application of simulation technology in education and teaching can improve the process of modern education digitalization and information, and improve the structure of modern education. The development of virtual simulation technology affects modern education. A high-quality education platform is not only the demand for hardware, but also the development of educational software power restricts the height of the education platform. The competition, learning and development of modern educational institutions are reflected in the development degree of multimedia virtual technology in many aspects. To do a good job in the research and application of multimedia simulation technology in the field of education is an expansion of the new development space in the field of contemporary education and has epoch-making significance.

Multimedia simulation technology in the process of modern university teaching virtual platform, such as the design and production of virtual simulation animation. Especially for the difficult teaching content of “no practical operation in language”, such as: the replacement of building facade effect, the production process of a production process, the construction process display of a building, the use, maintenance and repair of an instrument and equipment. Improve the quality of teaching, truly realize the opinions of the Ministry of education on accelerating the development of vocational education informatization, and accelerate the development of digital high-quality information resources of modern language education.

According to the characteristics of multimedia virtual simulation technology to visualize model information, it has a definite aim for the actual course. According to the characteristics of the course, a reasonable and effective multimedia simulation platform is designed, and the practical reform methods are proposed. (promote the change of education and teaching concept, lead the reform of teaching content and teaching method; promote the digital information process of multimedia simulation technology in modern colleges and universities.

The interaction, verisimilitude, virtuality and immersion of virtual simulation technology in modern language teaching, give full play to its characteristics, and effectively assist teachers in modern language teaching. We should effectively promote the extensive, in-depth and effective application of digital information technology in modern education, constantly improve the construction of virtual simulation platform, virtual simulation animation, network courses and virtual environment in modern colleges and universities, comprehensively strengthen the ability of digital information

technology to support the reform and development of modern language teaching, transform the traditional education and teaching mode with advanced modern education digital information technology, and use informatization To promote the modernization of modern education.

**Acknowledgements.** School-level key project of Xi'an Fanyi University "Research on the interaction between cultural literacy and bottom-line thinking of college students" (No. 18A01); school-level project of Xi'an Fanyi University "Chinese Modern and Contemporary Literature and Writing Team" (No. ZT1710); project of scientific and research team of Xi'an Fanyi.

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# Construction of Student Management System Platform of Data Mining Algorithm

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**Abstract.** The rapid development of network information technology has led to the explosive growth of global information data volume. People's lives are more and more full of massive data. This era is vividly called "big data era". With the application of big data technology, colleges and universities can predict the future by analyzing and mining the laws hidden behind the data, so that teachers and managers can improve their teaching and management decisions.

**Keywords:** Big data · Management system · Platform

## 1 General Introduction

Student management information system is to establish a good and stable database of students' detailed information. It mainly includes the data database of student party members, student cadres, student associations, students with difficulties, students' violation of discipline, Student Awards and grants, and student recruitment data; Ensure the security of the database, maintain data consistency; have a good user interface, easy to use; perfect query, add, modify, delete and other operations; with data statistics data mining to provide users with decision-making information; complete report output, reduce the burden of users [1]. The student management information system mainly includes system management, students' basic information management, information management of extremely poor students, dormitory management, students' reward and punishment management, information query, data statistics and other modules.

## 2 Data Mining Technology

- (1) Data summary is to condense the data and give its compact description. Data mining is to discuss data summary from the perspective of data generalization.
- (2) Classification discovery is a very important task. Classification is the use of classifiers to map data items in the database to a given category, which is used to predict the future data.

- (3) Association rules refer to the degree of support and credibility of the relationship between things. Meaningful association rules must be given two thresholds, minimum support and minimum confidence.

$$Y = b + w \quad (1)$$

Student information management system is an indispensable part of colleges and universities. With the rapid improvement of computer level, student information management system is constantly developing and improving. This management system mainly includes the information management of students and the management of courses and grades. The system is written in C language, uses SQL Server 2005 database as the background database to store information, and uses ODBC technology to realize the connection between foreground net and background SQL database. System design and analysis administrator can maintain the system, but authentication is required first, and then the administrator's authority can be implemented. It has the characteristics of strong openness, strong operability and high work efficiency. Administrators are divided into super administrators and ordinary administrators. Super administrators can add and delete administrators, while ordinary administrators can't operate on administrators and can only maintain student information. Students can log in to the system to check their own student status information, course and score information, but can not operate on them. This management information system mainly realizes the operation of authority, which can be realized according to different permissions of users.

### 3 Student Management Information System

Student management is more and more important, and the requirements are higher and higher. Under the traditional manual management, teachers in charge of student management need to spend most of their time collecting, storing, processing, searching and registering student information and statistics. A large number of data summary, accounting and report forms are completed by teachers or students in a centralized way, which is not only a large amount of data, but also prone to errors. At the same time, in the traditional way, each department carries on the student information exchange in a static way, and the mutual check and cooperation work between them can not be carried out, which can only be completed by the counselors or other teachers in charge of each class, which will increase their workload and lead to data errors between departments [2]. In addition, at present, the teachers in charge of student management feel more and more complex, and it is more and more difficult to predict the development status of students, and it is more and more difficult to select the excellent and poor students. Therefore, student management information system can not only be satisfied with the simple backup and query of massive data, but should have the function of assisting decision.

## 4 Innovation Based on Modern Big Data is the Basic Feature of Ideological and Political Education of the Times Abundant Educational Resources

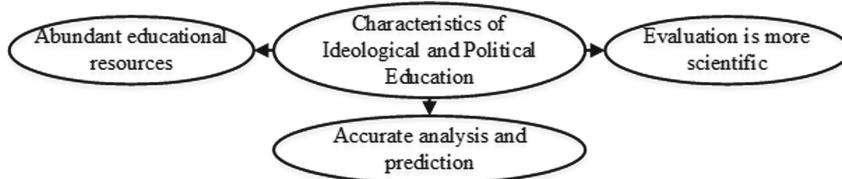
Almost all people are accessing the Internet in different ways. The software and hardware construction of various information systems, Internet, political work network, local area network, database and so on are constantly upgraded and improved. The data information related to ideological and political education, such as teaching plans, courseware, videos, pictures and so on, is greatly enriched.

### 4.1 Accurate Analysis and Prediction

“Big data” helps people not only to explore the causal relationship, but also to explore the relevant relationship extensively. The analysis and prediction function emphasized by statistical from huge seemingly unrelated data, summarize and extract the characteristics and laws, and then “predict the future”. This is very enlightening for political workers. After all, in some cases, it is more important to know “what” than “why”. On the basis of reality.

### 4.2 Assessment is More Scientific

College students meet the needs of social communication through microblog, wechat, QQ and other network tools and social network platforms, shopping and consumption through Taobao, Jingdong and other websites, leisure and entertainment needs through online literature and online games, resulting in a large number of digital information such as photos, videos, voice, text dialogue and email every day. In these data, including the students’ ideological, emotional and behavioral status, which provides a solid data base for carrying out targeted and effective [3]. The reason effect often appears in the form of spiritual achievements, which are difficult to quantify and can only be analyzed and judged qualitatively on the whole (Fig. 1).



**Fig. 1.** Characteristics of ideological and political education

## 5 Adapt to the Era of Big Data to Improve the Quality of Ideological and Political Education

### 5.1 Changing the Way of Working

Big data in College Students' Ideological Status: big data comes from social networks more, not only has the attribute data of everyone, but also can capture the context of their ideological status and social relations: big data can reflect the ideological dynamic of college students quickly and timely [4]. For example, when major public events and other social and emotional outbursts occur, college students often express their opinions in the first time through the Internet, mobile terminals and other channels, thus quickly forming a public opinion explosion; big data has the significance from the network and social media, through the analysis of each individual position role and behavior attitude in the social network, It can show the real ideological tendency of college students more comprehensively and widely.

### 5.2 Data Mining Technology in Student Management Information System

The tools in data warehouse are mainly analytical, but still include query tools. The query here does not refer to the query of record level data, but to the query of analysis results, which requires a more friendly and consistent interface. For example, various chart and report tools are convenient for users to understand complex query results more conveniently and clearly. The main tool of data warehouse is analytical tool. According to the definition and use of data warehouse, its users are middle-level leaders, mainly implementing decision-making and trend analysis applications. However, there is a huge gap between the current storage and retrieval system and the user's demand for high-level information. The original database tools can't do anything about this kind of problem. At this time, we can use the analysis tools of data warehouse. There may be many different ways for users to extract information from data warehouse, but they can be roughly divided into two modes: verification and discovery [5]. Verification tool verification means that users first put forward their own assumptions, and then use various tools to verify or deny their assumptions through repeated and recursive retrieval queries. From the user's point of view, they find the facts from the data warehouse, and the tool in this respect is multidimensional analysis tool. Online analytical processing (OLAP) is a commonly used multi-dimensional analysis tool. It enables decision-making analysts to analyze and observe the data in depth through fast and consistent access from multiple perspectives of information.

## 6 Conclusion

The school has accumulated management students for many years. At present, these data have not been effectively used, but only a treasure to be developed. Using data mining technology, we can establish a relatively perfect student management

information system, extract the useful information hidden in the data, so that the student management information system can more comprehensively meet the new needs, provide better services.

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# Research on Design Factors of Urban Public Space Safety Based on ISM and AHP

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**Abstract.** Taking Jiefangbei commercial district of Chongqing as an example, this paper analyzes and discusses the urban design angle and the influencing factors of the public space safety design in the commercial district by means of the interpretative structure model method (ISM) and the analytic hierarchy process (AHP). On the basis of the field investigation and questionnaire consultation, this paper sorts out the 15 main factors that affect the public space safety in the commercial district, and uses ISM establishes the multi-level hierarchical structure model of influencing factors, and then calculates the comprehensive weight of the problem through AHP analysis, obtains the importance degree and hierarchical relationship of the main factors that affect the public space safety design of the urban commercial intensive area, clarifies the design focus of the urban public safety design, and provides reference and basis for the public space safety design of the urban commercial intensive area.

**Keywords:** Interpretative structural model (ISM) · Analytic hierarchy process (AHP) · Business district · Public space · Security

## 1 Introduction

Due to high building density, large population flow, effective use of site and space and functional combination, in the areas with concentrated population and wealth, the threats to the safety of urban public space may be magnified, resulting in more serious losses. Therefore, the safety problem of the urban commercial concentrated area is the main component of the whole urban safety system, and the more important value of the public space lies in its social role. Therefore, the introduction of the comprehensive safety perspective and content in the design of the public space is to carry out the comprehensive design from the aspects of disaster prevention and mitigation, safety refuge, safety defense, behavior and psychological safety, and actively pay attention to the city. The security attributes of space environment cloud computing and its application the security design of public space is the concretization and visualization of the content of urban security planning and design, and the research on the influencing factors of its design is a hot spot in recent years [1].

In 2008, Cai Qizhen and Wang Jianguo discussed the basic connotation and content composition of urban safety design with urban public space as the main object from the perspective of modern urban design. From the perspective of public space security

planning, the main contents of public space security planning are summarized as psychological security, behavior security, defense security and disaster security. The visualization of urban public space security planning is studied through simulation. The analysis model mainly selects road traffic conditions, service time and disaster resources as constraints. In 2008, Mao Yuanyuan and Dai Shengzhi summarized the results of urban public space design and crime prevention, and believed that urban public space should be used from macro to micro level. There are also many discussions on common disasters (such as fire), underground public space disasters and safe evacuation. In the foreign urban design, the analysis and Strategy Research on the security factors of community public space, as well as the urban design research for special groups are also increasing. Most of these research results focus on the single or multiple factors of public space safety design, while the comprehensive research on the hierarchical relationship of safety factors is less, and the focus of safety design in urban public space design is not clear enough.

In order to guide designers to better carry out urban safety design, it is necessary to make clear the element structure of public space safety design on the basis of fully analyzing the hidden dangers of public space safety in urban commercial intensive areas. Therefore, this paper uses the method of interpretive structure model (ISM) and AHP to establish a multilevel model of influencing factors of urban commercial intensive areas safety. The weight of each level element in the model is determined by AHP, and a clear structure system of safety design elements is established, which provides guidance and reference for the safety design of urban public space.

## 2 Principles and Methods of Analysis

### 2.1 Interpretive Structural Model (ISM)

Interpretative structural modeling (ISM) is the knot of J.N. warfiedzai for analyzing complex systems a system analysis method developed by modeling. ISM It belongs to conceptual model, which can transform vague ideas and opinions into intuitionistic relational model with good structure, especially for system analysis with many variables, complex relations and unclear structure. This method makes qualitative analysis of system evaluation, decision-making, planning, goal determination, etc. based on human experience, intuition or inspiration in the past, and can rely on structural model Type B was analyzed quantitatively.

### 2.2 Analytic Hierarchy Process (AHP)

The analytic hierarchy process is mainly to make a comparative judgment on the importance of the two indicators by decomposing the complex problem into several levels and factors, and to establish a judgment matrix. By calculating the maximum eigenvalue of the judgment matrix and the corresponding eigenvector, we can get the weight of the importance of different schemes, which provides a basis for the selection of the best scheme. As a method of qualitative and This method is widely used in safety design research.

### 3 Analysis of the Factors Influencing the Safety Design of Public Space in the Urban Commercial Intensive Area

#### 3.1 Building an Interpretative Structural Model

- 1) This paper takes Jiefangbei commercial center of Chongqing as an example, collects and sorts out the main problems that affect the public space security of urban commercial concentrated area by means of on-the-spot investigation and questionnaire survey, and establishes the element set  $S_i = \{S_1, s\}$  in combination with the existing research on the safety design factors of urban public space 2, ..., S<sub>16</sub>, as shown in Table 1. The element set mainly covers the behavioral safety, psychological safety and conventional disaster prevention safety in the public space of the commercial intensive area.
- 2) The reachable matrix is determined. The reachable matrix  $R(S_i) = \{R(S_i) = S_j \in n | S_{ij} = 1\}$ , of which 1 is the direct or indirect correlation between the two factors, and blank is the low or basically irrelevant correlation between the two factors.
- 3) The element reachable set  $R(S_i)$  and antecedent set  $A(S_i)$  are established. When  $R(S_i) \cap A(S_i) = R(S_i)$ , the element corresponding to this line is the highest level set factor, which is recorded as  $h_i = \{S_1, S_2, \dots, S_N\}$ . After finding out the first level of the highest factor set H<sub>1</sub>, cut the corresponding factor I from the matrix, and then continue to find the highest set factor from the remaining reachable matrix, that is, the next level factor; repeat until finding out the highest level factor of each step, and establish the structural model.
- 4) The highest set factors of all levels are: the highest set factor  $H_1 = \{S_{16}\}$ , the first level factor  $H_2 = \{S_5, S_7, S_{10}\}$ , the second level factor  $H_3 = \{S_{11}, S_{14}\}$ , the third level factor  $H_4 = \{S_1, S_2, S_{12}\}$ , the fourth level factor  $H_5 = \{S_3, S_6, S_{13}, S_{15}\}$ , five level factor  $H_6 = \{S_4, S_8, S_9\}$ , establish the structural model. Then, according to the structural model, establish the interpretative structural model.

#### 3.2 Explanation of Structural Model

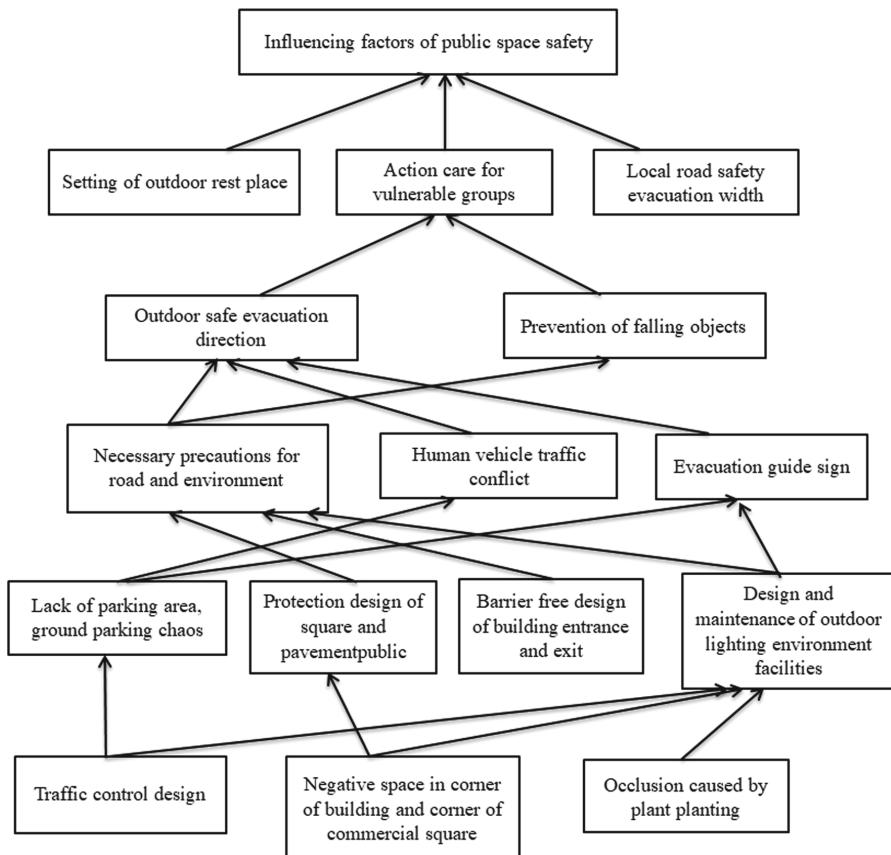
According to the interpretative structure model (Fig. 1), the factors that affect the safety of Jiefangbei commercial dense area have five levels of multi-level ladder structure. This model explains the logical relationship between the factors that affect the safety of public space from potential to depth:

- (1) The first level influencing factors include outdoor rest place design, action care for the elderly, children and other vulnerable groups, and the width of evacuation road, which is the most superficial influencing factor, indicating that the most direct performance of public space safety design is the outdoor environment design, and the width of outdoor road also directly affects the safety evacuation, which also reflects that behavior safety is public space safety Foundation of full design;

**Table 1.** Reachable matrix of the first level

influence factor $S_i$	reachable set $R(S_i)$	antecedent set $A(S_i)$	$R(S_i) \cap A(S_i)$	$R(S_i) \cap A(S_i) = R(S_i)$
$S_1$	1,2,3,7,10,11,14,16	1,6,13	1	
$S_2$	2,5,7,10,11,16	1,2,3,4	2	
$S_3$	2,3,7,8,10,11,12,15,16	1,3,4,15	3,15	
$S_4$	2,3,7,10,12,15,16	4,8,11,15	15	
$S_5$	5,7,16	2,5,7,8,9,15	5,7	
$S_6$	1,6,7,13,16	6,7,8,13,15	6,7,13	
$S_7$	5,6,7,10,13,16	1,...,15	5,6,7,10,13	
$S_8$	4,5,6,7,8,12,15,16	3,8,9,15	8,15	
$S_9$	5,7,8,9,10,12,15,16	9,15	9,15	
$S_{10}$	7,10,16	1,2,3,4,7,9,10,13,15	7,10	
$S_{11}$	4,7,11,12,16	1,...,4,11,12,13,15	4,11,12	
$S_{12}$	7,11,12,16	3,4,8,9,12,15	12	
$S_{13}$	1,6,7,10,11,13,16	6,7,13,15	6,7,13	
$S_{14}$	7,14,15,16	1,14,15	14,15	
$S_{15}$	3,...,16	3,4,8,9,14,15	3,4,8,9,14	
$S_{16}$	16	1,...,16	16	16( $H_1$ )

- (2) The second level of influencing factors include the direction of outdoor safety evacuation and the prevention of falling objects. This is still a relatively shallow factor, which shows that in the safety design of public space, attention should be paid to the design of space guidance. At the same time, due to the large number of high-rise buildings in the commercial intensive areas, the aging of building exterior wall materials, improper installation and use of equipment, etc., falling objects are easy to be caused Threatening the safety of personnel in public activity areas;
- (3) The third level factors are the necessary road safety protection measures, the sign design related to the traffic conflict between people and vehicles and the safe evacuation direction of public space, which are the influencing factors of the medium level, and the common influencing factors of the surface level, and the relationship between them is parallel;
- (4) the third level factors are the necessary safety precautions for roads, the design of signs related to the traffic conflict of vehicles and the direction of safe evacuation in public space. This is the influence factor of the middle level, which affects the surface factors together, and the relationship between them is parallel [2].
- (5) The fifth level factors include traffic control design, negative space and plant configuration design, which are the highest level factors, mainly related to the traffic planning of the whole urban design at the meso level, the design of urban space to avoid negative space, and the requirements of improving material space safety and preventing crime in environmental design, which are higher level requirements in public space safety design.



**Fig. 1.** Structural model of public space safety influencing factors interpretation in Jiefangbei commercial dense area

### 3.3 Using Analytic Hierarchy Process (AHP) to Determine the Weight of Public Space Safety Design Factors

- 1) Establish a judgment matrix. Through the understanding and preliminary analysis of the research problems, build a ladder hierarchy system. In this paper, use the interpretative structure model to build a multi-level ladder structure. One element of the above layer is the evaluation criteria. Through the comparison of two elements of this layer, score the relative importance of the next layer's indicator to one element of the previous layer, and establish a judgment matrix. Use Satty's "1-9 scale method" to assign values to the comparison results of the two elements and establish a judgment matrix, as shown in Table 2.

**Table 2.** Judgment matrix, combination weight and consistency judgment

				Feature vector	Consistency judgment
				$W_i$	$C_r$
Secondary factor weight data	A	$B_1$	$B_2$	$B_3$	
	$B_1$	1	4	4	0.677
	$B_2$	1/4	1	3	0.199
Three level factor weight data	$B_3$	1/4	1/3	1	0.124
	$C_1$	$C_2$			
	$C_1$	1	5		0.833
Four level factor weight data	$C_2$	1/5	1		0.167
	$D_1$	$D_2$	$D_3$		
	$D_1$	1	3	2	0.496
Five level factor weight data	$D_2$	1/3	1	6	0.363
	$D_3$	1/2	1/6	1	0.141
	$E_1$	$E_2$	$E_3$	$E_4$	
Five level factor weight data	$E_1$	1	4	3	0.469
	$E_2$	1/4	1	3	1/2
	$E_3$	1/3	1/3	1	3
1	$E_4$	1/3	2	1/3	1
	$E_1$	$E_2$	$E_3$	$E_4$	
	$E_1$	1	2	2	4
2	$E_2$	1/2	1	1/2	4
	$E_3$	1/2	2	1	2
	$E_4$	1/4	1/4	1/2	1
Six level factor weight data	$F_1$	$F_2$	$F_3$		
	$F_1$	1	1/5	1/5	0.090
	$F_2$	5	1	3	0.607
	$F_3$	5	1/3	1	0.303

- 2) Combined weight and consistency check. According to different orders of the judgment matrix, check the average random consistency index table (omitted here). Take the consistency test index  $R_i = 1.12$ . When  $C_r < 0.10$ , it represents the judgment matrix.
- 3) Calculate the comprehensive weight value of each factor. On the basis of combined weight, calculate the comprehensive weight of each factor in the multi-level structure model, as shown in Table 3. Reorganize and arrange each factor according to the comprehensive weight value, and establish a new factor ranking. Among:  $W_{i0} = W_i \sum W_i$

**Table 3.** Comprehensive weight data table of each element

	$B_1$ (0. 677)	$B_2$ (0. 199)	$B_3$ (0. 124)	Comprehensive weight
$C_1$	—	$0.833 \times 0.199$	—	0.166
$C_2$	—	$0.167 \times 0.199$	—	0.033
	$C_1$ (0.166)	$C_2$ (0.033)		
$D_1$	$0.496 \times 0.166$	$1 \times 0.033$		0.115
$D_2$	$0.363 \times 0.166$	—		0.060
$D_3$	$0.141 \times 0.166$	—		0.023
	$D_1$ (0.115)	$D_2$ (0.060)	$D_3$ (0.023)	
$E_1$	$0.469 \times 0.115$	$1 \times 0.060$	$0.422 \times 0.023$	0.124
$E_2$	$0.363 \times 0.115$	—	$0.225 \times 0.023$	0.05
$E_3$	$0.189 \times 0.115$	—	$0.259 \times 0.023$	0.03
$E_4$	$0.157 \times 0.115$	—	$0.094 \times 0.023$	0.02
	$E_1$ (0.124)	$E_2$ (0.05)	$E_3$ (0.03)	$E_4$ (0.02)
$F_1$	$1 \times 0.124$	—	—	$0.090 \times 0.02$ 0.126
$F_2$	—	$1 \times 0.05$	$1 \times 0.03$	$0.607 \times 0.02$ 0.092
$F_3$	—	—	—	$0.303 \times 0.02$ 0.006

## 4 Research Conclusion

Based on the above analysis, the conclusion of this paper is as follows:

In the analysis and evaluation of the factors that affect the safety design of public space in the commercial intensive area, the use of interpretative structure model (ISM) and analytic hierarchy process (AHP) is an effective method to describe the complex design elements by combining qualitative and quantitative analysis, which can provide a basis for the safety based design of urban public space;

The comprehensive weight value of reasonable design of outdoor rest place is the highest, which shows that in the commercial intensive area, outdoor rest place is not only the necessary content to attract commercial activities, but also the important content of public space safety design. Reasonable rest space design will mainly affect the safety of human action and psychological safety, which should be paid more attention to in the design of public space safety;

The factors involved in traffic design and behavior safety design, safe evacuation direction, width of evacuation road, planning of vehicle and pedestrian system, and traffic management are of considerable importance, indicating that a reasonable traffic design is public space safety, from the weight value, we can see that the design of public space guidance (safe evacuation direction) has more direct identifiability than the setting of evacuation guidance signs, which is more conducive to shaping a safe public space [3].

The importance of necessary road safety protection and passive space design is second only to traffic safety design, which shows that the passive space will not only affect the local commercial value of the commercial intensive area, but also affect its overall safety performance.

The weight value of line of sight occlusion formed by plant planting is very small, which indicates that in the commercial intensive area, the line of sight occlusion formed by plant planting is objective requirement of commercial value, and the plants with serious occlusion will not be planted. Moreover, due to the large daily flow of people and intensive activities in the commercial intensive area, the hidden dangers such as crime caused by line of sight occlusion are relatively small.

There are many factors in the design of public space security in urban commercial intensive areas, and because of the differences in their own construction and business development mode, there must be differences in the choice of safety design factors. This paper mainly lists the common problems of public space security in commercial intensive areas on the basis of field research and sorting out the literature research results, simplifying the safety attributes of the same factors In the further research, we can use ism and AHP to analyze the differences of the same factors in different situations, and the application of related improvement methods in this field. It can provide reference and guidance for public space safety design and safe city design.

## 5 Analysis and Discussion

The interpretative structure model (ISM) is a qualitative model to analyze and express the elements of the system, the relationship between them and the hierarchical structure. The analytic hierarchy process (AHP) is a typical method to quantitatively analyze and evaluate problems in the form of scores The analytic hierarchy process (AHP) usually uses the Delphi method (expert scoring method) to determine the weight relationship of factors. When determining the relationship between two factors and the weight value, there are certain subjective factors due to the differences of interviewees' personal experience, knowledge structure, cognitive level, etc., but generally speaking, the interpretative structure model (ISM) and the analytic hierarchy process (AHP) Combined with the use of AHP, through scoring and weight calculation, the qualitative analysis and quantitative analysis are integrated to improve the reliability and effectiveness of the analysis. The results are consistent with the analysis results from the perspective of urban design, which shows that it has guiding significance for design.

In this paper, the safety design factors of public space are not specially designed for specific disaster factors (such as fire, earthquake, terrorist attack, etc.), instead of safety evacuation direction, road width, evacuation guide sign. The main reason is that for the urban business intensive areas, disasters often have the effect of amplification and rapid diffusion, and the safety of people is the primary content, which is the priority Evacuation to urban public shelters (such as parks, urban green space, etc.) has limited ability to resist disasters. If we want to consider local disaster prevention and avoidance, we need to integrate the safety performance of buildings into the safety design factor set for overall analysis.

There are many factors in the design of public space safety in urban commercial intensive areas. Because of the differences in self construction and business development mode, the choice of safety design factors must be different. This paper mainly lists the common problems of public space safety in commercial intensive areas on the basis of field research and literature research, simplifying the safety category of the same factors. In the further research, we can use ism and AHP to analyze the difference of the same factors in different situations, and the application of related improvement methods in this field. It can provide reference and guidance for public space safety design and safe city design.

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## **Technical tracks 6: Marketing Decision Making, E-commerce, and Their Sustainable Intelligence Computing**



# Research on the Visual Design and Performance of Print Advertisement in the New Media Era

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**Abstract.** The development speed of print advertising design is also getting faster and faster, especially since entering the new media era, the media and methods of information dissemination have also undergone earth-shaking changes. Affected by this, the visual design and expression of print ads in the era of new media have also undergone corresponding changes. The article briefly analyzes the visual design and performance of print ads in the new era.

**Keywords:** New media · Print advertising · Visual design · Visual performance

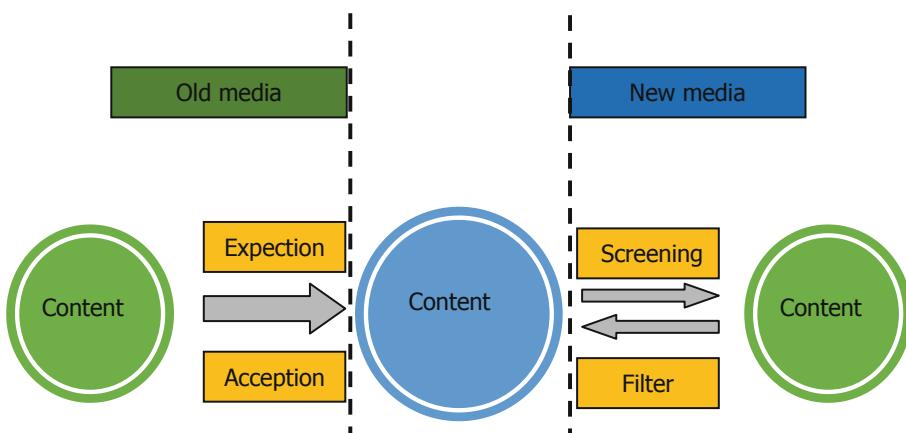
## 1 Introduction

Graphic design refers to a process of conveying information by combining and sketching elements such as images, text, symbols and other elements related to the design. It gives visual memory in the form of images to realize the spread of information. In short, it is to art, visualize and professionalize information. The graphic advertising design is based on graphic design and incorporates computer technology, digital technology and artistic creativity. The visual design of graphic advertising can be said to be a collection of multiple concepts and is relatively comprehensive. It is worth noting that there is a big difference between the visual design of print ads and fine art. The design of print ads pays more attention to practicality. The content it wants to express should be straightforward, eye-catching, and even easy to understand. At this point, it is not as abstract and mysterious as some art works often show; at least there is a difference in the form of expression between the two. Advertising is not only a way to spread information, but also a way to provide people with aesthetics. With the advent of the new media era, people's aesthetic needs are also ever-changing. Traditional print advertising design has been unable to meet increasingly diverse aesthetic needs. Therefore, print advertising design needs to keep pace with the times if it wants to achieve more long-term development [1]. Only by pioneering and innovating, making continuous changes in the new media environment and improving our own strength can we maintain vigorous vitality in the new environment.

## 2 The Visual Design and Expression of Print Advertising in the New Media Era

### 2.1 Dynamic Manifestation

Traditional print advertising designs are mostly presented in static or solid forms. Posters, wall newspapers, etc. are typical print advertising design methods. Their media are mainly printed media, and only stay in a two-dimensional mode. Of course, this graphic advertising design method is also used in current life, but it is obviously difficult to meet people's higher aesthetic requirements. With the advent of the new media era, print advertising design has gradually moved from the previous two-dimensional and three-dimensional framework to a higher stage [2]. In order to present better visual effects, designers use modern information technology to try to improve Multiple dynamic elements are integrated into the advertising design, so that it can also bring new visual experience to the audience when it performs its basic functions (information transmission), as shown in Fig. 1. Facts have proved that these attempts are effective [2]. For example, in the advertising design of a certain car brand, highly infectious music is used as the background music, and the figure of the car speeding on a straight road appears. With the background music, the good performance of the engine of this brand can be heard, and it is beautiful [1]. The car body, the picture is agile and infectious, even in just a few seconds; the visual experience is fully displayed. From the perspective of the overall advertising effect, the designer mobilized the audience's sensory experience such as vision and hearing, and left a deep impression on them [3].



**Fig. 1.** Changes in advertising by new media

The dynamic expression of advertising design has become an inevitable trend in this field. At the same time, print advertising design is not only limited to infecting the audience with visual impact and auditory enjoyment, but also pays attention to the

emotional mobilization of the audience [2]. The abstract emotions are integrated into the graphic advertisement design, which makes the audience resonate. They can see and feel it, and the design effect of the advertisement will be greatly improved.

## 2.2 Non-linear Expression

In the past, traditional print advertising design and communication were mostly realized by direct visual reception, with the characteristics of simplification and linearization. In the era of new media, the development of computer Internet technology has brought changes in the form of expression of print advertising design. Designers can create advertising hyperlinks through information technology and editing methods, and then transmit the hyperlinks to users or audiences through other platforms [4]. Among the pages that the audience can receive, the audience can jump to the relevant webpage to obtain relevant advertising information by clicking on the hyperlink, which is easy and fast. This non-linear form of expression makes the visual performance of advertisements more extensive and free, breaking the limitation of space, and not relying too much on physical objects [4]. As long as they are connected with modern media, they can be transmitted from time to time. Greatly improve people's efficiency in obtaining advertising information.

This non-linear way of expression has both advantages and disadvantages. Network links are susceptible to viruses. Many malicious viruses will be received by users in the form of hyperlinks [4]. Just be careful. The device of the user who opens the link will be attacked. This is also the situation that you need to beware of the use of hyperlinks to spread the advertisement, and try to avoid the disguise of viruses and the infringement of users' interests.

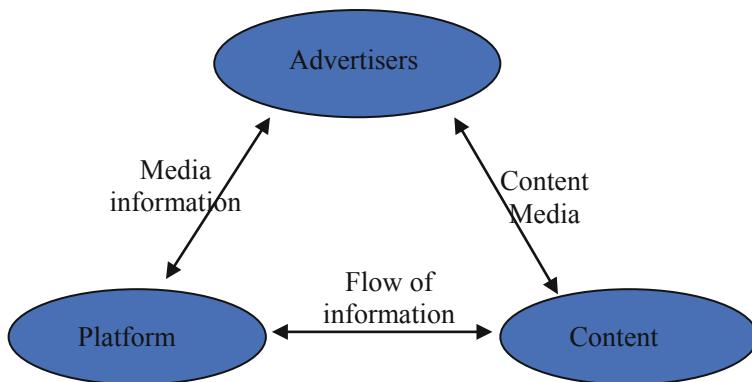
## 2.3 Diversification of Transmission Media

There are many types of advertisement design, including static newspaper advertisements, dynamic TV and film and television advertisements, vivid radio advertisements, and the emerging hyperlink advertisements introduced above. There are many kinds of transmission media, and the communication media in the new media environment increased a lot [5]. In recent years, with the continuous increase in the number of Internet users, the use of mobile devices has increased year by year. The advertising industry sees this trend clearly, and many ads are gradually infiltrating various social platforms. For example, Tencent QQ, WeChat, Weibo, QQ Music, etc., as well as large and small software, as long as you log in or open the software, the page will automatically pop up a variety of advertisements, either static or dynamic, with endless patterns. Not only that, in order to greatly develop the huge market of mobile device users in my country, the design of print ads uses mobile phones as a form of advertising visual expression, such as Xiaomi mobile phones. Not only does Xiaomi use mobile phones as its main product, it also builds Xiaomi into An industry chain has derived many products [5]. Xiaomi has its own advertising platform, and Xiaomi will occasionally push new listed products to users who use Xiaomi phones. Xiaomi mobile phones have become an important way for their company to advertise [6]. In addition to mobile phones and various software as advertising media, black technologies such as

4D technology are also used. In short, the visual design and performance carriers of print ads will be more diverse.

## 2.4 Mutual Integration Between Media

In order to further expand the scope and influence of advertising in the new media era, the design of print ads has gradually shown the development characteristics of media integration. For example, in the advertising design of a clothing brand, the design method of the integration of new and old media is adopted [6]. The division created a digital dynamic showcase and used multimedia technology and Internet technology to organically integrate promotional videos and music related to the clothing brand (see Fig. 2), and installed a sensor that can capture human movements. In the shop window, when the audience is just standing in front of the shop window, a virtual model wearing the brand's clothing will appear in the shop window, and as the audience starts to change their actions, the virtual model in the dynamic shop window will not only respond accordingly At the same time, the clothes on the body will also change with the changes in the movements [7]. After the digital upgrade of the traditional media, it provides a new design form for the design of print ads.



**Fig. 2.** Convergence of new media advertising

## 3 Visual Performance of Print Ads in the New Media Era

### 3.1 Dynamic Manifestation

Since entering the era of new media, print advertising design is no longer limited to two-dimensional and three-dimensional expressions. It is working to break the static and fixed deficiencies of traditional print media and try to incorporate more dynamic elements into advertising design [7]. It can increase the visual performance of advertisements in a dynamic manner while completing the task of information transmission. For example, in the design of a certain wall planting advertisement, the designer uses the full-screen form and a large number of dynamic elements, uses the cicadas as the

background music of the advertisement and uses the earthy yellow as the main color of the advertisement, which makes a sense of summer sultry feel. At this time, the words “Midorie” (wall planting) will appear in the advertisement screen [8]. If the audience clicks on this word, various plants will slowly appear in the screen in the form of animation, and the relevant advertisement text will also appear. Uniform was replaced with a fresh mint green, and the background music was replaced with a breeze sound, sweeping away the sultry atmosphere of the previous advertisement [8]. Under the combination of dynamic elements and visual language, the audience can have a deep impression on the advertisement [9].

### 3.2 Non-linear Manifestations

In the graphic advertising design in the new media era, the visual communication method also shows obvious non-linear characteristics, which also makes the traditional graphic advertising design only along a single narrative direction visual communication has been brand-new development [9]. By using digital media and editing methods, designers adopt brand-new thinking modes and performance perspectives, and on the basis of actively understanding and mastering popular visual symbols and communication media, using hyperlinks and other methods to make users and audiences By clicking the hyperlink, you can immediately jump to the corresponding information and web page, so as to obtain more information related to the advertisement [10]. This non-linear way of expression not only makes the visual performance of print ads more free, but also greatly improves the speed and efficiency of users and audiences in obtaining advertising information, as shown in Fig. 3.



Fig. 3. Non-linear manifestation of media advertising

### 3.3 Diversified Design Carriers

The visual design and expression carriers of the current print ads are also richer and diversified. In the new media era, the design and expression carriers that have attracted

more attention are the Internet [11], mobile smart phones, and so on. For example, in the car advertisement jointly designed by Volkswagen and Tencent QQ, users log in to the Tencent QQ page or the client, and a message of the Volkswagen advertisement will pop up, thereby effectively focusing the attention of online users [11]. Compared with other forms of advertising visual expression, this kind of pop-up advertisement not only has a more shocking visual impact, but also uses the efficient transmission rate and wide spread range of the Internet to further increase the scope of advertising and break through time and space. Constraints. In the Volkswagen advertisements cooperating with Tencent QQ, the use of pop-up forms of expression combined with brilliant advertising colors and domineering car pictures enables the audience to deepen the impression of the brand and products [12]. The audience can click on the “I want to order”, “Takeaway order” and other functions in the WeChat public platform to obtain more information about the dishes in the restaurant, and complete the reservation online or Take-out ordering and other functions. Mobile advertisements represented by the WeChat public platform use pictures and texts to display as many advertisements as possible for users and make it easy for them to click and understand at any time. At the same time, this personalized visual communication method also makes print ads innovative and interactivity is fully demonstrated [12].

## 4 Conclusion

All in all, in the era of new media, the content of the visual design of print ads has gradually shown interactive characteristics, the form of expression has become more dynamic, and the visual expression is also full of personalized colors. In the future development, print advertising design also needs to keep up with the development requirements of the new media era, flexibly use various digital technologies in combination with the actual situation, and constantly innovate the design carrier, making the design more innovative and diverse, so as to help people create a more intense and shocking visual effect.

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# Discussion on the Application of Big Data in Tourism Management

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**Abstract.** The advent of the Internet age has made the travel industry more digital. Judging from the current actual situation in China, big data has penetrated into all aspects of tourism management, whether it is tourism services, tourism facilities or tourism products. Big data integrates information on people's needs, government policies, and tourism resources to make tourism more systematic and comfortable. At the same time, it has further promoted the development of China's tourism industry. This article first introduces big data in the tourism industry, and then analyzes the important role of big data in tourism management, so as to grasp the future industry development trend, and finally explains the use of big data, which is of great significance to the realization of tourism management information goals.

**Keywords:** Big data · Smart tourism · Tourism · Tourism management

## 1 Introduction

The tourism industry is a pillar industry in the national economy and plays an important role in improving the level of the national economy. Tourist attractions can drive the development of the local economy and industrial chain, including the catering industry and the accommodation industry. After entering the information age, the application of the Internet and big data in the tourism industry has gradually deepened. People have begun to inquire about tourist attractions information through the Internet, search for local food and lodging, book hotels, and buy scenic spots [1]. The more commonly used travel software include Ctrip.com, Qunar.com provides convenient conditions for people to travel. It can be seen that the application of big data in tourism management has provided a great impetus for the tourism industry.

## 2 Big Data in the Travel Industry

The so-called big data is a new technology in the information age [2]. It is not possible to collect and manage data through software within the corresponding time frame, so a new processing method must be used to ensure the efficiency of data processing. To a large number of information resources [3]. The application of big data in the tourism industry makes use of the data extraction, storage, search, analysis, and processing functions of big data to provide the tourism industry with a new competitive advantage

and solve problems in the past industry development in a timely manner. As a part of China's economic growth, the tourism industry will inevitably have a lot of data, and these data need to use feasible methods to accurately calculate, and fully solve the problems of traditional calculation methods such as time-consuming and inaccurate results.

## 2.1 Improve the Service Quality of the Tourism Industry

Travel companies can use big data technology to analyze all aspects of the data and information of the travel industry, which can effectively reflect the diverse needs of consumers, which is conducive to the construction of tourism companies to meet the diverse needs of consumers in accordance with the regulations formulated by relevant departments and scenic spots. The public service system of the tourism industry has promoted the comprehensive service of tourism companies and increased consumers' satisfaction with public services in the tourism industry, thereby improving the service quality of the tourism industry.

## 2.2 Improve the Management of Tourism Industry

The tourism industry uses big data to analyze all aspects of tourism information, which can promote the tourism industry to effectively improve the level of public services in scenic spots, and it can also clearly and accurately grasp consumer preferences and real needs, so as to provide targeted services to cater to consumers. Multi-demand products and services, and the use of big data to analyze the operating conditions of tourism companies, and conduct a full range of operational monitoring on them, which can effectively grasp the development status of tourism companies and manage tourism products, and improve the development level of tourism companies themselves.

## 2.3 Promote the Update of Marketing Strategies

Tourism companies can use big data technology to analyze all aspects of the tourism industry, which can reflect the diversified development needs of consumers, quickly and accurately grasp consumer preferences, and help companies understand target people. According to market competition, there are targeted formulate product lines and update marketing strategies to improve the core competitiveness of the company in the market.

# 3 The Important Role of Big Data in the Tourism Industry

## 3.1 Expand the Number of Users

After entering the information age, the application of big data in people's work and life has gradually increased. The Internet is used to realize the rapid dissemination of information, combine various lifestyles, extend people's cognitive categories, and encourage people to actively explore the outside world [4]. The travel industry has developed very rapidly in recent years, and has a very close relationship with big data.

More and more travel software has appeared in people's field of vision. You can also share the experience of the travel process through Weibo and WeChat public account to evoke People's desire to travel has increased the number of users [5].

### 3.2 Improve the Quality of Tourism Services

The traditional form of tourism, because there are some projects with relatively high benefits, it is also more attractive to practitioners. This will have a certain degree of impact on the tourism industry environment and leave a bad impression on consumers. During the transformation and reform of the industry, through the application of big data, travel companies put various projects on the Internet, and participating users can comment on them, making the internal environment of the travel industry more open and transparent. In this way, strong supervision of the development of the tourism industry has not only optimized the industry environment, but also improved the quality of services [6].

### 3.3 Improve Marketing Accuracy

Innovation in the tourism industry is also reflected in marketing. With the support of big data, industry information is becoming more and more abundant. By analyzing this information, marketers can accurately classify users and understand their travel needs. The marketing methods and precise positioning content used during the marketing period is the key to marketing. For users, it also provides convenient conditions for users to obtain the required information, improve the accuracy of tourism marketing, and draw marketing staff and Consumer relations.

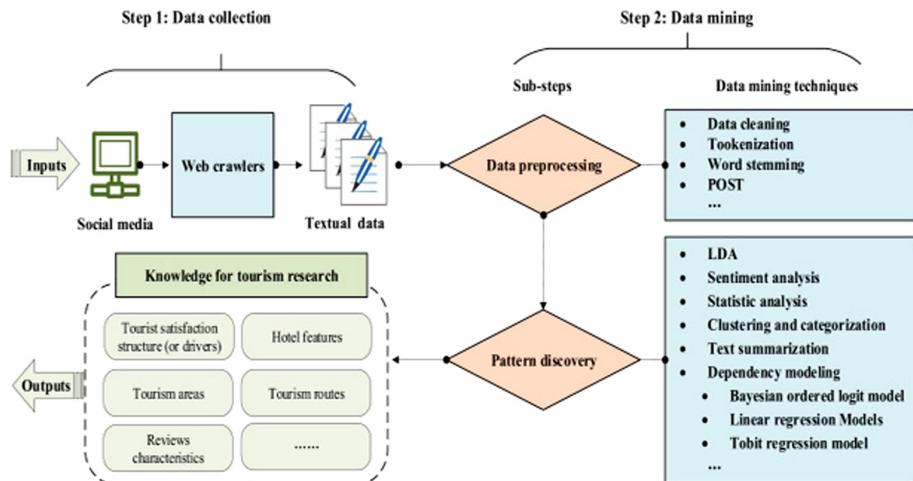
## 4 Discussion on the Application of Big Data in Tourism Management

Tourism big data can not only make resource adjustments and tourism plans for specific tourist locations, but also evaluate resource division, marketing methods and precise services in the tourism market, but also analyze the overall development level of the entire tourism area and the integration of consumers Tourism concept, so as to better promote the operation of Chinese tourism management enterprises [7–9].

### 4.1 Use Big Data to Accurately Analyze and Reasonably Speculate on the Needs of Each Link in the Travel Chain

There are two main aspects to tourists' travel needs. Firstly, they require the hardware facilities in the source area. They hope that the food, housing, and transportation of the tourist destination are safe and sanitary. The second is the requirements for software facilities such as tourist service attitudes. They hope that the service staff in tourist destinations can have a warm and respectful attitude. However, the infrastructure construction of tourist destinations is a relatively stable process. It has been basically determined when the government or tourism enterprises determine the nature of the

tourist destination and the main service targets, and there will be no obvious changes in the future tourism management, as shown in Fig. 1. This is also an aspect that can be predicted and changed by other links in the tourism chain.



**Fig. 1.** Big data accurately analyzes and reasonably infers the needs of each link in the travel chain

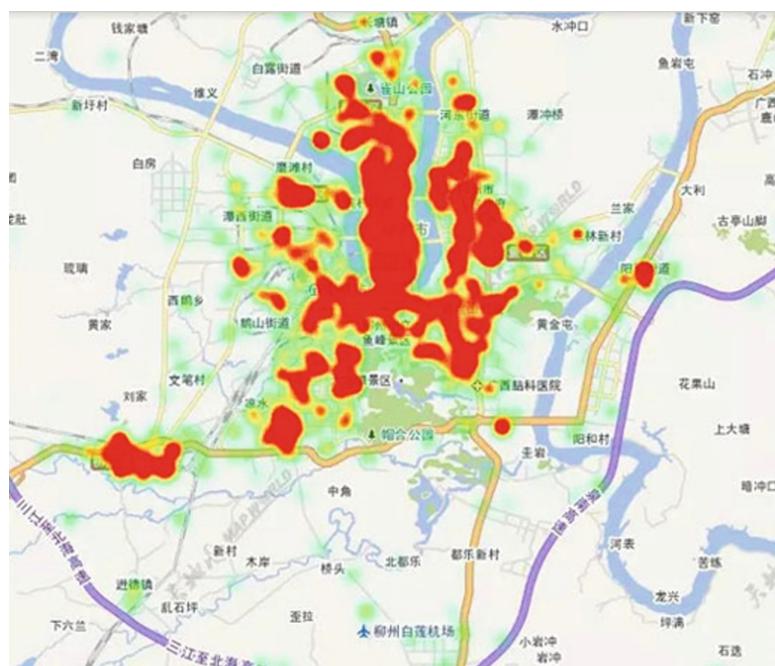
## 4.2 Realize the Sharing and Integration of Tourism Information Through Big Data

Big data connects all aspects of tourism together. Through this huge network, tourism managers can integrate tourism market information, corporate information, and tourist demand information, thereby allowing multiple links in the tourism chain Synchronize coordination and cooperation. In the past, travel products required people to experience them at the tourist source site before they could feel it. The expectations presented before the experience were through other people's verbal narration and the same product description, but because everyone's personality is different, so this disunity between production and consumption has increased the risks of both parties to a certain extent. However, the application of big data in tourism management enables timely feedback and sharing of all aspects of information, allowing consumers and producers to adjust products according to the information they need. The development and application of various review software has also made a basic guarantee for the production efficiency of tourism products [10].

## 4.3 Use Big Data to Achieve Tourism and Precision Marketing

For tourism, precision marketing mainly refers to the implementation of different focused marketing programs for different types of tourists on the basis of meeting the service needs of tourists, so that everyone's tourism can meet their own personality

characteristics and temperament types, and can achieve their own An ideal travel experience can be a unique memory. Big data can help managers obtain the hobbies and behavior characteristics of tourists, so as to accurately divide the resources of the tourist source at the initial stage of infrastructure construction, and divide the tourist sites into multiple characteristic projects and according to the different tourists Basic attributes recommend them to go to different venues to achieve precision marketing. However, the simultaneous conduct of multiple unique tourist sites does not mean that the proportion of each type of tourist project is the same. Tourism managers must determine the main source of customers based on the information displayed by big data and their own economic strength, so as to allocate funds and energy consumption appropriately, as shown in Fig. 2. This method of analyzing tourist hobbies and types based on the technology of big data statistical analysis can help tourism managers accurately grasp the company's position in the tourism market, and refine the company's tourism venues and tourism projects, and implement precision marketing [11].

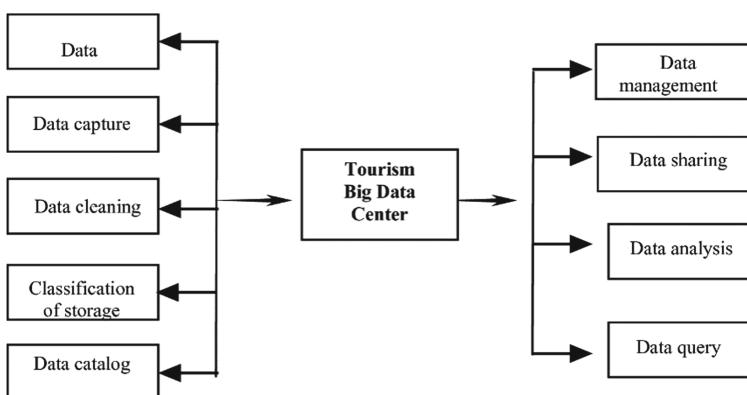


**Fig. 2.** Big data implements tourism monitoring for precision tourism marketing

#### **4.4 Use Big Data to Make Macro-control on Tourism Management in a Timely Manner**

The variability and broadness of the tourism market determines that tourism managers should always pay attention to development trends, and conduct research and analysis within the market to determine the development scale and development direction of

tourism projects. Big data technology provides technical support for achieving this goal. Through the data analysis of the tourism market over the years, tourism managers can conduct in-depth analysis of the needs of tourists, have an overall grasp of the wind direction of the tourism market, can also carry out macro-control of tourism projects, and propose a set of scientific and reasonable tourism project construction. The plan enables the scale and project of tourist source to be in line with the actual development of the enterprise, and enables tourism planning to precede market development. The macro-control of big data on tourism management is also reflected in the manager's ideology. It puts the needs of tourists in the first place, and integrates Internet technology and other aspects into tourism projects, making tourism projects more substantial and diverse [12] (Fig. 3).



**Fig. 3.** Big data timely collection and macro-control of tourism management data

## 5 Conclusion

In summary, the application of big data in modern tourism management is not only conducive to improving the level of tourism management, but also conducive to the creation of efficient tourism. However, in the process of applying big data at this stage, there are still some problems. Therefore, certain measures must be taken to deal with these problems, so as to better obtain the needs of tourism customers and the tourism market through the fine and accurate analysis of big data, and then promote the development of the overall tourism industry.

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# Exploring the Employment and Entrepreneurship Model of the Deaf Under the Background of “Internet+”

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**Abstract.** Currently, the cause of the deaf in China is under active construction. The rise of “Internet+” has brought new opportunities for the employment and entrepreneurship of the deaf, and also created the possibility for the transformation and upgrading of the employment and entrepreneurship of the deaf. However, the Internet has not yet fully played its role in assisting the disabled in employment and entrepreneurship. It faces many obstacles from the society and the deaf themselves, and it is urgent to break the deadlock. In the context of the Internet, how to promote the employment and entrepreneurship model of the deaf.

**Keywords:** “Internet+” · Deaf · Employment · Entrepreneurship · Model

## 1 Introduction

At present, the employment of the deaf in China is mainly divided into four types: concentrated employment, proportional employment, individual flexible employment and community employment. The new employment model has not yet matured. The “Internet+” employment model for the disabled has not yet played a complementary role in the form of concentrated employment support and proportional employment [1], and the employment willingness of the deaf cannot match the employment model of the information industry [2].

## 2 Problems of Deaf Graduates in All Aspects of Employment

### 2.1 Choices for Employment

Compared with deaf college students, sound fresh graduates have a wider range of employment options. Fresh graduates can choose different companies or even cross-professional employment. Deaf college students learn by themselves due to communication barriers with the outside world. It is more difficult. In addition, the probability of deaf graduates taking the civil service examination and being successfully admitted is also relatively low [3]. But in some majors, deaf college students are more capable but difficult to be discovered by companies. At the same time, deaf college students are not very sensitive to information, and their ability to collect information is relatively

weak. We need to use the resources of the library and our own professional advantages to guide deaf college students to prepare and coordinate work [1].

## 2.2 Access to Information Resources Before Employment

Currently, recruitment-related software and websites on the market are not uncommon, but these Internet-based platforms pay less attention to the needs of deaf graduates. Although there are companies that can accept deaf people, most of them are related to manual labor. The manual work does not match what deaf college students learn in university, which is a waste of human resources. At the same time, these platforms also did not provide relevant information about related companies that cooperate with the China Disabled Persons' Federation (hereinafter referred to as the Disabled Persons' Federation). This has caused a big gap between deaf college students and able-bodied college students in obtaining information resources [2]. Obviously, deaf college students can obtain much less information than ordinary college students. When the able-bodied people's college students have already enjoyed the convenience of the Internet for their employment, it seems that it is still far away for deaf college students to use the Internet to obtain more and more effective resources [3].

## 3 Employment Barriers for the Deaf in the Context of “Internet+”

### 3.1 Deaf People Have Low Levels of Education

The level of education will affect the cognitive ability of the individual. The higher the level of education, the stronger the cognitive ability of the disabled individual on things [5]. However, the current insufficient supply of special schools makes it difficult to meet the educational needs of all deaf people. As a result, the education level of most deaf people in China stops at elementary school and junior high school, and the average educational level is far lower than that of healthy people. Under the background of “Internet+”, the importance of human capital such as knowledge, skills, and creativity is constantly increasing. Deaf people must have sufficient professional knowledge and skills to be competent for Internet-related jobs. However, most deaf people are not yet proficient in using computer and network resources, and it is difficult to adapt to the “Internet+” work model. Some positive and motivated deaf people hope to narrow the gap with healthy people through self-study and fast-food vocational training, but the actual effect is not ideal [4]. Therefore, the low level of education greatly restricts the deaf people's use of the Internet to find employment and entrepreneurship.

### 3.2 Deaf People's Mental Health is Not High

Deaf people generally have different degrees of psychological problems, often self-denial, self-doubt, and avoid contact with the outside world. Some people with a more serious degree of self-closing do not have the desire for employment and entrepreneurship at all, maintain a negative attitude towards life and lack motivation;

while the deaf group in the process of employment and entrepreneurship often runs into a wall due to the disconnection of communication with the society and strong self-esteem [6]. In today's society, the network of relationships is a key factor in determining employment competitiveness. In the Internet industry, only by mastering a wider social circle can you earn considerable income. The social circle of deaf people with poor mental health is very narrow, and it is difficult to find a sufficient source of customers. There is a general situation of "not selling goods when available" [7].

### **3.3 E-Commerce Entrepreneurship is Difficult**

E-commerce entrepreneurship itself has a high degree of difficulty. First of all, the establishment and operation of online stores have high capital requirements, and it is difficult for disabled entrepreneurs to bear the high start-up capital and promotion costs. Except for the one-time start-up funds given by the government, it is difficult for deaf people to obtain financial support from other social organizations. Secondly, in terms of supply, deaf people are easily squeezed out of the market by competitors due to the inconvenience of travel, limited social scope, and lack of stable and price-competitive supply [7]. In addition, the constantly changing market supply and demand relationship is difficult to predict, and even ordinary entrepreneurs are frequently faced with the risk of bankruptcy.

### **3.4 Companies Have a Tendency to Avoid Risks**

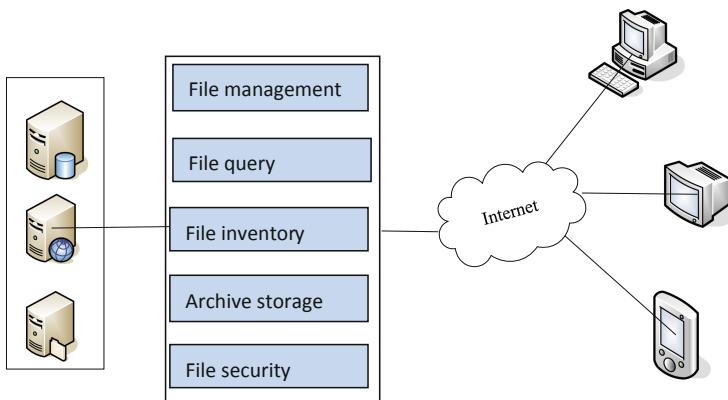
Various practical factors such as obstacles in the working environment, poor interpersonal communication, low physical fitness, and weak stress tolerance make companies worry about recruiting disabled employees [8]. Although in some jobs, the labor cost of deaf people is much lower than that of ordinary people, companies still refuse to hire disabled labor because of the low productivity of deaf people, the high rate of defective production, and the high risk of accidents [9].

## **4 Employment and Entrepreneurship of the Deaf in the Context of the Internet**

### **4.1 Improve the Training System for the Deaf**

First, promote the long-term companionship mechanism of deaf individuals, highlighting the personalized care for the trainees. It is recommended that the training organizer formulate a personalized training plan based on the specific situation of the trainees [8]. Before the training, pay attention to the information collection of disabled trainees, comprehensively analyze the four aspects of family, disability, education and psychology to form a report, and make specific task arrangements based on the report. In the training, the mode of combining group teaching and group tracking is implemented: group teaching focuses on knowledge explanation and communication among trainees, group tracking is manifested as "one-to-one" or "many-to-one" tutoring, and tutors perform supervision and feedback, the task of guidance to ensure the quality of the

trainees [8]. After the training, continue to track the development of the trainees, give employment guidance and provide employment resources. Second, broaden the sources of training hosts and make full use of resources from all walks of life. It is recommended to strengthen the cooperation between the government and non-governmental organizations, commercial training schools, network training institutions, etc., promote the marketization of training for the deaf, and expand the current government's annual regular planned training into a flexible time slot, multiple contractors, and multiple locations [9]. Third, update training content and develop "Internet+ characteristic industries". It is recommended that a large number of Internet-related training courses be increased, and the courses are offered in grades from easy to difficult. For the deaf group with a certain amount of Internet knowledge, practical courses can be carried out, such as the operation of Taobao stores and the daily work of customer service, as shown in Fig. 1. In addition, it is also recommended that each region combine with local characteristic industries to offer characteristic "Internet+" entrepreneurship courses [10].



**Fig. 1.** Online training model for the deaf

## 4.2 Establish a One-Stop Deaf Affairs Management Platform and Portal Website

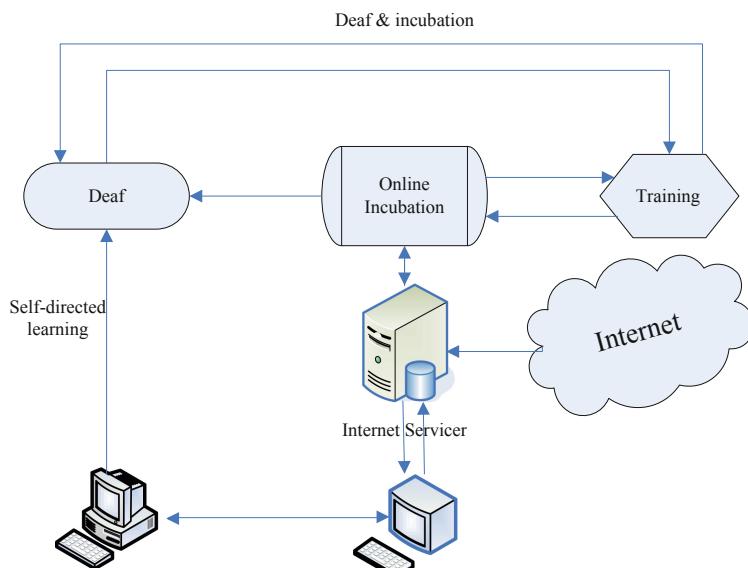
First, establish a one-stop deaf affairs management platform internally, covering various aspects such as data platform, regional interconnection, enterprise docking, and subordinate unit jurisdiction [11]. At the same time, different decision-making modules are added according to the type of deaf affairs, such as deaf training, deaf Employment distribution, etc. Encourage the unified use of all regions and all levels of government departments, give full play to the role of information transmission, information analysis, and information sharing, and truly achieve breakthroughs in regional barriers and improve efficiency through "Internet+" [10].

Second, actively establish a portal website to enrich the content of the website. The portal website is a window of publicity and communication. It is recommended to broaden the existing website sections, increase the frequency of website updates, and focus on the connection with deaf individuals [11]. Although existing websites have

job search windows for the deaf, they have not played the actual main role. Therefore, it is recommended to invest heavily in the construction of employment recruitment platforms, on the one hand, actively publicize job information and provide abundant employment resources, on the other hand collect deaf individuals Information, increase the employability assessment model, and make it easier to give the most suitable matching suggestions [11].

#### 4.3 Use Big Data to Achieve Tourism and Precision Marketing

Promote the establishment of an incubation mechanism for e-commerce businesses for the deaf encourage all regions to actively establish deaf people's e-commerce business incubator parks. Special preferential policies are implemented in the incubation park to attract deaf entrepreneurs to join, provide them with funds, places, equipment and other resources, and provide services such as training, business docking, and distribution [12], as shown in Fig. 2. Regularly evaluate the entrepreneurial achievements and issue stage bonuses to stimulate entrepreneurial motivation. At the same time, vigorously attract high-tech enterprises to settle in, provide tax relief, government cooperation and publicity and other preferential conditions, while promoting the cooperation between enterprises and disabled individuals and teams, it also creates opportunities for cooperation between settled enterprises and promotes the formation of regional high-tech industrial circles., To achieve self-sufficiency and independent operation. In addition, special attention should be paid to the building of self-operated brands, which can gradually gain public recognition by co-branding with well-known brands in the society around themes of public welfare and technology [12].



**Fig. 2.** Internet incubation

## 5 Conclusion

The employment problem of the deaf needs to arouse widespread attention from all walks of life. With the development of society and the update of science and technology, the opportunities for deaf people to receive higher education are also increasing. How to minimize the gap between the deaf and the able-bodied, how to promote the integration of the deaf, and how to enable the deaf to be fully employed after employment utilizing our own professional advantages, etc., are all issues that urgently need us to solve. The school should closely follow relevant policies, continuously optimize the teaching process, actively improve the education and teaching environment, and provide better guidance for the smooth employment of students in the future; enterprises should improve their own office environment, optimize the design of the talent distribution structure within the enterprise, and strengthen.

**Acknowledgments.** This paper is supported by the Foundation of Zhejiang Vocational College of Special Education for Team Projects of Teaching Innovation.

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# The “Artificial Intelligence + Social Governance” Mode: Risk Prevention and Governance Ability Improvement

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**Abstract.** The application of artificial intelligence, on the one hand, can liberate human from the heavy physical labor; on the other hand, it can solve problems that human intelligence can't solve and help the development of human. This paper analyzes potential risks and development bottlenecks caused by the embedding of artificial intelligence into social governance, discusses methods of using artificial intelligence to cope with people's increasingly diversified needs and social risks brought about by artificial intelligence, and puts forward reform measures to improve the ability of social governance.

**Keywords:** Artificial intelligence · Social governance · Risk prevention · Governance ability improvement

## 1 Introduction

Today's society is in a state of high complexity and uncertainty. Human beings are stepping into a new era of information society driven by the Internet, big data, cloud computing and artificial intelligence. The information society, a model of management innovation driven by technological innovation, “has formed a governance system with big data and cloud computing as network platforms, and with flat and decentralized intelligent governance as the core. The participatory governance is characterized by fragmentation and resource integration. Based on the expansion of interactive space, it has formed a co-construction and sharing governance mode with multiple subjects participating in interaction” [1].

### 1.1 Artificial Intelligence

Artificial intelligence means “intelligence simulated or realized by electronic computers” [2]. In the field of artificial intelligence, the academic circle of China focuses on computers and the Internet; the research on social science is also increasing. As a high-level product of the information age, modern artificial intelligence takes data and knowledge as the carrier. Through the acquisition, expression and use of data and knowledge, it can realize the goal of processing complex tasks. It contains data mining, machine learning, computer vision, the knowledge processing system, natural language understanding, automatic programming and other complex links [3]. With the

development of autonomous learning and deep learning algorithms, artificial intelligence gradually develops from weak artificial intelligence to strong artificial intelligence. Strong artificial intelligence not only has the ability of using data analysis, reasoning and solving problems, but also has the sense of autonomy. It can provide specific solutions according to the changes of specific application scenarios, and realize the transformation from smart governance to intelligent governance, which also means the arrival of the era of artificial intelligence.

## 1.2 Social Governance

Based on the complexity of society, the social governance of multiple subjects needs to be reflected from three aspects. The first aspect is value guidance, which needs to build a good social value foundation. “How to coordinate the value relationship among individuals, groups and the society has become a permanent issue that perplexes human beings” [4]. The second is system construction, which requires the construction of an orderly social system. This system includes politics, economy, law, culture, education, technology and so on. The institutional arrangement and adaptability of these social elements determine whether the society can operate smoothly. The third is life shaping, which needs to construct the order of daily life. To meet the daily needs of social members, we need not only the spontaneous coordination among members, but also good manners and customs in the sense of daily social construction. This is the bottom order that a society can grow out of long-term running in the world of daily life [5].

## 2 Embedded Artificial Intelligence: A New Picture of Social Governance Model

The human society has strong expectations for artificial intelligence. “On the one hand, it can liberate human from the heavy physical labors; on the other hand, it can solve problems that cannot be solved by human intelligence and play a role in helping human development” [6]. At present, the “artificial intelligence + social governance” mode has brought a new picture to China’s social governance methods.

### 2.1 Intelligent Governance

The intellectualization of social governance is the inevitable result of the close combination of the social governance and the technological system, which mainly includes two aspects. On the one hand, it refers to the introduction of artificial intelligence in the process of social operation. For example, the intelligent level of traffic management is greatly improved, which greatly alleviates the contradiction between heavy traffic and the low control ability of the traffic control system designed by human intelligence. Another example is the criminal investigation. The use of face recognition can uncover criminal cases that have not been detected for a long time. On the other hand, the artificial intelligence system can directly maintain the social order, and in many cases, it can play a direct control role without the help of human intelligence and physical fitness. For example, today, in large-scale cities of China, the Tianyan system plays an

increasingly important social role. “The ‘Tianyan’ digital remote monitoring system can realize the remote video monitoring through Intranet and Internet. It is suitable for chain stores, kindergartens, factories, public security and fire control stations, banks, highways, shopping malls, hotels, tourist attractions, residential areas, hospitals, prisons, docks and ports” [7]. The artificial intelligence system plays a broad and direct role in various fields of social governance.

## 2.2 Scientific Decision

The fundamental guarantee of social governance is to obtain real and comprehensive information, to process information quickly and accurately, and to implement effective decision-making procedures. In traditional governance, we need to invest a lot of time and manpower in the collection, processing and analysis of data. It is difficult to collect comprehensive and real information for decision-making, which also leads to many uncertainties and risks in the decision-making of the government, enterprises, social organizations and other subjects. The era of “artificial intelligence + social governance” has strong advantages in data classification and processing. It can provide more comprehensive, real and effective information for decision-making, and improve the quality of decision-making. At the same time, in the decision-making process, with the help of a new round of technology applications such as big data, actuarial science, super arithmetic and the block chain, “artificial intelligence can improve the comprehensive and effective decision-making information, and automatically generate corresponding decision-making schemes according to the needs of decision-makers, so as to greatly improve the quality of the government’s decision-making, and provide strong decision-making intelligence and power guarantee for promoting the modernization of governance capacity” [8].

## 2.3 Smooth Flow of Information

The active and effective interaction among various subjects, including the government, enterprises, third-party organizations and the public is the fundamental guarantee to promote the modernization of social governance. In the era of traditional governance, the interaction between the government and the public is restricted. The public may doubt the government’s operation modes like closed policy formulation and policy implementation; the credibility of the government is greatly reduced. At the same time, with the advent of the risk society, public crises and public security risks are increasing day by day. Public opinion is regarded as an object that needs to be avoided cautiously. The behavior of avoiding responsibility is further strengthened; the relationship between the government and the people is more difficult to coordinate and improve. Artificial intelligence technology can effectively solve the problem of limited attention and insufficient ability of each subject. The daily interaction between subjects, the information collection and classification, the social public opinion monitoring, the cyberspace public opinion supervision and other work can be dealt with by the artificial intelligence platform. The wishes and demands of the public can be accurately and effectively concerned by the government or relevant organizations, and their demands can get responses in time.

### 3 Facing Artificial Intelligence: New Thinking on the Process of Social Governance

It is very important for the development of social governance in China to face up to artificial intelligence and explore potential risks and development bottlenecks caused by the embedding of artificial intelligence technology into social governance.

#### 3.1 Potential Risks of Artificial Intelligence Embedded in Social Governance

Technology always brings negative impacts on human beings. This is not only the driving force of technological progress, but also the reason why human beings must regulate the development of technology. It is necessary to be alert to technologies, especially the most advanced technology, and to carry out technical fortification in the whole process of its use. Artificial intelligence, which imitates human intelligence, is also used for the purpose of social control. If we lose our vigilance, it is likely to cause inestimable negative impacts on human beings [9].

##### 3.1.1 Social Security Concerns Brought by Artificial Intelligence

First is the risk of reverse technology imitation. If a technology in artificial intelligence is used by lawless persons, it will become an anti-monitoring way, or even become a technical means for reverse profit seeking. For example, the face recognition used in the bank payment system has been broken through by the simulation of human faces. It has lost the barrier function of guaranteeing the interests of the real payers in the legal sense. Therefore, this technology may be alienated into an illegal and criminal means to infringe the interests of legitimate network payers that should be protected.

Second is the cross information leakage risk. The fingerprint and face recognition systems are widely used in artificial intelligence. They are not only single recognition information; they can track to people's identity information, action traces, property situations, relatives, social circles and so on. These identification systems are not under the unified monitoring of the state. Various commercial organizations and social organizations can use this system, and the personal information of citizens is mastered by these people and institutions. How they use such huge citizen data becomes a matter of their own will [10]. At the same time, in the actual promotion of the face recognition system, security and capital are the two main promoters. The government is attracted by the convenient control of personal information, and becomes the most direct and powerful driving forces to encourage the two big promoters to act bravely. This situation makes the face recognition system rapidly develop in the absence of security guarantee [11]. This is the risk under the condition that the state effectively controls the order. If the country falls into some kind of disorder and turbulence, the huge amount of data obtained from intelligent control maybe used for more vicious purposes.

##### 3.1.2 Social Ethical Issues Behind Artificial Intelligence

The arrival of the era of artificial intelligence has promoted the profound change of the traditional social governance mode. The governance subjects, governance means and

governance value orientation in the original governance system change accordingly. Social ethical problems caused by the transformation of this artificial intelligence include the following aspects.

First of all, the highly intelligent work and corresponding risks caused by the application of artificial intelligence will appear with its wide application. For example, artificial intelligence can occupy some positions and lead to unemployment of human beings; the loss of human's labor value, the decline of human's labor skills as well as related knowledge, experience, reasoning and decision-making abilities may lead to human retrogression [12]. Then, with the higher degree of autonomy of artificial intelligence, we need to think about the design and implementation of the artificial intelligence moral agent. For example, what kind of ethical principles should be given to artificial intelligence, and how to make it obtain the ability of ethical reasoning and ethical decision-making similar to human beings? This involves the application of formal logic, mathematical reasoning, the rule base and machine learning in ethical judgment and decision-making [13]. Moreover, when artificial intelligence has self-awareness, it will also breed similar human desires and weaknesses. The ethical rules they follow may no longer serve the interests of mankind but serve their own interests, which is also an important issue for us. On the other hand, how to deal with the artificial intelligence system is also a problem that needs careful consideration.

### 3.1.3 The New Social Crisis of Digital Leviathan

“The State Leviathan” is an uncontrolled monster created by human beings. People depend on the “peace and security” guarantee provided by a powerful country, but they always have a card up their sleeves to prevent it from escaping the shackles of the rein [14]. With the development of information technology, the value of data has been improved unprecedentedly. Data is known as the oil in the era of artificial intelligence. People enjoy the convenience brought by digital technology in an all-round way. At the same time, they also feel that they are “bound to data”. “Digital technology, as a way to constrain state Leviathan, began its alienation process, and then evolved into a new Leviathan - ‘digital’ Leviathan” [15]. It is often understood as putting citizens under a thorough and effective information technology monitoring system, while citizens are difficult to effectively use information technology to protect their civil rights. They cannot use the digital democracy to check and balance the state monitoring system. The essence is a process of combining technical means with state power to produce huge political effects [16]. It reflects the state’s control ability in a more secretive and firm way. The state can use the value rationality and instrumental rationality of artificial intelligence technology to weave a new type of state power network, and the state will be displayed through the formulation of algorithms, so as to strengthen the national monitoring ability and social management ability.

## 3.2 Constraints of AI Embedded in Social Governance

At present, artificial intelligence is still a clearly limited technology. There are technical and social reasons for its limitation.

There are technical reasons that limit AI. Generally speaking, these capabilities of intelligent machine devices make responses according to established procedures

designed by human beings, which is different from the autonomous responses made by human beings through the brain [17]. In the future, even if intelligent robots may achieve a high degree of human-computer integration, the machine can show some ability to respond to the environment autonomously, and show the prospect of machine self-vitality, it is not likely to replace human beings. The reason is that it is very difficult for the human brain science to realize the brain replication technology, which is the ultimate reason that robots can only be robots. They are “things” receiving human instructions, rather than “people”. The measurement of mirror neurons in human brain can provide support for the development of artificial intelligence. However, the emotional and social mechanisms of human brain responses cannot be imitated, which means that advanced intelligent robots cannot become the existence beyond human beings and control human beings in turn. Even if AI experts are worried about large-scale intelligent lethal weapons and whether human beings will become slaves of AI, “it can be predicted optimistically that these weapons are also made by human operation, and ultimately, human beings are required to solve disputes, prevent war crisis and solve life settlement problems” [18].

There are social reasons limiting AI. It is true that artificial intelligence has replaced human beings in many fields. It is so ferocious that people begin to imagine the terrible prospect of artificial intelligence controlling human society. Cautiously, with the rapid development of artificial intelligence, there is no reason for us to declare that these concerns are groundless, but there is an inherent possibility of social resistance. The composition of human society is not only the combination of various systems on the surface. There are various and subtle micro structures behind it; they play an important role in supporting the human society. On the one hand, artificial intelligence is difficult to form a society independently; it can only exist and play a role as a dependent of human society. On the other hand, in many fields, artificial intelligence seems to squeeze out the living human's social functions, thus increasing the vigilance on artificial intelligence products.

## **4 Making Good Use of Artificial Intelligence: A New Breakthrough in Social Governance Reform**

The rise of artificial intelligence technology “is not only a technological revolution, but also a revolution in decision-making and governance. It is opening up a new unknown space and may bring about social changes, especially in the field of public governance” [19].

### **4.1 Structural Adjustment of Social Governance Subject: From “Center –Periphery” to “Multiple Coordination”**

Government departments have advantages in information and resources; they are in the central position of the system, forming a “center and periphery” structure. It does not only affect the function of the market and the society, but also often leads to government failures. The “Artificial intelligence + social governance” structure can promote the realization of “multiple coordination”.

The government's comparative advantages come from the possession of data and information. Artificial intelligence is conducive to the interconnection of underlying data. It is not only conducive to government departments to obtain data information and improve their macro-control and public service capabilities, but also requires the government to share data, which weakens its central position, and promotes the government to become more open, transparent, equal and collaborative. As the mechanism of the optimal allocation of social resources, the market not only increases the transaction cost in the case of asymmetric information, but also brings potential security risks because the information is freely obtained and occupied by the third party. Artificial intelligence can not only solve the problem of mutual trust through information symmetry, but also enhance the equivalence relationship between the market, enterprises and the government, and enhance the effectiveness of social governance participation. Artificial intelligence can enable micro individuals in the society to participate in the process of social governance with free and equal identities. It not only improves the ability and initiative of actions, but also strengthens the restriction and supervision of the government's decision-making and behaviors.

Therefore, from the three dimensions of the government, the market and the society, we can realize the co-construction, co-governance and sharing of the social governance pattern. At that time, all network participants become partners and play an equally important role in the governance of public affairs. The consensus agreement will be implemented in the form of smart contracts. The allocation of social resources is jointly determined by all participants, and the governance responsibility and results are determined by all participants.

## **4.2 Optimization of Social Governance Discourse Structure: From “Monologue Discourse” to “Consensus Discourse”**

The current discourse structure, to a certain extent, is still the continuation of the “monologue discourse”. In the governance of public affairs, the “discourse hegemony” of government departments and the “collective aphasia” of the public often occur. Especially in the face of some intractable public problems, the voice of the general public with interests can be easily submerged by the voice of the so-called government and experts. The failure of common value has become an important manifestation of the imbalance of discourse structure. Using artificial intelligence can realize the transformation of discourse structure from the “monologue discourse” to the “consensus discourse”. On the one hand, artificial intelligence can guarantee the identity and information equivalence of network participants. The occurrence of “discourse hegemony” and “collective aphasia” is the result of the difference in the amount of information and professional knowledge held by different subjects. Artificial intelligence enables all network participants to express their views and opinions on certain public affairs. On the other hand, according to the theory proposed by Fox and Miller, artificial intelligence is more like playing the so-called “public energy field” function [20]. Based on the discourse consensus of various governance bodies, in the “decentralized” environment, only the agreement authorized by all network participants has “legitimacy”. Once the participants have reached an intelligent contract, the computer program will execute it mandatorily and automatically.

#### **4.3 Restructuring of Social Governance Power Structure: From “Unbalanced Distribution” to “Balanced Allocation”**

Power is the special influence among people. The power structure represented by the power allocation among the governance bodies has not yet reached a balance. It is still difficult for the power of other governance bodies to have a direct impact on public policy-making and public affairs. The situation is in the state of “distribution imbalance”. Artificial intelligence is expected to realize the restructuring of social governance power structure through the “balanced allocation” of power.

Meanwhile, artificial intelligence ensures that all social governance subjects can realize their power through distributed data, decentralization, security and credibility, as well as intelligent contracts. It puts these governance subjects in the field of dynamic supervision and being supervised; each network participant has the ability to influence others, and the power structure of social governance presents a balanced situation. On the other hand, the reorganization of power structure follows the idea of equal rights of all citizens. The basic idea of social governance power allocation based on artificial intelligence is to recognize the equal power of all citizens. At this time, the power is no longer given by the system or the law, but comes from the legitimacy support of mutual recognition and agreement. Compared with the current social governance situation, the power structure of artificial intelligence is more in line with the essence of post-modern social governance. The absolute decentralization, personalization, equalization and decentralization of power structure are the adherence and compliance of governance values such as equality, participation, pluralism and autonomy.

## **5 Conclusion**

The well-ordered society is a realistic social form worthy of expectation. It is built on the basis of differential cooperation; it keeps stable on the cornerstone of common justice concept, and is strongly maintained by relationship among citizens. Such a society is obviously not a social form that can be directly designed and effectively maintained by artificial intelligence guided by procedures. It can only be constructed and maintained by human intelligence. However, some technical supports provided by artificial intelligence can greatly optimize human’s disposal of specific affairs in social governance. The supplement of artificial intelligence to human intelligence is worthy of attention, and the effective substitution of human physical fitness is worthy of praise. In this regard, the integration of human intelligence and artificial intelligence for the purpose of constructing a well ordered social is a good way of high-level social governance.

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# Accurate Prediction of NBA Players' Lifespan with Big Sports Data

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**Abstract.** This study aims to figure out which factors can be a significant risk predictor for the lifespan of professional basketball players and to figure out which machine learning model can be used to predict NBA players' lifespan. This paper explores the relationship between response variable American professional players' lifespan and predictors including handness, total points earned during career (PTS), height, weight, position, and ethnicity using data from departed sportsmen who have worked in the National Basketball Association and the American Basketball Association. This study compares different machine learning and decides to use regression for the prediction. The cut-off date for death data collection is August 1, 2020. Overall, this analysis included and identified 920 deceased players. As a result, weight and PTS play the most crucial factor which affects NBA players' lifespan. Besides, the range of weight is between 137.00 pounds to 284.00 pounds, with a standard deviation of 22.48, and has a mean weight of 199.03 pounds. Except birth periods before 1920 and from 1941 to 1950, the most massive players are more likely to die younger than the lightest players based on the descriptive finding. Similarly, Polynomial, Lasso, and Ridge regression analyses show a strong relationship between the predictor weight, PTS, and response lifespan. The mortality risk of more massive and high PTS players is significantly higher than lighter and lower PTS players. Understanding the potential risks of early mortality can help NBA players better plan their training sessions to improve their life quality.

**Keywords:** Lifespan · Regression · Machine learning · NBA players · Big sports data

## 1 Introduction

In today's cultural society, people hold negative views about life's longevity for people who are engaged in certain professions [1]. Sadly, some well-known former National Basketball Association (NBA) players, such as Darry Dawkins and Moses Malone, emphasize this assumption that NBA players can die younger than normal individuals. The argument that bigger body size can result in shorter life expectancy has been gradually confirmed in recent scientific research. Samaras and Harold Elrick, for example, proved that shorter stature is better for the human body, and this study is backed by over 25 years of evidence [2]. The authors obtained insights from different human beings species, including African American, White, Asian, Indian. They found that shorter human height would not adversely affect people's health, and shorter ethnic

groups would have achieved lower mortality rates. Moreover, the writers often make use of data from livestock. Furthermore, the result shows that while larger species tend to grow smaller and live longer than smaller species; adverse outcomes for the same species will be preferred. Analysis of the research reveals that greater height tends to play an adverse role in affecting people's longevity [3]. However, Mondal and Shitan (2013) suggested that relative weight, various clinical activities, daily exercise routine, social status, and economic status have impacts on the longevity of healing and lifespan, which suggests that we need to understand the relationship between body size more critically and longevity of lifespan.

This research aims to broaden the study for the national basketball players NBA) and provides an accurate machine learning model based on analysis of the relationship between body size and lifespan longevity. Although several variables affect the expression of a person's longevity profile, the objective of this study is exclusively to measure weight and its role for NBA players in lifespan longevity. However, if weight independently affects longevity, deceased NBA players stand for a promising community to further explore this phenomenon, based on the fact that their exceptional general weight and other confounders such as wealth. For NBA players, this study's research issue will be which factors related to body size lead to the lifespan of NBA players at most? Which machine learning algorithm could help boost the accuracy of predicting the life span of NBA players? Are other variables substantially affecting the longevity of NBA players as well?

## 2 Literature Review

Although biological factors have not been entirely determined between body size and lifespan survival, the scientific evidence that obesity continues to bring genetic risk to people's health by having adverse biological effects on the lifespan of people cannot be ignored. The University of Oxford has released a news story that the research of one million people worldwide has found that life expectancy is shortened by around three years due to generally moderate obesity. Moreover, although extreme obesity is rare, it is likely to shorten a person's life by ten years. In Oxford University, Epidemiologist Dr. Gary Whitlock, who led the analysis, said that excess weight tends to shorten humans' longevity. Three years of lifespan will be shortened if someone's weight is third more than the optimal weight. 20 to 30 kilograms will be carried by a third greater than the optimal weight. If people become overweight or obese, it may well add years to people's lives to prevent further weight gain.

There has been much less exploration of the relationship between weight and lifespan in athletes compared to the general population. NHS News released an article analyzing high-weight men between the ages of 20 and 39 who said that high weight shortened life expectancy by eight years [4, 5]. Ades and Savage presented evidence based on research from various cross-sectional, retrospective database surveys, including an exciting review [6]. They discovered that being overweight could be better than being average or low in weight. Thus, there seems to be contradictory data for individuals between weight and lifespan survival.

### 3 Methodology

#### 3.1 Data Pre-processing

**Table 1.** Sample data

Player	From	To	Pos	Ht	Wt	Birth	Ethnicity	Handness	PTS	Death	Lifespan
Gerry Calabrese	1951	1952	G	6.1	175.0	1925	White	Right	492	2015	90
Tom Callahan	1947	1947	G	6.1	180.0	1921	White	Right	17	1996	75
Howie Carl	1962	1962	G	5.9	160.0	1938	White	Right	170	2005	67
Chet Carlisle	1947	1947	F-C	6.5	195.0	1916	White	Right	256	1988	72

There are 920 observations of 12 variables (See Table 1). For a subject, each row represents the features. Lifespan is the goal variable (also known as the response); it is a continuous variable that decides this supervised task for a regression problem. We want to utilize a set of training data with known objectives and to let our model learn from the other variables to predict lifespan. The primary variable of interest is the lifetime constant variable.

With a mode at 80, the variable lifespan almost follows standard distribution (in these deceased NBA players, the lifespan goes from 23–99). Although there is no significant skewness in the overall lifespan, NBA players may have a biased Lifespan from some categories. To check the lifespan distribution within each stratum identified by specific covariates, such as Location, Ethnicity, and Handedness, that are concerned [7].

#### 3.2 Feature Selection

Since there are a total of 12 prediction variables in the dataset, we do not expect every variable to be strongly correlated with the life span, so we need to choose the “appropriate variables to perform feature selection. Instead of using traditional linear regression-based automatic feature selection by stepwise selecting or selecting features with the lowest p-values, it is over greedy”. It tends to result in outcomes that are locally optimal at each step but not global optimal, leading to a tough selection on the next regressor. Moreover, this method should not go back to revising its past decisions. This research, therefore, selects 11 regularized regression (Lasso). When several weights are pushed to zero, Lasso penalizes the  $\ell_1$  norm of the weights, which causes sparsity in the solution. Since the “related variables are required to have nonzero weights, this performs variable selection”. The term of the penalty governs the degree of sparsity, and this research uses cross-validation to choose.

$$\min_w \|y - Xw\|^2 \text{ s.t. } \|w\|_0 \leq c \quad (1)$$

The columns of X correspond to the independent variables in the regression sense, while y corresponds to the dependent variable. The goal is to find a sparse set of w weights that provide the best approximation of y (least square).

### 3.3 Establish Baseline Metrics

Since it is a regression problem, for each observation in the test data, this study chooses to guess the median value of the target. The median is 71 in this analysis, so the model's accuracy will be tested by predicting 71 for deceased NBA players in the test sample. To test forecast accuracy, this analysis uses two evaluation methods Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE). The MAE can show the average of the absolute value of the differences between the forecast values and actual values. The RMSE can show the square root of the average of the squared differences between the forecast values and actual values. The MAE shows how far on average the forecast values deviates on the truth value. The RMSE more strongly penalizes larger errors and is often used in regression problems.

## 4 Results and Discussion

Based on the data sources available online, 920 deceased NBA players were listed, and the mean weight of the deceased players population was 199.03 pounds ( $\pm 13.63$ , range: 137.00–284.00). The mean death ages per birth decade, shown by percentile weight, are shown in Table 2. The least weighted sportsmen are included in the 5th percentile, while the most weighted sportsmen are included in the 95th percentile. For

**Table 2.** Mean (M) ages of death per birth decade, by percentile weight.

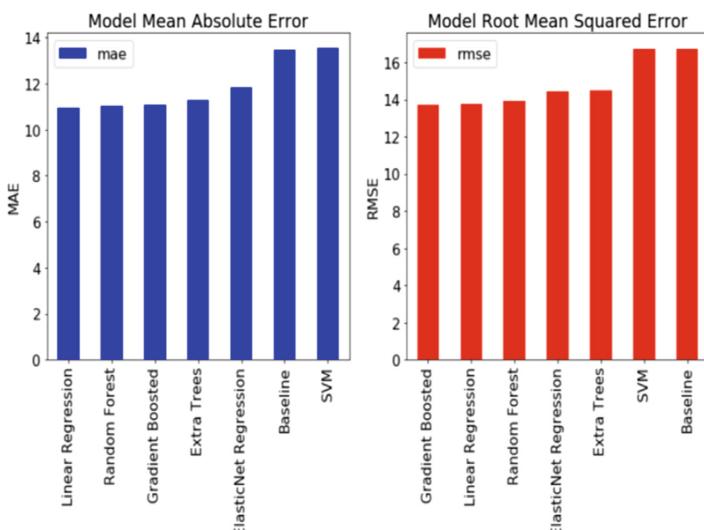
Birth decade	W (weight in pounds)	5th	10th	50th	90th	95th
1920 (113)	76.15 (189.85)	76.83 $\pm$ 12.02	79.27 $\pm$ 9.78	77.31 $\pm$ 12.26	75.15 $\pm$ 11.98	80.67 $\pm$ 9.87
1921–1930 (383)	76.22 (191.38)	72.79 $\pm$ 16.64	71.94 $\pm$ 14.05	70.65 $\pm$ 12.46	69.60 $\pm$ 11.44	68.63 $\pm$ 9.26
1931–1940 (132)	69.04 (205.49)	68.00 $\pm$ 15.69	65.77 $\pm$ 16.53	69.42 $\pm$ 13.37	62.07 $\pm$ 16.04	61.83 $\pm$ 11.01
1941–1950 (158)	60.31 (205.89)	60.12 $\pm$ 10.81	60.69 $\pm$ 8.76	61.22 $\pm$ 10.50	59.43 $\pm$ 16.61	61.37 $\pm$ 20.87
1951–1960 (71)	52.3 (206.34)	51.75 $\pm$ 6.84	50.57 $\pm$ 8.48	50.25 $\pm$ 10.84	49.42 $\pm$ 6.87	48.00 $\pm$ 6.24
1961 (62)	41.02 (223.5)	56.33 $\pm$ 12.09	47.50 $\pm$ 14.18	41.45 $\pm$ 14.15	37.5 $\pm$ 5.08	36.33 $\pm$ 5.13
total (920)	68.28 (199.02)	76.45 $\pm$ 12.54	76.20 $\pm$ 13.00	76.15 $\pm$ 12.72	60.23 $\pm$ 13.23	54.34 $\pm$ 11.62

deceased players born in the early decades to the most recent decades, a linear rise in mean weight has been observed, reinforcing the widely held view that basketball players' evolution is predicated on them being larger and heavier.

The NBA's starting season was 1946. It shows that a high percentage of deceased sportsmen were subjected to premature death in this population; thus the effect of weight on longevity of lifespan was measured by differences in lifespan within the same decade of birth instead of between decades. According to descriptive results, in all but two birth spans (1920 and 1941–1950), the top five percent most massive players died earlier than the bottom five percent least massive players. Overall, we can conclude the negative linear relationship between weight and lifetime longevity; the longest was lived by the least weighted players (76.5 years) and the shortest was lived by the most weighted players (54.3 years).

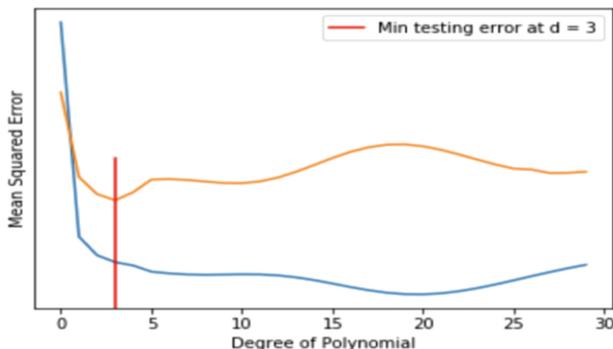
Only a small proportion could live age because this research included departed retired players as of August 1, 2020. Therefore, the sportsmen's mean death ages, which were born in 1920 or earlier and between 1921–1930, is compared to life expectancies at birth and for males from the general citizens of the United States in 2013 in this research. In the male US general citizens, life expectancies at birth were 46.3 years in 1900, 48.4 years in 1910, 53.6 years in 1920, and 58.1 years in 1930. The mean death ages of the NBA sportsmen greatly surpassed these figures. The players survived until they started their careers; players were born in 1920 or earlier and died on average 76.2 years.

According to the penalized Lasso regression, which figures out the formula to be  $\text{lifespan} = -0.25 * \text{Wt} + -0.07 * \text{PTS}$  and other predictors coefficients are 0. Thus, we conclude that the critical predictors for our model would be Weight and PTS. Then, Fig. 1 illustrates the result of MAE and RMSE for various machine learning models:



**Fig. 1.** MAE and RMSE for different machine learning models

Therefore, according to the findings, we would like to use Linear Regression as our model for prediction. However, for the nonlinearity problem, consideration of the linear regression model does not do well. This research chooses to use Polynomial Regression to predict the lifetime prediction of NBA players, and we find that, as illustrated in Fig. 2, the best degree for Polynomial Regression prediction with the lowest MSE will be three.



**Fig. 2.** Best degree for Polynomial Regression

The Linear Regression Model performance and Polynomial Regression Model performance is compared by using R-squared and adjusted R-square. The results are shown in Table 3.

**Table 3.** Performance comparison

Measures	Linear	Polynomial
R-square	0.991	0.997
Adjusted R-square	0.991	0.997

## 5 Conclusion and Discussion

This study concludes that, compared to lighter NBA/ABA sportsmen, more massive NBA/ABA sportsmen died earlier. In evaluating these results, however, the uniqueness of testing the weight hypothesis in a similar characteristic population in terms of confounding variables should be recognized. Since many players have higher weight relative to the age and average weight of the general population, there appears to be a curvilinear relationship between weight and lifespan. However, this impact may have been motivated by smaller sample sizes in the younger sportsmen. Besides, Lemez and Baker's study indicated that professional sportsmen live longer, while most are likely to be heavier than people in the general population [8]. Since NBA players typically have more muscle percentage in their bodies than normal individuals, Luks also

indicated that the percentage of muscle in individuals' bodies would positively affect the longevity of people's lives [9]. Additional evidence will educate and explain our understanding of the athlete population's possible risks of early mortality.

This research aimed to investigate the effect of weight on professional basketball sportsmen's longevity and concluded that the comparatively more weighted players would like to die at younger ages. The critical, descriptive result confirmed a negative linear relationship between weight and lifespan longevity, where the most massive players died on average earlier. In addition to descriptive research, the hypothesis was also backed by Polynomial regression, Ridge, and Lasso regression analyses. More massive NBA sportsmen had a substantially higher risk of mortality than least massive NBA sportsmen.

For the more massive NBA sportsmen (i.e., 95th and 90th percentiles), my descriptive studies helped us explore the details of lifespan longevity. Therefore while results for players born in the previous decades have more meaningful relevance in the current sample because they could live to old age, the most massive sportsmen seem to die comparatively younger than the lightest sportsmen. More unnatural causes of death than the suggested negative biological arrangements of increased weight are likely to misinterpret the last born matches' lifespan differences. Lemez and Baker reported that car accidents were the leading cause of death among active NBA sportsmen, although only 10 cases of premature death were noted in this category of sportsmen [10].

Moreover, while more massive players tend to die younger than lighter players, this research found that the mean age of death for players born in 1930 or earlier in the 95th percentile was close to the lifespan at birth in 2013 for males in the general United States citizens. Besides, Lawler indicated that the factors for unique mortality outcomes for basketball players are likely to be affected by multiple factors, such as wages, life experience, social status and economic status from becoming a professional sportsman, allowing for a higher quality of life with a better medical care. Moreover, the possibility that weight itself is correlated with longevity, or whether it is merely an indication of other underlying biological reasons, is also critical [11]. In people with weights in the highest percentiles, these reasons confuse our perception of fitness.

If professional sportsmen continue to get heavier, more information and factors will be needed for future studies to investigate the death rates and causes of death in extremely heavy sportsmen, which will provide us with more complete information to find out the reason why possible risks of increased weight are involved, or if it is enough to be a professional basketball player to counteract the equipment.

First, a possible weight variable disadvantage was that a tertile split of weight by birth decade was to calculate mortality effects, which may be inaccurate for a weight calculation and prevented potential nonlinearity from being examined. Besides, the statistical strength may be decreased by the smaller sample sizes since we can see there are merely 920 departed NBA sportsmen. Second, while this research aimed to analyze the relationship between weight and lifespan, many other socially constructed or biological factors such as wealth, life experience, and social status may have affected the mortality. Conversely, if weight is considered a specific death predictor, it might not be necessary to monitor variables such as decade of birth.

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# Research on the Application of Data Mining Technology in Smart Transportation

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**Abstract.** The level of automobileization in China is increasing year by year, and the pressure of urban traffic is increasing day by day, which brings a lot of inconvenience to people's daily travel. Intelligent transportation based on big data can improve the timeliness and accuracy of traffic information acquisition, its diversified construction the traffic data network provides preconditions for the construction of intelligent transportation, and the application of big data technology has become the key to improving the urban traffic environment. This article explains the relationship between big data technology and intelligent transportation, analyzes the advantages of big data technology, shows the changes that big data brings to transportation, and conducts research on the application of big data in the field of intelligent transportation.

**Keywords:** Big data · Mining technology · Smart transportation · Internet of Things

## 1 Introduction

With the new technologies rapid development such as artificial intelligence, big data, IoT, and cloud computing, various terminals, electronic field equipment, and central business applications have generated massive amounts of data, and have penetrated into various business areas of the transportation industry. Has become an important factor of production. Big data has therefore become the focus of attention from all occupations, and the era of big data has come. Traditional data processing technology cannot meet the processing large-scale data, and cannot tap the important value of data [1]. Therefore, it is to find a combination with actual business needs. In this context, this article first proposes the increasingly prominent pain points and needs of intelligent transportation from the aspects of information resource integration, data intelligent analysis and decision-making, new technology applications in the full life cycle of big data, active information push, and intelligent networked vehicles [1, 2]. Secondly, it summarizes the research status of intelligent video analysis, traffic signal control, intelligent transportation platform application and intelligent networked vehicles. Once again, focusing on new technologies such as natural language processing, computer vision, intelligent traffic signal control, automotive electronic signs, and data lake blue-ray storage, the application of new technological breakthroughs in the field of intelligent transportation is explained from two aspects: technological breakthroughs and

business applications [3]. Finally, suggestions on the research direction of new technologies in the era of big data are proposed.

## 2 Analysis of Pain Points and Needs in the Intelligent Transportation Industry

### 2.1 From Single Disorganization to Resource Integration

Single-scattered includes data scattered, technology scattered, business scattered and application scattered. After China's large-scale informatization construction, most departments related to transportation have built their own informatization systems and accumulated many data [3]. However, at present, too much data information only exists in the vertical business and single application of a single department, the lack of open intercommunication between departments has caused the fragmentation of data resources and information fragmentation, and the degree of data sharing is not high. To this end, on the one hand, there is an urgent need to establish data open standards, clarify the data open process, scope boundaries, usage methods, and the rights and obligations of various departments in data management and sharing. On the other hand, there is an urgent need to establish cross-sectoral, cross-industry, and the regional information resource integration platform realizes efficient transportation resource allocation, and provides more effective support for traffic management and services [4], as shown in Fig. 1.



**Fig. 1.** Big data integration platform

### 2.2 From Data Statistics to Intelligent Decision-Making Assistance

The traffic big data has a large volume and a wide variety, including bayonet, road video surveillance, electronic police, traffic signal control, traffic guidance information, car driving management, traffic accidents, parking lots, operating vehicles, vehicle video, station video, and bus lines Internet, vehicle positioning and other data [5, 6]. However, in the face of such massive and complex data, most of the current background data processing still uses traditional statistical analysis methods, or through the comparison, accumulation, and percentage calculation of single-dimensional data, simple graphical models are generated to assist decision-making, or based on A simple

model algorithm for limited-dimensional data predicts key parameters. The results of the above data processing are far from realizing intelligent analysis, processing, and providing intelligent auxiliary decision-making [7]. Future data analysis is expected to be realized: predict data values of unknown attributes based on existing attribute data values; discover potential patterns of data based on big data technology, including complex multi-dimensional data correlation analysis, and divide data into meaningful or useful clusters [8]. The cluster analysis and the classification analysis from the input data to each label mapping are shown in Fig. 2.



**Fig. 2.** Big data auxiliary system

### 2.3 From Passive Information Search to Active Push of Information

Most intelligent traffic management and control platforms adopt a passive information search mode that is the server responds to the request, and finally returns the content requested by the user to the user. The problem with this model is that as the business volume increases, users cannot obtain accurate and effective information in time [8]. Therefore, the use of artificial intelligence and other technologies to automatically obtain practical, accurate, and high-quality information from huge data resources, and the realization of active push of decision-making information is urgently needed [9].

### 2.4 Cars from Traditional Transportation to Next-Generation Mobile Smart Terminals

The increasing number of cars in China has made the problem of urban congestion more serious. Other emerging technologies have caused major changes in the traditional automotive industry [10]. Intelligent connected cars have become the focus of

the global automotive industry, as shown in Fig. 3. Intelligent connected cars are the transformation and upgrading of the traditional automobile industry, which are specifically manifested in [10]: (1) High data volume, high concurrency and Internet entertainment. (2) Voice interaction and gesture recognition through background big data processing and cloud computing. (3) High-precision map, understand road condition information beyond the visual range, safer and more energy saving. (4) Advanced vehicle-mounted combined sensor technology emphasizes the active safety performance of vehicles. Therefore, intelligent networked vehicles will be one of the important directions for the development of intelligent transportation in the future.

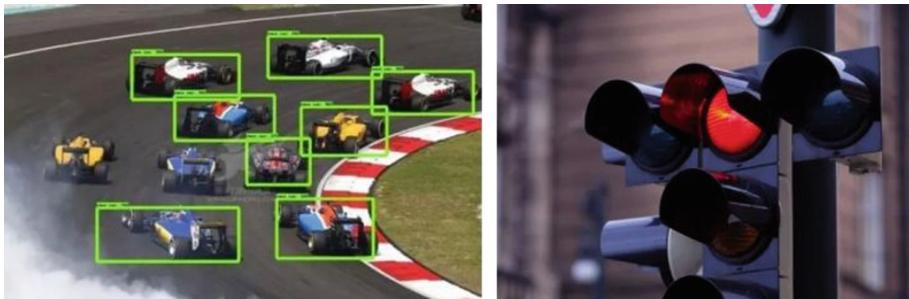


**Fig. 3.** Big data real-time monitoring system

### 3 The Big Data Application in the Field of Intelligent Transportation

#### 3.1 Target Detection Based on Computer Vision

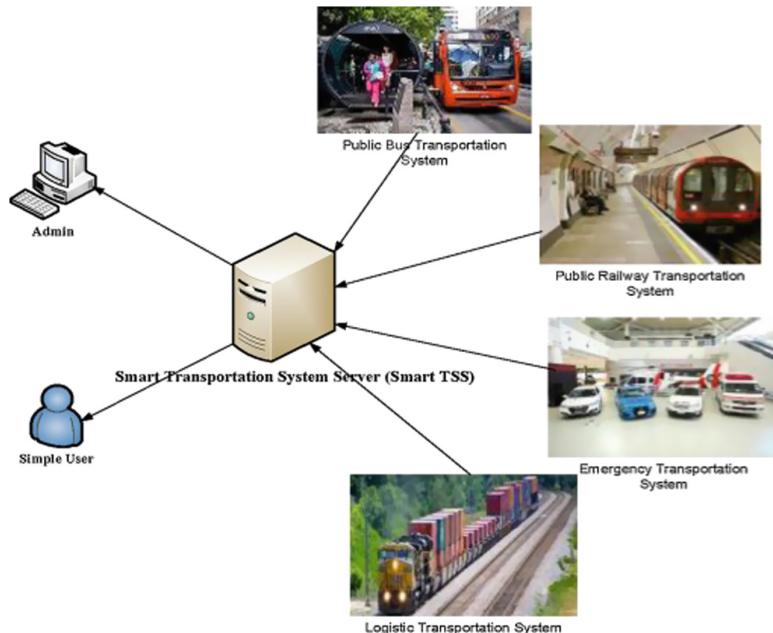
Target detection based on computer vision is to quickly and accurately extract the moving target from the real-time changing background, and then obtain the relevant attributes and characteristic information of the target. Commonly used target detection methods include image difference method, optical flow field method and target feature model detection method [11]. The disadvantage of the image difference method is that it is affected by complex scenes, environmental interference and noise, and background modeling is difficult. The optical flow field method is affected by multiple light sources, noise, transparency, shadows, occlusion, and other factors, which makes the calculated optical flow distribution less reliable, accurate, real-time and practical. The target feature model detection method is a relatively new research result. The method is to establish a feature model of the detected target, set a classifier, and classify the target from the image [11]. The main steps include target feature extraction and target classification and recognition, as shown in Fig. 4.



**Fig. 4.** Big data real-time recognition

### 3.2 Intelligent Connected Vehicle

Intelligent connected cars are equipped with advanced on-board controllers, sensors, actuators and other devices, integrate modern communication and network technologies to exchange and share information among people, cars, roads and clouds, and have intelligent decision-making, and collaboration control and other functions [12]. As the intelligent network can provide safer, energy-saving, environmentally and convenient travel services, as shown in Fig. 5.



**Fig. 5.** Big data intelligent control system

### 3.3 Traffic Signal Control

At present, some companies are looking for the application of artificial intelligence technology and front-end equipment, such as intelligent traffic signal control, typical representative companies include Didi and Ali. Didi Traffic Cloud can integrate data from traditional traffic collection equipment and Internet trajectory data to realize intelligent signal control with active signal optimization, precise area control and comprehensive effect evaluation. Ali “Internet + Signal Light” integrates mobile Internet data and traffic police’s own data, and integrates various information to optimize the signal distribution plan [13]. The traditional signal control system and the Internet signal control system is that the data of the former comes from limited peripheral collection equipment, such as video, coil, radar, etc., and the detection range is very limited; while the data of the latter comes from calculations based on mobile phone positioning Traffic flow data. This type of data can accurately count the traffic flow and direction of each node and section of the entire road network in real time. The internet signal can not only use artificial intelligence technology and network flow algorithms to optimize the signal-timing plan, but also evaluate the operation effect of the intersection signal-timing plan and the impact on the surrounding area traffic. Analysis shows that, on the one hand, the application of new technologies, mobile internet to traffic signal control is the future development trend; on the other hand, it is also necessary to use signal controllers with additional computing capabilities as the carrier [13].

## 4 Conclusion

The big data technology application in other industries has achieved good results, and its application in smart transportation can obviously also achieve certain success. It can effectively alleviate the problem of urban traffic congestion and reduce the probability of various traffic accidents. It can be said to have many advantages and benefits. Nevertheless, the combination of big data technology and smart transportation still has certain shortcomings and shortcomings. It still requires continuous research and testing by relevant professionals to better achieve the combination of the two and promote the sound development of urban transportation.

**Acknowledgments.** Shaanxi Province Co-ordination and Innovation Project of Science and Technology (2015KTZDGY01–04).

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# Research on the Enhancement Strategy of Teaching Effect in Entrepreneurship and Innovation Course Based on SPOC

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**Abstract.** As entrepreneurship education is of great significance nowadays, it is particularly necessary to strengthen researches on its models and combine macro requirements with students' practical condition. SPOC, as a mixed teaching combining online and offline teaching, has injected fresh blood into college education and teaching. Supported by the data extracted from Chaoxing learning platform, this paper analyzes problems existed in the SPOC-based teaching of entrepreneurship and innovation. Moreover, by conducting active explorations on the enhancement of learning effects, this paper also puts forward specific and effective measures in order to improve teaching quality in an all-round way and provide new ideas and methods for education reform and innovation.

**Keywords:** Entrepreneurship and innovation education · SPOC · Blended teaching · Enhancement strategy

## 1 Introduction

With the increasing concern of our country over entrepreneurship education, colleges and universities in China have launched relevant projects. Currently, the education of entrepreneurship is of great significance but there are also many difficulties ahead. While it undertakes the mission of exploiting employment market, promoting economy and constructing regional innovation system, the entrepreneurship education is limited by the traditional education concept and mechanism, transforming from an infant stage featuring conceptual analysis, path analysis, and discussion of contents to a mature one with conceptual integration, system construction and model establishment. In other words, the mode of entrepreneurship and innovation is not mature yet. Therefore, it is especially important to strengthen researches on entrepreneurship education modes and combine general requirement with students' condition in the current stage where opportunities and challenges coexist [1]. To this end, this paper introduces the typical entrepreneurship education implemented in the Capital University of Economics and Business (CUEB) and focuses on whether entrepreneurship and innovation education can be achieved with graduate students' improving in cognition and ability on the basis of the SPOC-based blended teaching [2].

## 2 Features of SPOC Teaching

The SPOC is characterized by its online learning, because such learning approach is not a copy of classroom courses but a more flexible and effective teaching pattern [3]. The restriction on student number enables teachers to better focus on students and guide them in accordance with their individual differences, thus promoting students' interests in courses and potential learning motivations and ensuring students' learning quality. Instead of imparting superficial knowledge, the SPOC aims high at leading students to do and to expand, so that students can improve their acknowledgement from conventional knowledge, comprehension and application to a higher level of analysis, synthesis and evaluation (according to the six cognitive domains classified by American educational psychologist Benjamin Bloom). Therefore, teaching contents is expanded in depth and domain. In general, the SPOC is designed to promote blended teaching and involvement learning and effectively improve teaching quality by restructuring the teaching process with MOOC, excellent courses and other online resources [4].

## 3 Implementation of SPOC-Based Blended Teaching in Entrepreneurship and Innovation Course

SPOC teaching is a teaching method that combines online learning and flipped classroom for all students in small or large classes [5]. This research took CUEB's introductory course of entrepreneurship as an example, and carried out an experiment of SPOC-based blended teaching mode in two classes during a 16-week semester with the help of learning data collected from Chaoxing or Xuexitong platform. In this experiment, students were divided into experimental group and control group at random. The control group was taught in conventional teaching mode, and the experimental group was taught in the SPOC mode.

Students learning in the SPOC mode were required to study in spare time after class, and online students were separated from offline students in different classes. At the same time, teachers would adopt different teaching patterns in the two groups with the same syllabus. In order to explore the effect enhancement between SPOC teaching and common teaching method.

## 4 Collection of the Implementation Data of Blended Teaching in Entrepreneurship and Innovation Course

### 4.1 Workshop Designing Study Plans

In order to effectively make up for practical problems such as inadequate knowledge and skill mastery caused by the reduction of course hour, and to reduce students' burden of homework, a learning plan was made as follows: in each teaching unit, 1 to 2 class hours of self-learning tasks would be assigned including various assessments,

micro-video cases, visiting practice, collaborative games and reading materials, etc., amounting to 14 class hours.

## 4.2 Adopting Formative Evaluation Model

### 4.2.1 Measures of Evaluation

This research implemented formative evaluation model in two teaching groups by means of individual interview, online learning record, online tests, online Q&A, online interaction, homework credits and electronic file to grasp students' learning attitude and effect [6]. The electronic file is an important approach of formative assessment, and a series of operating procedures are provided for students' specific activities and progresses, enabling students to master their own learning pace. Moreover, the online teaching platform makes it convenient to check students' learning records with more transparent learning processes, urging students to improve their study in time.

### 4.2.2 Feed Backs of Evaluation

This research adopted several methods to examine students' learning results. The first method is test results, the second one is comprehensive evaluation based on online records, and the third is to organize achievement presentation so as to examine students' interaction and ability through face-to-face observation. The evaluation should be dynamic by paying more attention to students' performance and progresses in learning, inputting their actual performance into learning file database and communicating with them regularly. In this way, the role of formative assessment is exerted because students can receive feedbacks to overcome learning problems and strengthen learning effects in this process.

### 4.2.3 Experiment Indices [7]: Comparing and Analyzing the Final Grades of Two Groups and Evaluating Their Effectiveness

#### 4.2.3.1 Evaluation Indices

Summative Assessment (total scores include the grades of online learning, practice reports, roadshows, and business plans): the experimental group and control group had the same evaluative standards, and comparison would be made according to their average scores.

Effectiveness Assessment of the Formative Evaluation: questionnaires were issued to teachers and students separately, with students as the mainstay and teachers as auxiliary measurement. The questionnaire includes question of whether the formative assessment and summative assessment can improve students' learning initiative, interest in learning, problem-solving ability, teacher-student interaction, independent learning ability, and cooperative ability, etc. Corresponding choices were divided into "Very Effective", "Relatively Effective", "Basically Effective", "Ineffective", and "Effectiveness" = (the number of choosing "Very Effective" + "Relatively Effective" + "Basically Effective") ÷ total student number × 100%.

#### 4.2.3.2 Statistical Processing

Collected data was analyzed and processed by SPSS 22.0 statistical analysis software, t-test, single-factor analysis of variance and multiple regression methods. When  $P < 0.05$ , statistical significance exists.

### 5 Analysis of the Learning Effect of Experimental Group and Control Group

#### 5.1 Comparison of Final Scores

There was a big gap in scores between the experimental group implementing formative evaluation and the control group implementing traditional summative evaluation. Ranges of less than 60 points and more than 90 points have no statistical significance, but for the middle part, the score of traditional control group clustered at 60–75 points, while grades of experimental group mainly distributed at 76–90 points (see Table 1). This shows that students in the experimental group with formative evaluation have achieved certain improvement in performance and that formative evaluation can promote the effect of summative evaluation to a certain extent.

**Table 1.** Score table of the experimental group

Group	Number	<60 points	60–75 points	76–90 points	>90 points
Experimental group	40	1 (2.50)	8 (20.00)	18 (45.00)	13 (31.25)
Control group	35	2 (5.71)	14 (40.00)	11 (31.43)	8 (22.86)
X <sup>2</sup> value		2.178	11.75	10.398	4.246
P value		0.020	0.001	0.002	0.023

#### 5.2 Comparison of Evaluation Effectiveness

The effectiveness of the experimental group for formative evaluation was 97.73%, while that of the control group was only 70.11%,  $X^2 = 16.743$ ,  $P = 0.000 < 0.05$  (see Table 2). It shows that formative assessment in blended teaching can improve students' enthusiasm, learning interest, and practical ability to solve problems. The two groups' compatibility degree is relatively high.

**Table 2.** Comparison of effectiveness evaluation of two groups [n (%)]

Group	Number	Very effective	Relatively effective	Basically effective	Ineffective	Effectiveness
Experimental group	40	17 (42.50)	9 (22.50)	13 (32.50)	12 (3.00)	97.73
Control group	35	4 (11.43)	7 (20.00)	13 (37.14)	11 (31.43)	70.1

## 6 SPOC-Based Teaching Enhancement Strategy

Restructuring teaching process with “problem-centered” principle: teaching contents and learning paths on the SPOC platform should not simply imitate the traditional offline education model [8]. Since online activities are completely carried out in a virtual space, how to urge students to emotionally involve in learning activities and attract students to conduct deep learning become particularly important. Teaching resources should be as short as possible [9], and the organization of these resources should change its focus from the traditional knowledge-centered approach to a problem-solving one. Meanwhile, planning of learning path should also be conducted according to core issues through incorporating issues’ introduction, analysis, exploration, solution, verification, and reflection into the entire teaching process.

Driving learning behavior with “task-centered” principle: In the SPOC teaching in small class, students’ online learning behavior also needs teachers’ involvement. Comparing the learning data of the two courses on Chaoxing, it can be seen that the teaching videos released on the platform led to a big gap in students’ video completion and data trend when task points are included and not. Behavioral investment is the guarantee of emotional investment. Thus, setting up and issuing teaching task points in an appropriate manner is helpful in carrying out online learning behaviors. At the same time, the task points should accord with students’ actual needs in quality. Take an instance, video resources should be as short as possible while including test feedback, and questions in discussion should be as clear as possible and open [10]. Task points should also be moderate in quantity. There should not be too much task points of assessment, but certain amounts of selective tasks can be assigned for students who are able to learn further. Besides, tasks should be as diverse and interacted as possible in form, so as to attract students to complete online learning tasks with better effects [11].

Stimulating students to reflect actively by using “peer response” as a breakthrough: At present, a common problem in students’ collaborative learning is the lack of collaboration enthusiasm. In this kind of learning, teachers must proceed step by step from stimulating students’ sense of reflection. Peer response is a type of evaluation that learners make on the works of peers who share the same level of learning. Compared with teachers’ assessment, this response is less likely to cause frustration because it is not only an evaluation, but also a learning method. Group evaluation with judgement criteria is likewise [12]. In this process, students need to evaluate according to a series of indicators, which help reducing randomness and subjectivity of evaluation, thus guarantee reliability. Meanwhile, students can find out their own strengths and weaknesses and be motivated to develop their reflection awareness in this process by comparing the learning methods of peers.

Supporting students to share knowledge based on “interaction and discussion”: Students are encouraged to conduct interactive discussion of core issues on the SPOC platform based on group evaluation. With the help of some pre-designed derivative questions, they are led to consider solutions to these issues in a deep level and develop their ability to explore independently. In this interactive discussion, teachers need to recognize their leadership and students’ major role, and then guide students to learn how to express, question, and communicate in this process. First of all, teachers should

encourage students to participate in discussion and share knowledge by giving them virtual rewards, such as setting their opinions as elite posts and sticking them to the top in the platform. Then, in the process of discussion, teachers should keep guiding students to have new problems, and spur them to learn by asking questions. Finally, discussion can be carried out in many forms, such as class discussion and separated or open group discussion in line with different types of questions. It provides the foundation for cultivating students' ability to analyze problems and explore in collaboration [13].

Taking "cooperative tasks" as a starting point to guide students to explore in collaboration: The ability of expression, reflection, questioning and communication in peer responds and mutual discussions is not enough for students to deal with an issue in collaboration. Therefore, it is of vital importance for teachers to create problems and situations for students to complete common tasks in groups. First of all, every group must have clear labor division in collaborative tasks. Teachers do not need to specify their division, but they must set clear labor division as one of the evaluation indicators [14]. Otherwise, the collaboration will be reduced to group leaders' own performance. Secondly, in the process of group discussion, teachers should guide students to analyze problems and decompose them into several smaller questions. If not, this group may develop a labor division in the form of "the one who divides the labor should record and speak". Finally, a reasonable group division is the guarantee of carrying out collaborative tasks. As collaboration tasks mean inter-group competition instead of individual competition, grouping should try to be balanced and reasonable according to students' abilities, characteristics of personality and other aspects. Besides, group members are advised to stay the same, because the process of cooperation to explore knowledge is also a way of exploring, adjusting, and unifying. With peer evaluation, interactive discussion and collaborative tasks launching step by step, a benign interactive learning ecosystem can be built by leading students to move forward from reflection, query and communication to collaboration.

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# The Construction of University Innovation and Entrepreneurship Education System in the New Media Environment

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**Abstract.** The rapid development of new media technology has brought a new perspective to the entrepreneurship and innovation education of colleges, and how to make full use of new media technology for entrepreneurship and innovation education is a problem that universities need to think seriously. Starting from the connotation and connection of new media and university entrepreneurship and innovation education, it summarizes the current research situation of university entrepreneurship and innovation education in the new media environment in China, and combines the characteristics of new media to discuss the current opportunities and challenges facing China's university entrepreneurship and innovation education under the path of entrepreneurship and innovation education in universities.

**Keywords:** New media · Universities · Entrepreneurship and innovation · Education system

## 1 Introduction

As China's higher education shifts from elite education to popular education, problems such as graduate employment difficulties and decline in professional application capabilities have also followed. Difficulties in obtaining employment for college students have become a major livelihood issue related to social stability [1]. The severe employment situation requires college students to have both strong professional abilities, as well as higher comprehensive qualities and innovative abilities. In this context, undergraduate entrepreneurship is considered one of the ideal choices to solve the employment problem of graduates and realize their dreams in life. The advent of the new media era directly affects college students' consumption habits, lifestyles, and social styles, and has inspired many innovative and entrepreneurial ideas and projects with their own personality [1]. Therefore, colleges should attach importance to entrepreneurship and innovation education in the new media environment and guide students. College students with innovative and entrepreneurial dreams realize their dreams.

## 2 New Media and the Interpretation of the Connotation of Universities Entrepreneurship and Innovation Education

### 2.1 The Meaning of New Media

New media, strictly speaking, should be called digital new media. It is a relative concept and a new media form developed after traditional media such as newspapers, radio, and television [2]. It relies on the support of new technology systems, and it covers a wide range, including the use of digital technology and network technology. Through the Internet, broadband local area network, wireless communication network, satellite and other channels, as well as computers, mobile phones, digital TV and other terminals to provide users with information and entertainment services [2]. New media has the characteristics of rich forms, strong interaction, wide channels, high coverage, accurate arrival, high cost performance, and convenient promotion.

### 2.2 University Entrepreneurship and Innovation Education

Entrepreneurship and innovation education aims to cultivate talents with basic entrepreneurial qualities and innovative personalities, and is fundamentally a practical education [2]. Nowadays, when “mass entrepreneurship and innovation” become one of the “dual engines” that promote the development of China’s economy, college students who are the main force in the new era should stand at the forefront of entrepreneurship and innovation. Therefore, entrepreneurship and innovation education in colleges appears to be particularly important. Cultivate students' innovative spirit and practical ability. It directly affects the effects of college students' independent innovation, independent entrepreneurship and entrepreneurship and employment, thereby promoting full employment of college students [3].

## 3 New Media and University Entrepreneurship and Innovation Education

In the 21st century, people are increasingly using new media in their daily life, study and work, and its importance is obvious. College students' innovation have attracted much attention, and the rapid rise of new media has provided new perspectives and methods for college entrepreneurship and innovation education.

### 3.1 New Media Makes College Students Accept Entrepreneurship and Innovation Channels More Diverse and Faster

Traditional media limits the way college students receive information through television, radio, newspapers, etc., with a certain degree of lag. However, the prevalence of new media and the use of traditional media allows college students to receive and disseminate information through multiple channels. Constrained by time and space, a lot of information can be consulted and mastered at any time, and the latest entrepreneurial information, entrepreneurial ideas, entrepreneurial methods, and entrepreneurial experience can be understood in a timely manner [3]. This reflects greater autonomy and promotes the continuous effectiveness promote.

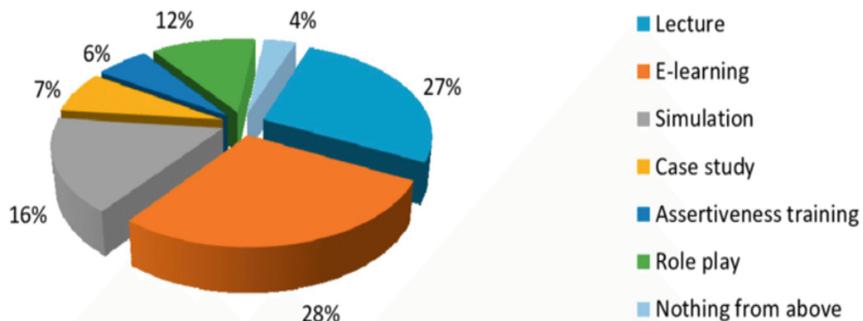
### 3.2 New Media Expands the Space and Methods for College Students Entrepreneurship and Innovation Education

College students pursue individualization, but they also pursue invisibility. While traditional media provides information for college students, it does not provide more free space. Almost all communication and activities need to be conducted face to face, and independence is greatly restricted [4]. In the new media environment, virtual space provides a coat of freedom for college students' communication.

## 4 An Overview of the Research in Colleges Entrepreneurship and Innovation Education Under the New Media Environment

### 4.1 Overview of People's Information

Compared with the single way of obtaining information by traditional media, after the rise of new media, people have access to various types of information, their identities and environments are different, and the channels for obtaining information from the surroundings there is a difference [4].



**Fig. 1.** Sources of knowledge acquired by students

It can be seen from Fig. 1 that, with the exception of personnel in special positions such as athletes, the channels for most people to obtain information from the outside world are mainly focused on new media such as computers and mobile phones. While those obtained from newspapers, magazines or other channels account for the proportion is small, which shows that new media has begun to spread in society. New media has the advantage of mass communication: completely personalized information can be delivered to countless people at the same time. Every participant, whether it is a publisher, a communicator or a consumer, has equal and mutually controlled content [5]. As contemporary college students who are about to take over the burden of building the motherland, at the juncture of vigorously promoting entrepreneurship and innovation, it is imperative for new media to comprehensively popularize innovation.

## 4.2 New Media and College Entrepreneurship and Innovation Education from the Perspective of College Students

The target of entrepreneurship and innovation education in colleges is college students, who have more say; it is more intuitive to look at new media and college entrepreneurship and innovation education from the perspective of college students. Encouraging college students to innovate and start businesses in the environment of new media is easier to accept and more motivated. College students have a lively personality and active thinking. Even in the virtual world, traditional education methods can no longer satisfy their desire for information acquisition speed and communication. The emergence of new media can improve this, and they are naturally loved by them [6].

## 4.3 Research Status in the Field of Entrepreneurship and Innovation

Entrepreneurship and innovation education is to develop the entrepreneurial potential of the educated, cultivate their pioneering spirit and creative personality. Chinese traditional entrepreneurship education starts with traditional educational thinking. The current higher education teaching model generally adopts a unified teaching plan and a unified mode of training. The training content is relatively simple, the training methods are relatively backward, and the students' innovative consciousness and creativity are not strong [7]. As shown in Fig. 2. For example, some concepts believe that college students should mainly learn knowledge and do not need entrepreneurship and innovation; others believe that entrepreneurship and innovation education is not applicable to all students, so it should not be implemented on a large scale.

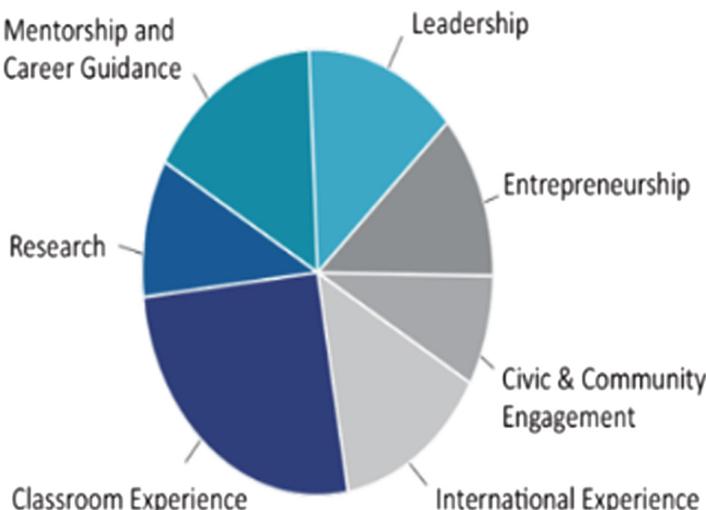


Fig. 2. The situation of students using new media

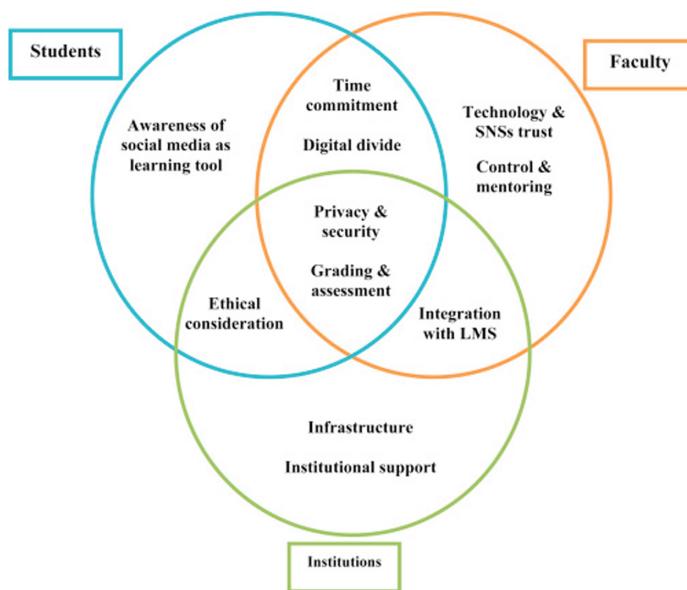
## 5 The Construction of Entrepreneurship and Innovation Education System in the New Media Environment

### 5.1 Cultivate College Students' Innovative and Entrepreneurial Concepts and Skills in the New Media Environment

The entrepreneurship and innovation education in colleges focuses on the cultivation of creative thinking, entrepreneurial spirit, and entrepreneurial ideas. The advanced development of new media can bring many opportunities for college students to start their own businesses. Under this environment, college students should establish innovative and entrepreneurial ideas with distinctive characteristics. Colleges should strengthen their understanding of new media, and fully guide them to use and understand new media [8].

### 5.2 Improve the Entrepreneurship and Innovation Education Curriculum System

The classroom is the most directly educated place, colleges should offer entrepreneurship and innovation courses, Fig. 3. At present, China's entrepreneurship and innovation curriculum education system still has many shortcomings. Compared with China's jerky and chaotic textbooks, the curriculum systems in some European and American countries are relatively complete. The textbooks used not only include systematic and formal professional courses, but also With strong applicability and operability, China can flexibly localize its textbooks, absorb them for use in China, and promote the orderly development of university entrepreneurship and innovation education [8].



**Fig. 3.** The melting relationship between entrepreneurship and innovation courses and new media

### 5.3 Building a Professional Team of Instructors for Entrepreneurship and Innovation

For the smooth development of entrepreneurship and innovation education, an excellent team of instructors is a reliable guarantee. The construction of a professional teaching team should start from the following aspects:

- 1) Not only should we train our school's potential teachers to become full-time entrepreneurship and innovation teachers, but also pay attention to the excavation and absorption of part-time mentors. For example, we can hire some successful entrepreneurs, alumni, or attract people with successful entrepreneurial experience to the school Engaged in entrepreneurial guidance [9]. Full-time teachers are required to have a broad vision and keen business insight, as well as innovative and entrepreneurial awareness and a relatively rich knowledge of entrepreneurship and innovation.
- 2) The training of entrepreneurship and innovation instructors should focus on the accumulation of their entrepreneurial practical experience. Colleges should vigorously support or organize entrepreneurship and innovation instructors to study and inspect enterprises, learn the relevant knowledge of business establishment and operation, and the experience of successful entrepreneurship and innovation [9]. Encourage them to actively participate in the practice of entrepreneurship and innovation, in order to help entrepreneurship instructors master the theoretical knowledge of entrepreneurship and innovation guidance, and accumulate practical entrepreneurship and innovation guidance experience, to guide college students' entrepreneurship and innovation more smoothly.

### 5.4 Fully Serve New Media Technology in Entrepreneurship and Innovation Education

Colleges should actively apply new media technology to entrepreneurship and innovation services, such as developing innovative and entrepreneurial training software platforms, and guiding students to make full use of new media technologies through simulated entrepreneurial planning, business establishment, and business operations, while enhancing college students' Skills in new media entrepreneurship and innovation [10]. Through new media technology, teachers can monitor the process of entrepreneurship and innovation of students in real time and give timely guidance to improve the success rate of entrepreneurship and innovation of college students in the new media environment [10].

## 6 Conclusion

By carrying out entrepreneurship and innovation education for college students in the context of new media, it can help students to have a good psychological preparation when facing future employment choices and various difficulties. At the same time, they have a reasonable and clear formulation of their future career plans to help students better understand the current employment situation and the future development trends of their own majors.

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# The Research on the Innovation Path of Modern Enterprise Economic Management Under the Background of Internet+

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**Abstract.** Due to the continuous improvement and promotion of information technology, modern enterprises are facing new challenges and opportunities in economic management. Under the background of the current “Internet+” era, modern enterprise economic management should continue to innovate management models and find a path that conforms to the characteristics of the company’s development and helps the company’s longer-term and healthy development. Taking advantage of the high efficiency and convenience of the “Internet+” technology, it provides more powerful technical support for the modern enterprise economic management model, and continuously explores the economic management channels of the enterprise. Actively respond to the economic impact of “Internet+” on modern enterprises, and implement corresponding measures to promote the mutual promotion and harmonious development of “Internet+” technology and the real economy of enterprises.

**Keywords:** Internet+ · Modern enterprise · Business management · Economic management

## 1 Introduction

Under the background of the “Internet+” era, the management methods and business philosophy of enterprises have undergone great changes. Traditional enterprises should make full use of Internet technology, give full play to their own advantages, and optimize and innovate economic management methods. Enabling enterprises to seize business opportunities, seize opportunities, and enhance their competitiveness will enable enterprises to develop more diversified businesses and realize their cross-border development [1]. With the help of “Internet+”, companies can also strengthen cooperation with other platforms, which can greatly enhance the company’s reputation in the market and its own economic benefits, and it can enable companies to gain stronger competitiveness.

## 2 “Internet+” Corporate Economic Management Concept

“Internet+” refers to the industrialization of the Internet. It is an economic development form with the Internet as the infrastructure and implementation tool. Simply put, it is the use of the Internet to optimize production factors to achieve the purpose of corporate innovation and production, and to achieve corporate [1]. The increase in social value. Enterprise economic management is the way and method for managers to manage the enterprise economy. This requires managers to formulate corresponding enterprise economic management plans and pay attention to the economic management system, to achieve the goal of healthy and sustainable development of the enterprise. Internet industrialization modern enterprise economic management is of great significance [2]. The industrialization of the Internet directly affects the innovation of modern enterprise economic management. Therefore, only by integrating the concept of the Internet into modern enterprise economic management can enterprises develop better.

## 3 The Importance of “Internet+” Innovative Enterprise Economic Management

### 3.1 Meeting the Reform Needs of the Enterprise Economic System

With the continuous changes in China’s economic development, if modern enterprises want to achieve sustainable development, they must innovate and improve the past economic management models. In recent years, Chinese modern enterprises have paid more attention to economic management to a certain extent [2]. However, under the background of the integration of planned economy and shortage economy, modern enterprise management is still only maintained at an extensive stage. Specifically, there is there are relatively more energy and material consumption, low resource utilization, obvious waste of resources, and low management efficiency. In response to these problems, companies should use innovative economic management models to eliminate the obstacles of unfavorable factors, to achieve more sustainable and healthy development [1].

### 3.2 Meeting the Development Needs of the Era of Knowledge Economy

In fact, knowledge economy is included in the category of information economy, so the innovation of enterprise economic management is also a necessary method to meet the development needs of the knowledge economy era, as shown in Fig. 1. From the perspective of knowledge economy, knowledge economy contains obvious sustainable development capabilities, so enterprises must expand the level of investment in information technology on the previous basis [3]. At the same time, the knowledge economy is also a networked economy, requiring companies to reasonably reduce internal management levels, continuously promote the increase of internal flow speed, and improve the efficiency of corporate economic management on the premise of reducing resource waste.



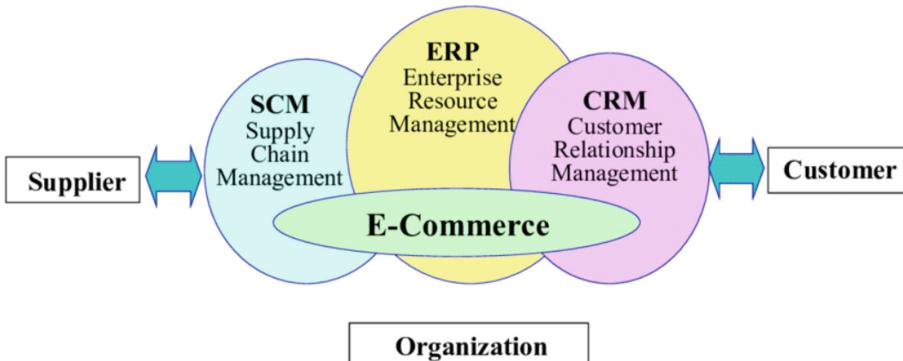
**Fig. 1.** The content of modern economic management

## 4 The Significance of Innovation in Business Economic Management in the Internet Era

In recent years, the Internet economy has developed rapidly, and information technology that has created huge benefits and benefits is playing important value in the application of economic development. Expanding the market also makes the market more dynamic and flexible [3]. Enterprises cannot always rely on traditions. The production model should be changed and innovated according to the situation. The following will explain and analyze the convenience of resource integration, innovative enterprise management and information technology.

### 4.1 An Important Way of Resource Integration

In the final analysis, a developing enterprise allocates resources reasonably, and after reasonable adjustments, optimizes the resources to ensure that they can be fully utilized and provide better services to the enterprise, as shown in Fig. 2. At this stage, the development of the Internet has led to the rapid development of the knowledge economy. In terms of economic management, the innovation of business management is bound to be the future trend, mainly because the global economy is showing its vitality due to the Internet, but in this environment, it also makes Enterprises face more challenges and changes, so the significance of innovation is even more important. To improve the efficiency of the economy requires sufficient resources to maintain and control [4]. The layout of the global economy is particularly important.



**Fig. 2.** Application of Internet+ in enterprise resource integration

#### 4.2 The Important Process of Innovation Management Enterprise

Nowadays, the market economy is changing with each passing day. Under the changes of domestic and foreign economy and environment, the future development of enterprises will have greater changes, which are reflected in the change of management mode, the inflow of enterprise talents, and the teaching of new technologies and new methods [4]. In addition, the introduction of new ways and new ideas. In fact, the innovation of corporate economic management in the new era is simply to allow companies to maximize profits with the smallest investment [5].

#### 4.3 The Advancement of Information Technology Provides Conditions for the Transformation of Business Management

Advanced, scientific, and forward-looking information technology has provided sufficient convenience for the society, including the economic development of enterprises, making cumbersome production management, complex accounting statistics and idle human resources more humane and simple [5]. The comprehensively improved management efficiency and production efficiency have injected new vitality into the enterprise. Effective and convenient communication has been set up between various departments, and it has promoted the transformation of enterprise management [6]. With the support of Internet technology, companies and companies, companies and schools, and companies and foreign markets have more frequent exchanges, and the market under the network environment has obtained more cooperation and development.

## 5 Innovative Strategies of Enterprise Economic Management Under the Background of Internet+

### 5.1 Lack of Innovation in Economic Management Thinking

At this stage, many companies still have some deficiencies in economic management. Financial personnel have not built up the correct concept of informationization. The network management mechanism is not perfect [6]. At the same time, some companies no longer have a sound network management platform. As a result, the internal economic management mode of the enterprise is very lagging, and the lack of great attention to economic management innovation has hindered the smooth operation of the enterprise to a certain extent. Moreover, under the background of “Internet+”, the amount of data information is even greater, and financial personnel have more channels for obtaining information and data [6]. However, most financial personnel still have not really got rid of traditional economic management concepts and do not have complete economic management information.

### 5.2 The Economic Management Mechanism is not Sound

In many enterprises at this stage, only a small part of the management can correctly realize the opportunities and challenges brought by “Internet+”. Most people still lack sufficient attention to the organic combination of Internet technology and economic management, and the management lacks of keeping up with the market [7]. Development and change of economic management concepts. In addition, in the continuous expansion of the market, the important role of Internet technology is not fully utilized, and e-commerce marketing activities have certain limitations.

### 5.3 The Economic Management Platform is not Advanced Enough

As the “Internet+” is developing faster and faster, China’s traditional corporate economic management model has obviously been unable to effectively meet market requirements, and offline economic management platforms with a certain degree of lag lack efficient and standardized management [7]. Companies can choose to rely entirely on the “Internet+” technology, dedicated to improving product visibility and increasing customer stickiness, and using continuous innovative business strategies to promote more optimized development of the company [7].

## 6 Innovative Strategies for Business Economic Management in the Internet Era

### 6.1 Reform of the Management System

Coordinating the relationship between various departments of the enterprise, we must optimize the internal management system, and perfecting the enterprise management system in the exploration is the basis for the stable development of the enterprise in the

future. The rewards and punishments are appropriate, the rules of work are performed, and management not only requires personnel to improve the completion of the work, but also it must also be able to drive the enthusiasm of the staff [8]. From the perspective of human resource management, system-based enterprise managers should adopt humane management methods to avoid internal conflicts. The purpose of management has never been inhumane constraints, but in a process of strict control. To be reasonable, such a company is humane, can better retain the elite and increase the loyalty of employees [8].

## 6.2 Cultivation and Introduction of Elites and Talents

The managers in the training part of the enterprise should pay attention to the selection and appointment of talents. It is not advisable and even more ignorant to select talents with the same vision. A successful company must have a meritocracy basis to attract people from all occupations. In addition, consider what the talents want and what they want to learn [9]. Do not miss talented people. At the same time, you should not let the incompetent people fish in troubled waters in the company. The company's growing growth depends largely on the retention of talents. System is certainly important, but humanized management and training, guidance and appointment of qualified personnel are the most important tasks. To cultivate new types of talents, companies need to build an innovative team [9]. A multi-disciplinary and multi-level comprehensive knowledge network is needed to support this team.

## 6.3 Renewal of Thoughts and Concepts

Enterprises should not only work hard on the introduction of talents, but also upgrade the assessment system and corporate philosophy. The theoretical and practical ability of employees is more practical than empty words on paper. Where there is a market, there will be business [10]. Therefore, the most correct thinking is to formulate a more reasonable plan by understanding the market demand. Of course, enterprises and managers should evaluate the achievements and abilities of their members from many aspects to pave the way for the company's future development.

## 6.4 Innovation of Enterprise Technical Knowledge

Only by researching and developing technology, introducing new methods, and constantly updating with the company's own advantages and disadvantages, can we lead the technology and generate greater benefits. The convenience brought by the Internet can further enhance the innovation capabilities of enterprises [10]. In an increasingly fierce competitive environment, enterprises strengthening their own requirements for technology are also an important way to ensure that their strength and status are not exceeded.

## 6.5 Enterprise Personalized Innovation and Optimization

While China's economy is growing, enterprises should be encouraged to develop together with different industries. In the current market economy competitive environment, all occupations should establish strategies and plans with customers as the center of the market, formulate feasible plans for their own enterprise development requirements, and adjust and analyze existing problems [11]. Develop business management concepts in the Internet era, use the Internet to control the information dynamics of the market, introduce and learn from the new development framework, further play the role of the Internet in combination with the actual situation, and sort out practical strategic steps [11].

## 7 Conclusion

To sum up, the progress of “Internet+” technology has brought a huge impact on China’s economic management and development, and has brought modern enterprises to a situation where development opportunities and challenges coexist. Modern enterprises should attach importance to economic management, effectively integrate Internet technology with it, innovate in their work, and do not rest on their laurels. Actively promote the integrated development of “Internet+” technology and modern enterprises, continue to optimize the economic management model, and finally break the development dilemma, and achieve high-quality development of the enterprise.

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# Research on the Impact of Technological Innovation on Regional Economic Development Under the Background of Internet

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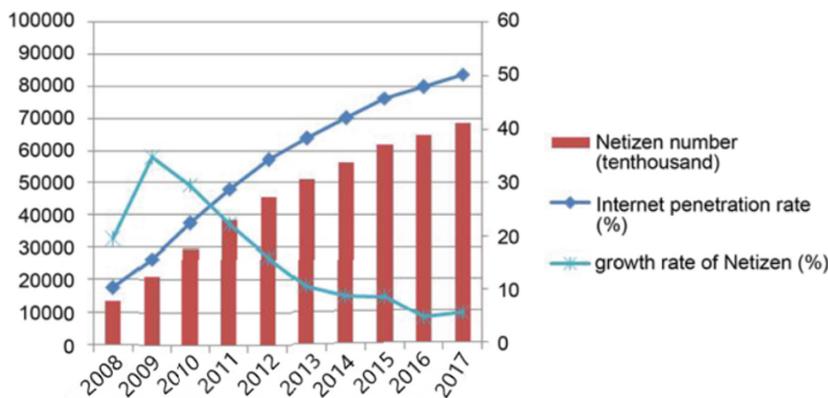
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**Abstract.** The rapid development of material technology has allowed the Internet to penetrate into various industries in society, promoted the production changes in various industries, and at the same time has a huge boost to social and economic development. The development of modern society is inseparable from the Internet, and the role of the Internet in promoting social and economic development is not only reflected in the fact that it provides a brand-new technical platform for the development of various industries in society, but also reflected in the Internet itself has become a modern social and economic development. The Internet industry, driven by Internet technology, is the main producer of the Internet economy. Therefore, the development of Internet technology is an important driving force for social and economic development, and the concept of “Internet+” was born. As a new economic development model, the emergence of “Internet+” has brought new changes and opportunities to the development of various industries in society. This paper studies the development of regional economy by technological innovation.

**Keywords:** Internet · Technological Innovation · Region · Regional Economy

## 1 Introduction

The so-called “Internet+” is a new technological form developed from Internet technology. It is based on the development of network information technology and exists on the background of the information society. “Internet+” can be said to be a new result of the development of Internet thinking in a new social background. Its emergence has prompted a technological change in the social economy, and has injected new vitality into the development of the social real economy [1]. A popular understanding of the concept of “Internet+” refers to “Internet+ various industries in society”, that is, the integration of Internet platforms and social industries to improve the level of innovation and development of social industries, as shown in Fig. 1. Since China’s economic development has entered a new era and new stage, the development of the local economy is currently facing some problems, such as the economic downturn [1]. The emergence of “Internet+” can bring substantial changes to the development of the local economy.



**Fig. 1.** The Internet promotes regional economic growth

## 2 The Social Industrial Technological Changes Triggered by the Birth of “Internet+”

### 2.1 Impact on the Transformation of Traditional Industries

“Internet+” has a profound impact on the transformation of traditional industries, and has promoted the breakthrough development of traditional industries in the new economic situation. This impact is mainly reflected in the following two aspects:

First, “Internet+” has played a role in perfecting and improving the traditional industrial development model, and this is mainly reflected in three aspects. First of all, the emergence and development of “Internet+” rely on the mature development of Internet information technology, so fundamentally speaking, the impact of “Internet+” on traditional industries is essentially the impact of Internet information technology on traditional industries [2]. It enables the development of traditional industries to achieve new breakthroughs driven by technology, and improves the technological content of traditional industry technologies. Secondly, for traditional industries, the original business model has also undergone corresponding changes due to the development and progress of Internet information technology. Finally, traditional industries are affected by the development of Internet information technology, and some new industrial forms have been born. For example, in recent years, the development of online finance has been very rapid. Alipay and Yu’ebao, founded by Alibaba Industry Group, are a breakthrough in the online finance industry, and then WeChat Pay, founded by Tencent Group, has emerged. The development and maturity of these online financial industries has brought an impact to the traditional financial industry and played a role in promoting the development of the traditional financial industry. For example, major banks have successively innovated service models, actively integrating banking business with Internet information technology, and providing users with more convenient financial services [2].

Second, “Internet+” has given birth to some new industrial forms. The development of Internet information technology makes the concept of “big data” deeply rooted in the hearts of the people and is actively applied to the development practice of various industries. The collection and analysis of industrial big data can help the industry clarify the current development situation, find out existing problems, and provide solutions. “O2O” based on big data technology, that is, a development model that combines online and offline has greatly promoted the reform and innovation of traditional industrial business models [3]. At the same time, consumption patterns have also been largely affected by the development of Internet information technology. Customized product customization methods have become more and more popular, and consumers have become the core service targets of product production and circulation. “Internet+” has played an important role in promoting the reform of traditional industrial production methods. In the production process of industries, information technology has played an increasingly important role [3].

## 2.2 Combination of “Internet+” and Traditional Industries

“Internet+” can effectively and deeply integrate with traditional industries, thereby continuously improving the development efficiency and production efficiency of the industry, and laying a solid technical foundation for the future development of the industry. Take the development of agriculture, industry, and service industries as examples. The deep integration of Internet information technology and agriculture has had an impact on the single production method and production environment of traditional agriculture, changing this production situation and making agriculture and other industries greatly connected [4]. Strengthening has given birth to new forms of agricultural production and development. For example, the currently popular model that combines agricultural operations with e-commerce has greatly improved the efficiency of agricultural product promotion and sales. This is well reflected from the fact that the amount of agricultural products sold through e-commerce channels in China has exceeded 50 billion yuan [5]. For the industrial industry, the combination of traditional industrial technology and emerging Internet information technology has caused major changes in the original production methods. Information industrialization is also the mainstream trend of China’s industrial development. The emergence of the intelligent industry field confirms this.. Since industrial development is an important driving force and foundation for social development, in the future, more and more new forms of industrial development arising from the influence of Internet information technology will appear, which can create more economic markets and industrial fields, and contribute to the development of local economy. The application of “Internet+” in the service industry is even more extensive [4]. Whether it is about education, travel or daily entertainment, the application of Internet information technology has become higher and higher, and it has been integrated into the daily lives of social members. Internet information technology has played a leading role in the development of social-related industries [5]. For example, the emergence of “Didi Taxi” has not only facilitated the daily travel of social members, but also spawned a new economic industry and promoted the development of the local economy.

### 3 The Impact of Technological Innovation on Regional Economic Development

#### 3.1 Changes in the Pattern of Regional Economic Opening

In the 21st century, economic globalization and the trend of world industrialization have gradually produced new changes. One of the most significant changes is the rise of China's economy. With the help of the situation, China has rapidly integrated into the process of economic globalization, the process of industrialization has also been significantly accelerated, the economic level has been rapidly improved, and it occupies a pivotal position in the world [6]. Enjoying an increasingly important international discourse, the Chinese economy has become an important part of the world economy, as shown in Fig. 2. From the perspective of the world, China's economy affects other countries largely, and the foreign trade economy of many countries cannot cut off ties with China [7]. If China is isolated, it will not benefit most countries, nor will it benefit its competitors. Therefore, the further development and opening of the economic field is the inevitable way for China's development.

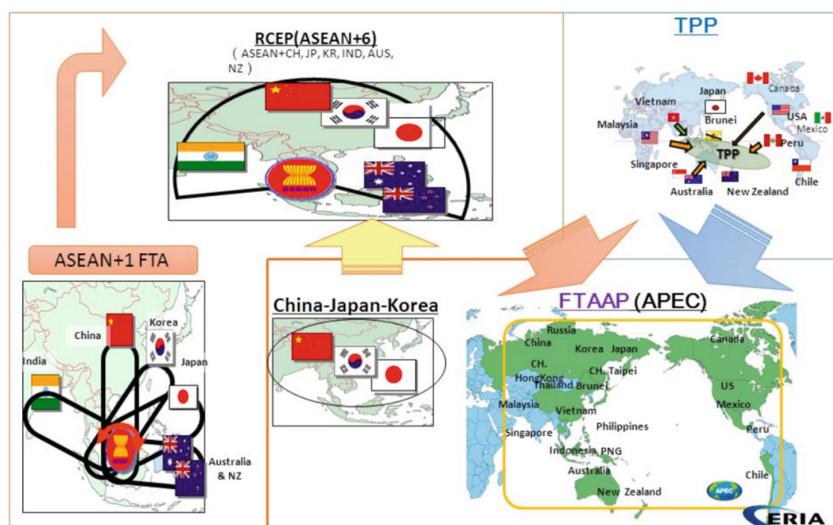
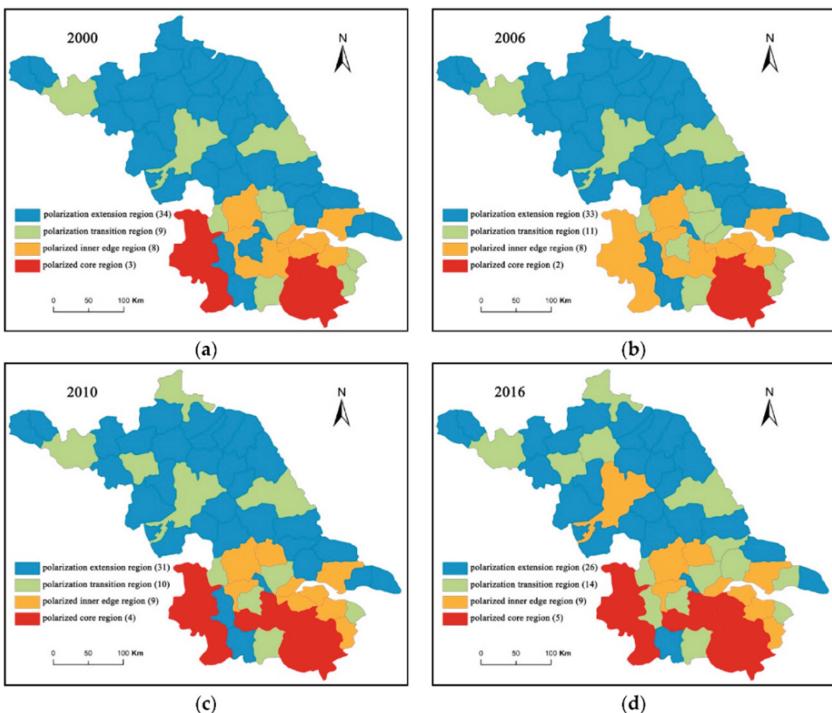


Fig. 2. China's participation in regional economic integration

Under the new situation of economic globalization, industrialization and informatization will follow and develop in a longer-term direction. The hardware conditions are gradually becoming more mature, especially the application of contemporary information technology has been applied in most fields [6].

### 3.2 Evolution of the Pattern of Regional Economic Interests

After the common interests between countries expand, the economic interests of various regions and countries will gradually become indivisible. The boundaries of interests between various regions are also expanding outward, and then spreading to the whole country [7]. As a result, a pattern of intertwined interests among countries has gradually formed. In this situation of regional interests, participating in regional and international exchanges and competition with more open means has gradually become an important way for countries and regions to develop their economies, as shown in Fig. 3. The competitiveness and means of competition among various industries have also changed, which will promote the continuous update of the original competition standards and policies [8].



**Fig. 3.** Regional economic evolution

### 3.3 Usher in a New Round of Technological Revolution

Science and technology are primary productive forces. To promote the sustained and stable development of China's regional economy, it is necessary to introduce advanced science and technology. Economic globalization can promote exchanges and communication between different talents in various countries, which also provides an important opportunity for China's development [8]. As the largest and fastest growing

developing country, China must firmly grasp this opportunity, Intensify the introduction of advanced science and technology, and continue to develop emerging industries, and promote the realization of substantial development goals. For China, economic globalization is a good development opportunity [8]. If this opportunity can be used reasonably and effectively, the realization of economic globalization will be accelerated. In addition, domestic enterprises can also introduce advanced foreign technology to promote the development of various high-tech industries.

### 3.4 Accelerating the Process of Industrialization

Industrialization is an important criterion for judging the process of a country's economic development. Affected by economic globalization, China's industry is developing faster and faster, which promotes the further optimization and integration of China's regional industrial structure, and enables the national industry to achieve overall development and progress., Continue to learn from the experience and lessons of other countries, to promote the sustained and stable development of China's economy. Some foreign-invested enterprises have increased China's jobs and promoted the innovation of various technologies in China, which strengthened China's market competitiveness [9]. The background of globalization has promoted the speed of China's integration into the world economic system and innovated the development mode. Economic globalization can also reduce production costs to a certain extent, and improve production effectiveness and quality standards. At the same time, when China actively participates in economic globalization on its own, it must abide by the basic principles of equality, mutual benefit and common development, and face up to the differences between countries; not only that, but also with developed and developing countries. Maintain friendly and cooperative relations. The new era of globalization can promote the further development of China's industrialization, and enable a certain degree of integration and improvement of the industrial structure and product structure in the region [9].

### 3.5 Accelerating the Development Process of Regional Economic Integration

China's regional economic integration is embodied in the integration of infrastructure, urban structure, and industrial structure. In the future, the development process of regional integration in China will become faster and faster, especially after China's accession to the World Trade Organization, the flow of elements between various regions will become more and more. In terms of population mobility, some imported agricultural products have caused a certain blow to the agricultural development in the central and western regions [10]. The output of some agricultural products has decreased sharply, causing some farmers to lose their original jobs, and most of the rural surplus labor force is gradually shifting to cities and towns. As far as capital flows are concerned, because large and medium-sized coastal cities will be affected by changes in the financial system, both the investment environment and the industrial chain are constantly optimizing. Some companies have relatively strong market competitiveness and relatively profit the capital in some relatively backward areas is

gradually shifting to the coastal direction [10]. Although this form of capital flow can promote the progress of China's industrialization and urbanization to a certain extent, the allocation of resources will be improved to a certain extent. Optimization, but it will also make the differences between urban and rural areas more significant.

## 4 Conclusion

According to the current economic development situation, the integration of "Internet+" and industry is already an inevitable development trend. In this context, China should take its essence and discard its dross, seize every opportunity for development, so that China's overall strength can be significantly improved. This requires continuous research and development of advanced science and technology in the process of regional economic development, correct transformation of economic development direction, full use of various resources, and gradually conform to economic development trends, promote the healthy and stable development of the regional economy, and further the sustained development of the Chinese economy provides a strong guarantee.

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# Practice Research on the Inheritance and Innovation of Traditional Culture from the Perspective of New Media

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**Abstract.** In order to carry forward the excellent traditional culture of the Chinese nation, new media technology has played an important role. The new media's transmission ability and artistic display ability are outstanding, which can perfectly integrate the flash point of traditional culture and let it bloom with vitality. New media has a unique way of development, so that colleges and universities can cultivate Chinese excellent traditional culture, master the basic concepts of traditional culture, and make better contributions to the revival of the great "Chinese dream". Therefore, this paper explores the inheritance and innovation of traditional culture from the perspective of new media, and puts forward guiding suggestions by investigating the status quo, opportunities and challenges of traditional culture inheritance and innovation in Colleges and universities. The effectiveness of the proposal is verified by questionnaire survey in Colleges and universities. Results the response is good, and it is worth promoting to the universities.

**Keywords:** New media · Excellent traditional culture · Inheritance and innovation · Chinese dream

## 1 Introduction

Culture [1–3] is the soul and root of a nation. The excellent traditional Chinese culture with thousands of years of history contains the spirit and wisdom condensed from many dynasties. In the context of the rapid development of new media technology [4], the party and the state attach great importance to improving the national soft power and comprehensive competitiveness with the dissemination of excellent traditional culture. Under the requirements of the current era and the social needs of traditional culture inheritance, innovation of traditional culture plays a very important role in the development of innovative countries. The unique communication performance and cultural function of new media can vividly inherit the central idea of traditional culture.

As an important carrier of inheriting Chinese excellent traditional culture, higher education [5–7] also needs to popularize the education of traditional culture, deeply tap the rich resources of Chinese excellent traditional culture, and explore and create the inheritance mode of traditional culture, and promote the ability of socialist cultural construction [8]. At the same time, as the carrier of carrying forward and inheriting

Chinese excellent traditional culture, college students are a group with active thinking and extensive network information. They are the best choice for using new media to innovate and inherit Chinese excellent traditional culture [9, 10]. Therefore, attaching importance to the popularization of Chinese excellent traditional culture knowledge and strengthening the inheritance of Chinese excellent traditional culture are very beneficial to the growth of college students and the promotion of national cultural soft power.

Based on the questionnaire survey, this paper carries out a series of traditional culture practice research, through a large number of data collection to achieve sorting and analysis; explore the innovation and inheritance of Chinese excellent culture, to a certain extent, to achieve practical significance. Therefore, only by constantly adapting to the development of the times, realizing the modern innovative development of Chinese excellent traditional culture through the new media platform, and realizing the unity of history and the times, can our society be better continued and developed; at the same time, we should inherit the excellent traditional Chinese culture, use new media means to feel its charm with pragmatic spirit and rational attitude, Let the excellent traditional culture of the Chinese nation spread throughout every inch of China and cultivate tens of millions of Chinese people.

## 2 New Media and Related Concepts of Chinese Excellent Traditional Culture

### 2.1 Conceptual Features of New Media

The existence of “new media” is supported by new technology, which is basically a dynamic media mode. Its form of expression is completely different from that of traditional media. It promotes the flow of information through the network and displays information in a visual and dynamic form. For example, the existence of smart phones enables people to book TV programs at any time in the network environment and download information content according to their preferences.

### 2.2 Chinese Excellent Traditional Culture and Its Contents

The excellent traditional Chinese culture is created by the Chinese nation according to the requirements of the times and promotes social development. Its content involves philosophy, ethics, literature, art, medicine, architecture, clothing, diet and many other aspects. The excellent traditional Chinese culture explored in this paper refers to the core of Chinese traditional culture, which has the most profound impact on human growth and is the most important part of national progress. It is the crystallization of the Chinese nation from generation to generation. Closely related code of conduct, value orientation, Chinese people's life customs and concepts and value orientation are closely related. The life customs and concepts of the Chinese nation take root in the cultural psychology of “the people rooted in a nation or country is very firm, shape and national self-esteem, self-esteem, self-improvement spirit and other cultural psychology.”

### 3 Experimental Ideas and Design

#### 3.1 Experimental Ideas

With the help of new media, the role of new media is to promote college students to inherit the excellent traditional culture of China and analyze the significance of new media. While promoting the development of China's excellent traditional culture, we should promote college students' familiarity with traditional culture and absorb certain theoretical achievements. Through the methods of questionnaire survey and literature analysis, we can understand the attitude of college students towards the inheritance of traditional culture and the use of new media and explore the communication effect of new media on Chinese excellent traditional culture. For teachers and students to use new media to learn the degree of innovation of traditional culture, analysis and let it inherit and innovate in practice, so that the excellent traditional Chinese culture can be popularized to the public.

#### 3.2 Experimental Design

We collect, sort out and analyze all kinds of relevant documents and materials, obtain effective information from them, and form a scientific understanding method of relevant investigation. In order to fully understand the impact of new media on College Students' Inheritance and innovation of Chinese excellent traditional culture, a reasonable questionnaire survey content was listed 350 copies were published in Colleges and universities. In this study, through two forms of online questionnaire and outdoor questionnaire, we understand college students' learning style of Chinese excellent traditional culture under the background of new media, as well as the influence of new media. Shown as Table 1, the frequency of using new media to watch cultural programs for college students is shown.

**Table 1.** Using new media to watch cultural programs

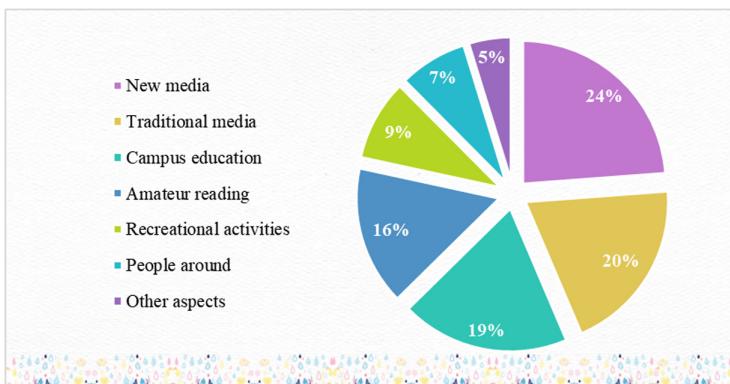
Viewing frequency	Number of people (%)
Watch it more than once a week	23.6
Once every two or three weeks	37.7
Seldom see	54.3
Basically not	43.9

### 4 Discussion

#### 4.1 Inheritance of Excellent Traditional Culture

Shown as Fig. 1, we conducted a questionnaire survey on College Students' learning methods of excellent traditional Chinese culture, and more than 24% of them thought that the learning method of new media was the most fruitful. Through the traditional media, campus education, reading literature in spare time, we can effectively learn the

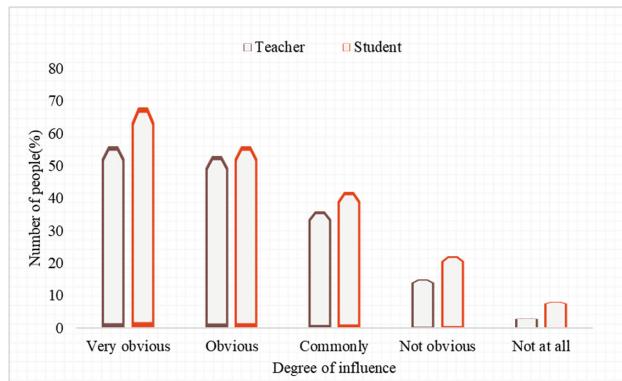
excellent traditional Chinese culture, which is also a very effective channel to extract the knowledge of traditional culture. We also know that most students learn traditional culture through mobile phone browsing, TV programs and computer reading. On the one hand, it makes the passive learning method more active, and the method of presenting content by new media is more vivid. Students are exposed to more abundant information resources, not only limited to book learning, broaden their horizons, from different levels of excellent culture to find fun. New media can also be used to organize and publicize cultural communication, which can effectively improve the number of participants and topic attention and strengthen the inheritance of traditional culture. Let the boring traditional culture learning rise to a higher level, so as to affect students' interest in learning, and enrich the inheritance form of Chinese excellent traditional culture.



**Fig. 1.** Proportion of excellent traditional culture learning methods

## 4.2 Innovation of Excellent Traditional Culture

Shown as Fig. 2, we conducted a sample survey on the degree of innovation of new media on the inheritance of traditional Chinese culture, aiming at teachers and students in Colleges and universities. In contrast, students feel that they have great influence on themselves, accounting for 67%. Only a very small number of people feel that the influence is small. Teachers are also influenced by the new media's dissemination of traditional culture, with diversified forms and innovative consciousness. Some teachers think that the digital learning method can strengthen the students' ability to think independently, obtain the information they want most quickly and directly through new media, and explore what kind of excellent cultural heritage is implied. Based on the inheritance of new media, this paper explores students' in-depth research on traditional culture, so as to achieve the purpose of innovative inheritance. There is also a new form of digital media, which can provide a new multi text mode for information receivers. The comprehensive dissemination of pictures and video information makes young people vulnerable to the influence of information resources, so that many people have



**Fig. 2.** Innovation degree of learning Chinese excellent traditional culture on new media platform

unlimited imagination when they think deeply about problems. The inheritance of Chinese excellent traditional culture needs multi-party coordination, professional participation, in-depth exploration and thinking, scientific practice and continuous innovation.

#### 4.3 Positive Influence of New Media on College Students' Inheriting Chinese Excellent Traditional Culture

The communication mode of traditional media is the unified communication of cultural content with official media as the core. Moreover, this kind of communication is in the abstract state and its efficiency is very low. Different from this is the new media, the mode of information dissemination is very efficient. Mainly from the characteristics of non-governmental exchanges as the basic starting point, the theme of communication is at the same level, the form of communication is diversified, the degree of freedom of communication is very high, and the impact on communication is also huge. Therefore, the current research on traditional culture bearing mode is still focused on technology, terminal, network media and other dimensions; at present, most of the research on traditional culture also discusses the impact of new media environment.

- (1) Add the way of traditional culture inheritance: for the inheritance and development of traditional culture in modern society, the role of new media is beyond doubt. It can set the relationship between the two sides as an equal and open mode. The original elite education system from the center to the edge has been completely broken, a new theoretical concept can be transmitted to the public through a new way of communication.
- (2) The new media technology enables college students to have a faster and more convenient access to the context of the times, understand problems from multiple perspectives, acquire the latest and most abundant knowledge of traditional culture through various channels, and build a multi-level cultural exchange. This is an

important feature of breaking the original form of cultural exchange and attracting students' attention with new learning methods.

#### **4.4 Inherit and Carry Forward Chinese Traditional Culture in Practice**

Colleges and universities need to constantly promote and support the promotion of major projects, and research groups are built and developed by full-time and part-time teachers and experts. The enterprise and skills competition project are transformed into the practical teaching content of the course. The technological advantages of enterprises can help the reform of practical education mode. On the premise of resource sharing or complementary advantages, the breakthrough is cultural integration, and the support is curriculum determination, teaching management and base construction. We should establish accurate cooperation purpose, shortest period and key points, actively share cooperation technology and ideas, and jointly achieve the goals and bear corresponding risks. In the process of continuous adjustment and optimization, the practice teaching mode of school enterprise cooperation reflecting the characteristics of higher education has been formed. In the school enterprise collaborative practice education talent training mode, practice teaching project development, multi-channel assessment and evaluation adopt systematic division of labor research. Students' professional practice ability has been significantly improved. Through the campus culture and enterprise culture and other aspects, the school enterprise cooperation carries on the cultural nourishment "penetration" to the students.

- (1) There are also some problems in the development of new media, which play a negative role. How to quickly solve these problems, so as to promote its full play in the dissemination of traditional culture is of great significance. We will integrate new media and traditional culture, carry out digital upgrading and transformation, promote the integration of digital industry, break communication barriers, and integrate new and old media. The integration of traditional cultural products into new media technology enables the interaction and common development of traditional media and new media and strives to improve the scope and ideas of traditional cultural products communication.
- (2) There are many new media online education platforms, among which the most popular is MOOC education mode. As an open public education platform, all kinds of public courses can be completed online, and students can learn online at the network end; new media network teaching is an important teaching platform in Colleges and universities. The online education and teaching mode of students based on computer and Internet technology is the extension and supplement of classroom teaching; it is a real-time communication platform, and social application software relying on network mobile terminal has become the main way of modern young people's communication.
- (3) Campus culture is the soul of modern universities. It is the spiritual power of a university and the deep power to promote the long-term development of the University. In the process of self-shaping, college students' thoughts, behaviors and values will have obvious differences with campus cultural atmosphere. Therefore, we should integrate traditional culture into the construction of campus

- cultural environment, improve the traditional cultural factors in campus culture, let college students seriously experience and participate in the campus cultural environment, and constantly cultivate their own traditional cultural literacy.
- (4) With the progress of the times and the development of modern productive forces, culture should keep pace with the times. On the basis of retaining the essence and concept of the original core culture, we should constantly create new cultural interpretations to meet the new spiritual and cultural needs of the times.

## 5 Conclusions

The new environment created by the new media itself is also constantly innovating, which gradually affects people's way of thinking. Inheriting and innovating Chinese excellent traditional culture under the media environment is the basis of improving the comprehensive national strength. With the help of this innovative environment, we actively spread Chinese excellent traditional culture, build its existence form in Colleges and universities, and realize the inheritance and innovation of Chinese excellent traditional culture. Based on the questionnaire survey, this paper tries to practice the communication ability and innovation ability of new media to traditional culture. Most of the teachers and students agree that the use of new media to inherit traditional culture has a certain role in promoting students' innovative thinking. College students are the carrier of Chinese excellent traditional culture, and its inheritance and innovation is a huge cultural project.

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# Influence and Countermeasures of Green Trade Barriers on Agricultural Products Export Based on Data Analysis Technology

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**Abstract.** Agriculture is an important part of economic development. At present, China is deeply affected by green trade barriers, which seriously hinders the development of agriculture. Hebei Province has a huge grain output. Taking Hebei Province as an example, this paper discusses the impact of green trade barriers on the export of agricultural products, and finds solutions. Based on data analysis technology, this paper makes an empirical analysis. It is found that the symbol of the strictness of implementing green trade barriers is consistent with the anticipated symbol, which is passive in the brief term and optimistic in the extended term. Therefore, in the brief term, the implementation of green trade barriers will lessen the export quantity of farming products and raise the sell abroad price. In the extended run, the implementation of green trade obstacle will promote scientific and technological progress, increase the sell abroad quantity of agricultural products and expand diversified markets. Finally, the countermeasures of agricultural products export against green trade barriers are put forward from both government and enterprises.

**Keywords:** Data analysis technology · Green trade barrier · Agricultural products export

## 1 Introduction

Agriculture is the foundation on which human beings depend for survival. At present, some developed countries rely on their economic strength and technological advantages, and implement green trade barriers to hinder the export of agricultural products. At present, facing the re-emergence of foreign trade protectionism, how to maintain the competitiveness of products is of far-reaching significance to the development of agricultural trade [1].

Scholars at home and abroad hold two views on the study of “green trade barriers”. Some scholars hold a positive attitude towards setting up green trade barriers. From the perspective of economic development, green trade barriers will improve the productivity of enterprise products. Trade barriers stimulate manufacturers to restructure their domestic and international business [2]. Some scholars hold a negative attitude towards setting up green trade barriers. From the perspective of domestic import and export situation, they restrict international trade flows [3]. From the perspective of social welfare, green trade barriers will have a negative impact on social welfare. Some

scholars hold dialectical views on it. They define green barriers as neutral. It is considered that the green trade barrier is the regulator of coordinating trade and environment, and its positive influence cannot be ignored. The research on green trade barriers is an important subject to be studied urgently [4]. At present, the research mainly focuses on the extensive study of green trade barriers in China, and seldom goes to the provinces, especially for the big agricultural province like Hebei Province.

In this study, data analysis technology is used to conduct a comprehensive and systematic study. This paper discusses the problem from the extended period and the brief period. In view of the outstanding problems in dealing with green trade barriers, this paper puts forward an effective way to break the wall. And it will provide new ideas and methods for other provinces to deal with green trade barriers.

## 2 Influence of Green Trade Barriers on Agricultural Products Export

### 2.1 Theoretical Hypothesis

In the brief term, green trade barriers will reduce the export of agricultural products. Firstly, the laws and regulations of green trade barriers hinder the export of agricultural products in Hebei Province, limit the international trade flow between different countries, and reduce the trade volume of agricultural products between the two countries [5]. Secondly, due to the strict green trade barrier system in some importing countries, there will be trade conflicts between importing and exporting countries, which will reduce the export volume [6]. In the long run, green trade barriers will increase the export volume of agricultural products. There is time to expand the market and optimize the export market structure of agricultural products.

### 2.2 Empirical Analysis

In this paper, the export trade data of agricultural products between Hebei Province and fifteen countries from 1990 to 2019 are selected for analysis (Table 1).

#### 2.2.1 Introduction and Design of Gravity Model

(1) The formula of trade gravity model:

$$\ln F_{ab} = C_0 + C_1 \ln GDP_a + C_2 \ln GDP_b + C_3 \ln D_{ab} + C_4 \varepsilon_{ab} \quad (1)$$

**Table 1.** Meaning of each variable

Variable	Meaning
$GDP_a$	a's GDP
$GDP_b$	b's gross domestic product
$D_{ab}$	Geographical distance from a to b
$\varepsilon_{ab}$	Other factors affecting trade flows of a and b
$F_{ab}$	Trade flows between a and b

- (2) Design of the model: The explanatory variables of this empirical analysis are the trade volume of agricultural products exported from Hebei Province to various countries. The sum of TBT and SPS declared by various countries to WTO. The GDP of Hebei Province, the GDP of fifteen countries. The geographical distance between each country and Hebei Province. And the exchange rate changes between Hebei Province and fifteen countries in the past thirty years. The equation of the final model is (Table 2):

$$\ln E_{ab} = C_0 + C_1 \ln ST + C_2 \ln GDP_a + C_3 \ln GDP_b + C_4 \ln R_t + C_5 \ln D_{ab} + C_6 DUM + u_t \quad (2)$$

**Table 2.** Meaning and expected symbol of each variable

Variable	Meaning	Variable measurement index	Expected symbol
$E_{ab}$	Exports of agricultural products from Hebei Province to other countries	ln (Hebei Province's agricultural exports to other countries)	
$ST$	Strict degree of implementing green trade barriers	ln (number of TBT and SPS declared by each country to WTO +1)	Indefinite
$GDP_a$	Economic Development Level of Hebei Province	ln (GDP of Hebei Province in each year)	+
$GDP_b$	The level of economic development ability of country b	ln (gross national product of country b in each year)	+
$R_t$	Price Advantage of Agricultural Products in Hebei Province	ln (exchange rate of each country relative to RMB)	Indefinite
$D_{ab}$	Geographical distance from each country to Hebei Province	ln (geographical distance from each country to Hebei Province)	-
$DUM$	Virtual variable	It was 0 before the financial crisis and 1 after it happened	-

### 2.2.2 Regression Results

Since logarithm can weaken heteroscedasticity among variables. Firstly, the variables are treated as logarithm. Secondly, because the time span of data selection is large, some countries start foreign trade late, and there is a situation that  $ST$  is equal to 0, so  $ST$  is treated as +1. In this paper, Eviews8.0 is used to analyze the export data of fifteen agricultural products in Hebei Province from 1990 to 2019.

- (1) Hausmann test: The houseman test result is prob = 1. The random effect model is correct.
- (2) Correlation analysis: Correlation analysis is to judge whether there is collinearity in variables, and carry out correlation analysis on data. Through correlation analysis,

it can be seen that the correlation coefficients among the variables are relatively low. There is no collinearity problem in preliminary judgment.

- (3) Multiple collinearity test: The data were tested by multicollinearity, and the VIF was 3.03. VIF value is between 1 and 10, which means there is no multicollinearity problem.
- (4) stationarity test: The test result is the  $\ln E_{ab}$ ,  $\ln ST$ ,  $\ln GDP_a$ ,  $\ln GDP_b$ ,  $\ln R_t$  is stable.
- (5) cointegration test: Use Eviews8.0 software to carry out cointegration test on data. The result of Kao test is prob = 0.00, which rejects the original hypothesis, that is, the panel model has passed Kao test, indicating that there is a cointegration relationship.
- (6) Regression analysis under random effect model (Table 3):

**Table 3.** Regression analysis results without delay

Variable	Coefficient	Std. error	t-Statistic	Prob
$\ln ST$	-0.011276	0.008265	-1.364385	0.0000
$\ln GDP_a$	0.581358	0.019788	29.37884	0.0000
$\ln GDP_b$	0.047210	0.019910	2.371149	0.0187
$\ln R_t$	-0.005259	0.006085	-0.864286	0.0000
$\ln D_{ab}$	-0.001749	0.000376	-4.654628	0.0000
<i>DUM</i>	-0.093948	0.019051	-4.931397	0.0000
<i>c</i>	-7.019324	1.697619	-4.134806	0.0001
Effects Specification				
			S.D	Rho
Cross-section random			0.388185	0.9767
Idiosyncratic random			0.059951	0.0233
Weighted Statistics				
R-squared	0.941628	Mean dependent var	-0.029470	
Adjusted R-squared	0.939902	S.D. dependent var	0.272728	
S.E. of regression	0.066859	Sum squared resid	0.907432	
F-statistic	545.7795	Durbin-Watson stat	0.825805	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.291338	Mean dependent var	-0.714588	
Sum squared resid	118.1754	Durbin-Watson stat	0.020497	

Rsquared goodness of fit is 0.941628, and the adjusted goodness of fit is 0.939902, which shows that the goodness of fit of the model is very good. The prob value of each variable is less than 0.05, which means that it has a significant impact on  $\ln E_{ab}$  at the significance level of 5%. Then, the data are adjusted in the lag period. The results show that  $\ln ST$  is significantly negatively correlated with  $\ln E_{ab}$  in the lag results before the lag period of nine periods, but the experimental results are reversed after the lag period of nine periods, and  $\ln ST$  is significantly positively correlated with  $\ln E_{ab}$ , as shown in Table 4.

**Table 4.** Regression analysis results with nine periods lag

Variable	Coefficient	Std. error	t-Statistic	Prob
$\ln ST (-9)$	0.015822	0.008692	1.820242	0.0000
$\ln GDP_a$	0.579192	0.021489	26.95293	0.0000
$\ln GDP_b$	0.061950	0.022855	2.710607	0.0073
$\ln R_t$	-0.004959	0.006707	-0.739471	0.0000
$\ln D_{ab}$	-0.122060	0.213372	-0.572051	0.0000
$DUM$	-0.090879	0.019944	-4.556703	0.0000
$c$	-6.834649	1.732520	-3.944919	0.0001
Effects Specification				
			S.D	Rho
Cross-section random			0.393908	0.9761
Idiosyncratic random			0.061701	0.0239
Weighted Statistics				
R-squared	0.923784	Mean dependent var	-0.029373	
Adjusted R-squared	0.921352	S.D. dependent var	0.245033	
S.E. of regression	0.068718	Sum squared resid	0.887761	
F-statistic	379.7787	Durbin-Watson stat	0.740233	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.326676	Mean dependent var	-0.676768	
Sum squared resid	102.3682	Durbin-Watson stat	0.006419	

According to the results of regression analysis, the following conclusions can be drawn: the sign of  $ST$  is consistent with the expected sign, which is passive in the brief term and optimistic in the extended term. This is consistent with the theoretical hypothesis. Table 4 result analysis Empirical analysis shows that in the short term, green trade barriers will increase the potential transaction costs, increase the risks faced by export enterprises and trigger bilateral trade conflicts. Thus reducing the export quantity of agricultural products in Hebei Province. In the long run, green trade barriers will promote the technological renewal and improve the export layout of agricultural products by promoting the renewal of government management mode, which will increase the export quantity of agricultural products in Hebei Province.

### 3 Countermeasures Against Green Trade Barriers

#### 3.1 Government Side

Hebei Province should vigorously support green enterprises, give them enough support, formulate relevant policies, and promote the development of green enterprises [7]. For example, implementing financial subsidies, tax reduction and exemption, increasing the publicity of certification, and guiding enterprises to apply for

certification. Relevant governments should collect and study the green barrier policies established by other countries in real time, establish a green barrier information database. In order to correctly handle the dispute of green trade barriers of agricultural products, the government needs to settle the dispute through multilateral negotiations, and deal with the discrimination and unfair treatment of domestic agricultural products by other countries through the dispute settlement mechanism of the International Trade Organization, thus reducing the occurrence of transaction conflicts [8].

### 3.2 Enterprise Side

Agricultural export enterprises in Hebei Province should break through the obstacles of green trade barriers, establish the concept of green development on demand, and infiltrate green values into corporate culture to promote the development of enterprises [9]. Increase waste utilization and promote environmental protection. To further enhance the scientific and technological content of agricultural products can effectively overcome the green trade wall. Meet customer needs without damaging the environment. Strengthen the improvement of agricultural products and foster the progress of skills [10]. Complete agricultural products from extensive to intensive change. Therefore, Hebei Province is gradually expanding its agricultural products market to countries in South America, which is conducive to sharing risks and promoting diversification of agricultural products trade market.

## 4 Conclusions

With the rapid development of the world economy, more and more countries have implemented green trade barriers, which seriously hindered the development of world trade. Hebei Province, as a major exporter of agricultural products, is deeply affected by green trade barriers. This paper concludes the impact of green trade barriers on agricultural products export in Hebei Province through data analysis technology. In the short term, green trade barriers will reduce the number of agricultural products export in Hebei Province, while in the long term, green trade barriers will increase the number of agricultural products export in Hebei Province. Some countermeasures are put forward from both government and enterprises. This paper tries to enrich the relevant literature on green trade barriers and hope to promote economic development.

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# An Agricultural Network Production and Marketing Strategy Based on Evolutionary Simulated Annealing and Greedy Algorithm

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**Abstract.** In the decisive year of building of a moderately prosperous society in all respects, the state proposed to build a “three-in-one” pattern of poverty alleviation and targeted poverty alleviation in accordance with local conditions in poverty-stricken counties. First of all, the problem of food and clothing in the countryside needs to be solved. Some crops of high economic value should be planted. Depending on the situation of different regions, the regression model is used to set up high-level indexes to score different plants, select suitable crops and then carry out planting planning according to simulated annealing algorithm to maximize the utilization of rural land. Secondly, to make the countryside rich, we need to develop our own characteristic products. At the same time, in order to avoid the problem of “depreciating land price by itself”, we need to make use of the current popular live broadcast to improve the popularity. According to the obtained data, different network platforms are scored and the greedy algorithm is used to select the optimal measurement standard and the optimal investment scheme is obtained through the classification processing of the optimal solution, so as to realize the application of mathematical modeling in the targeted poverty alleviation work.

**Keywords:** Simulated annealing · Greedy algorithm · Agricultural planning

## 1 Introduction

Agricultural development is an important part of poverty alleviation. If we want to build a “trinity” poverty alleviation pattern, we need to ensure that agricultural production can be carried out efficiently with plan. The problem with most rural poverty is poor transport which means that good crops are sold at a low price. In the era of knowledge economy, in order to maximize the economic benefits of agriculture. It is necessary to use regression model to integrate the factors affecting the cost and benefit of crops. Select high economic value crops from them. Simulated annealing algorithm is used to solve the optimal solution of planting planning to select high economic value crops [1–4]. In the sale of products, use the network marketing model. The greedy algorithm is used to get the optimal solution of investment. Mathematical modeling was proposed to plan the whole process of agricultural production and product sales so

as to adjust measures to local conditions and realize poverty alleviation in precision agriculture.

A major obstacle to the economic development of rural mountainous areas is the inconvenience of traffic, and the lag of information exchange hinders the economic development. The general problem of rural agricultural development is the shortage of market materials, funds and talents. Due to the lack of available funds, backward farming methods and seriously backward mechanization, the rural occlusion is increasing day by day. After solving the problem of food and clothing, we need to consider optimizing the investment structure and further stimulate economic development by using the existing media publicity methods. In this paper, A city in Anui province as an example, the county tea industry for its characteristics, to solve above problems give a specific solution of the mathematical modeling and analysis.

## 2 Models and Methods

First of all, the regression model was used to establish the high-level indicators, and the low-level indicators were collected from the obtained data, and the weights were set. The regression model was used to solve the linear regression equation of the physical and chemical cost, water demand and fertilizer demand of the mu of crops, so as to solve the total planting cost of the crops. Secondly, according to the principal component analysis method, the total cost, land dependence, planting benefit and the weight ratio of planting cycle are solved, and the function equation is listed to solve the unsuitable planting degree of all kinds of crops, and the three most suitable cash crops are selected. Then a set of weights is selected according to the simulated annealing algorithm, and the given target output is directly taken as the algebraic sum of the linear equation to establish the linear equations, and the planting area corresponding to the three cash crops is solved, and the total economic benefit of planting is finally obtained.

Regression model is the regression analysis in mathematical statistics. One of the methods of statistical analysis used to determine the quantitative relationship of interdependence between two or more variables. The cost and profitability of different crops were calculated by regression model. A multiple regression model was established with fertilizer amount, water demand, physical and chemical cost of mu and labor employment as independent variables and total cost as dependent variables. The standard coefficient and probability value of each variable are used to solve the problem. Set up independent variables are represented as  $x$ , Each dependent variable is denoted by  $Y$ , the influence factor coefficient is represented by  $K$ , and the multiple regression equation can be obtained:

$$\begin{cases} Y = K_0 + K_1X_1 + K_2X_2 + K_3X_3 + K_4X_4 + K_5X_5 + K_6X_6 + \varepsilon \\ \varepsilon \sim N(0, \sigma^2) \end{cases} \quad (1)$$

**Table 1.** Some basic crop data

Crop variety	F	D	B	E	A	C	F
Materialized cost	109.16	112.25	84.63	115	67.4	80	174.63
Workers	413	350.4	208.5	273	193	113	208.5
Production input	552.16	466.25	293.13	388	260.4	193	383.13
Main production	720	675	400	247	300	264	375
Output	780	730	700	277	315	289	675
Planting benefit	257.4	263.75	406.88	406.88	54.6	96	291.88
Water demand grade	5	2	1	3	4	3	1
Fertilizer consumption level	4	5	1	3	2	1	4

The running algorithm can obtain the probability value of the independent variable T, and the corresponding variable factors will be retained for subsequent analysis after screening according to the probability value. Use the standard coefficient of the reserved variable to calculate the weight, collect crop yield per mu, wholesale unit price, irrigation cost, seed cost and other relevant crop information. According to the above information to summarize and process, choose a feasible scheme. Sets the collected, filtered raw data as indicators  $x$ . Set the second-level index  $Y$  as follows: planting cost, selling income, land dependence and maturity cycle. Do the mapping of the index  $X$  to  $Y$ . Second order index functions can be obtained by using multiple regression analysis. The second order index is weighted and fitted. According to the different conditions of land in poor areas, the weight is analyzed by using analytic hierarchy process, and the weight ratio is obtained as follows:  $(k_1, k_2, k_3, k_4)$ . Set the third-order index  $Z$  (crop planting appropriateness).

To plug in crop data rate, pick out the three economic value of the highest levels of crops, its planting in different situation of land, land situation of the reference data matching, based on past experience and preliminary analysis of the survey data, we can know the final total costs and mu cost  $x_1$ , labor employment  $x_2$ , a linear relationship with water and fertilizer requirement. Therefore, the following regression analysis model is established:

$$Y_i = \beta + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i \quad (2)$$

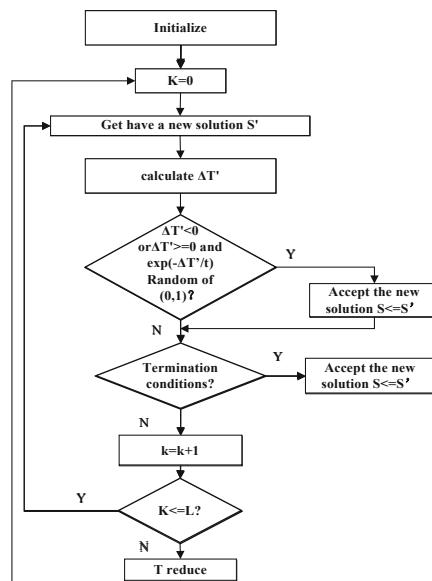
$Y$  represents the total cost of planting such crops per mu. For the various crops in the Table 1, the greater the degree of inappropriate cultivation, the more unsuitable the crops will be planted in the corresponding area. Therefore, we take A, B and C crops as the final result of our crop selection.

The simulated annealing algorithm (SA) [5, 6] is derived from the principle of solid aeration, the solid heating to full height, and then let it slowly cool down, heating, the solid internal particles with the temperature rise into disorder, internal energy increases, and slowly cool down when the particles gradually ordered, at each temperature reached equilibrium state, and finally at room temperature to reach the base state, internal energy reduced to the minimum. The starting point is based on the similarity between the de-ignition process of solid substances in physics and the general

combination optimization problem. SA starts from a higher initial temperature, with the continuous decline of temperature parameters, and randomly looks for the global optimal solution of the target function in the solution space combined with the probability jump characteristic, that is, jumps out of the local optimal solution and eventually tends to the global optimal. The basic steps are as follows:

- (1) Initialization: initial temperature  $T$  (sufficiently large), initial solution state  $S$  (is the starting point of the algorithm iteration), the number of iterations per  $T$  value  $L$ ;
- (2) For  $k = 1, \dots, L$  do steps 3 to 6;
- (3) Produce a new solution to the  $S'$ ;
- (4) The increment of increments is  $\Delta T = C(S') - C(S)$ , where  $C(S)$  is the evaluation function;
- (5) If the  $\Delta T < 0$ , accepts  $S'$  as the new current solution, otherwise the probability  $\exp(-\Delta T/T)$  accepts the  $S'$  as the new current solution;
- (6) If the termination condition is met, the current solution is output as the optimal solution, ending the program. The termination condition is usually taken as the termination algorithm when several new solutions are not accepted in a row;
- (7)  $T$  gradually decreases, and  $T \rightarrow 0$ , then turns to step 2.

The implementation of the simulated annealing algorithm in this article is as follows. In order to obtain the highest economic benefits in the limited fields, the three high-cost crops A, B, C selected above were treated. The optimization and simulation of land planting are carried out by SA [7]. At room temperature to reach the base state, the solution at the end of the algorithm is the approximate optimal solution, set the total number of acres for G, of which the ratio of water fields and drylands is 6:4, A, C suitable for planting land acres L (Fig. 1 and Table 2).



**Fig. 1.** The flow chart of simulated annealing algorithm

**Table 2.** Simulated annealing part of pseudocode

Define and Initial: $J(y)$ : The evaluation function at state y. $Y(i)$ : Represents the current state. $Y(i+1)$ : Represents the new state. $R$ : Used to control the speed of cooling. $T$ : The temperature of the system, the system should initially be at a high temperature. $T_{\min}$ : The lower limit of temperature, if the temperature $T$ reaches $T_{\min}$ , the search will be stopped.
1. while( $T > T_{\min}$ ) do steps(2-9) 2. $dE = J(Y(i+1)) - J(Y(i))$ 3. if ( $dE \geq 0$ ) // If the expression moves to get a better solution 4. $Y(i+1) \leftarrow Y(i)$ // Accept the move from $Y(i)$ to $Y(i+1)$ 5. else 6. if ( $\exp(-dE/T) > \text{random}(0,1)$ ) 7. $Y(i+1) \leftarrow Y(i)$ 8. $T = r * T$ ( $0 < r < 1$ ) 9. $i++$ 10. End

Greedy algorithm [8, 9] can be simply described as: sorting a set of data, finding the minimum value, processing, and then finding the minimum value, and then processing, that is to say, greedy algorithm is a choice in each step to take the best or best in the current state, so as to hope that the result is the best or best algorithm. Considering that greedy algorithms are local optimal solutions, in network marketing, investment is often maximized on platforms that meet the required conditions in order to maximize revenue [10].

The income from the production will be invested in the promotion and sales of tea featured in A county. Alternative sales models include physical stores, street stalls, online stores and live streaming. Taking the income obtained as the total  $Z$ , the freight carrying capacity of each live streaming platform was scored, and a new function index (the freight carrying capacity of the platform) was set. Entropy weight method was used to obtain the corresponding weight of each index according to the low-level indexes such as software download, user activity and total number of users of the platform. The weight was used to comprehensively score the three indexes to obtain the high-level index of the freight carrying capacity of the platform. The following Table 3 shows some basic platform information.

**Table 3.** Official part of the platform statistics

Platform	Total download	Monthly active population	The total number of download
A	15764800557.00	699180000.00	755000000.00
B	32377450830.00	469180000.00	518000000.00
C	31813943235.00	268530000.00	300000000.00
D	22359336886.00	288600000.00	516000000.00
E	34258263781.00	252160000.00	628000000.00
F	11450016751.00	140450000.00	400000000.00
G	14150687218.00	87810000.00	400000000.00
H	4673812934.00	53540000.00	300000000.00
I	4773093332.00	44910000.00	585000000.00

Firstly, the platform download total, monthly active users of the platform, and total users of the platform were normalized respectively. Since the three types of data are all forward data types, the forward indicator formula is used for calculation by (3). After standardizing the index values of total platform downloads, monthly active users of the platform and total number of platform users, the proportion of each index value in this index is calculated by (4). After the specific gravity values of each platform are obtained respectively, the entropy values of each indicator of the platform are calculated respectively by (5). After the redundancy of each index in the platform is obtained, the weight can be calculated. Then, the weight coefficients of the three data types of platform downloads, active users of the platform, and total users of the platform can be obtained. Then, according to the weight and each index value of the platform, the comprehensive score of each platform can be calculated by (6).

$$x_{ij} = \frac{x_{ij} - \min\{x_{1j}, \dots, x_{nj}\}}{\max\{x_{1j}, \dots, x_{nj}\} - \min\{x_{1j}, \dots, x_{nj}\}} \quad (3)$$

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^n x_{ij}} \quad (4)$$

$$e_j = -k \sum_{i=1}^n p_{ij} \ln(p_{ij}), \quad k = 1 / \ln(n) > 0 \quad (5)$$

$$w_j = \frac{d_j}{\sum_{j=1}^m d_j}, \quad s_i = \sum_{j=1}^m w_j x_{ij} \quad (6)$$

According to the core idea of greedy algorithm: select a measure standard. Then, the multiple inputs are arranged in the order required by the measurement standard, and a quantity is input in this order to obtain the optimal solution among all feasible solutions. At this time, the optimization problem is divided into the optimal choice of

carrying capacity and the optimal choice of current revenue. Platform A has the strongest carrying capacity and the highest income at present. Therefore, taobao platform is adopted to carry out live carrying and selling products according to the principle of greedy algorithm, so as to achieve the optimal investment when the investment amount is fixed.

According to the above investment, carry out live broadcast to bring goods, increase the popularity of characteristic industries in A County, so as to enable characteristic products to go out.

### 3 Conclusions

In this paper, targeted poverty alleviation is taken as the background, mathematical modeling method is adopted, including multiple regression model, greedy algorithm, simulated annealing algorithm and other methods to plan agricultural development. The regression model is used to set the index to integrate the factors affecting the agricultural cost, and finally the cost equation is obtained, so that the cost can be calculated quantitatively. Simulated annealing algorithm is adopted to optimize the planting land planning so as to get the planting method suitable for local land conditions and obtain the maximum benefits. Compared with the traditional planting method based on plant habits, this algorithm choice is more in line with the actual situation. In order to promote the development of featured products, different network platforms are scored, the greedy algorithm is used to design investment schemes, and relevant measurement indicators are set to select the optimal solution to obtain the highest return. Based on solving the problem of food and clothing for farmers and selecting the most suitable platform for optimal investment, this paper puts forward some Suggestions for the economic development of mountain villages.

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# Enterprise Independent Trust Management System Under the Background of Big Data

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**Abstract.** The rapid development of big data has more and more influence on the production capacity and development prospects of enterprises. Chinese enterprises are facing new development opportunities and new reform tests. How to effectively improve staff effectiveness and mobilize employees' lasting enthusiasm needs to change the management mechanism of enterprises. This paper starts from practice, through a brief overview of the independent management mode and the background of big data, studies and cooperates with an enterprise in our city, carries out management mode reform for 691 front-line production personnel, and concludes that the independent trust management system can effectively improve the enthusiasm of employees, improve the work efficiency of employees, and in essence enhance the productivity and influence of enterprises. To achieve the result of increasing income.

**Keywords:** Big data · Management mode · Independent management · Production staff

## 1 Introduction

With the acceleration of the construction of socialist market economic system and the deepening of market competition, the importance of management has become increasingly prominent. Since the birth of the first enterprise in the world, the enterprise has experienced more than 240 years of development, and the corresponding theory of enterprise management has also undergone great changes [1]. Looking at the changes of management history for so many years, it can be summarized into three stages, the order of which is experience management, scientific management and cultural management. The success of an enterprise depends not only on strict system management, but also on giving full play to the participation consciousness and independent management level of all employees [2]. Autonomous management is to transfer the decision-making power to the lower level of the organization as much as possible, so that the lowest level has full autonomy and realize the organic unity of responsibility and rights. Self-management provides a channel for each employee to participate in management. If the self-management mechanism can be provided for employees, they will spontaneously combine their personal and organizational goals. [3] The role of managers is to mobilize their subjective initiative, stimulate their internal potential, and give full play to the creativity of employees. Nowadays, in the era of rapid innovation

of knowledge economy, the traditional passive management has been unable to adapt to the development of the times, and the implementation of self-management is the general trend [4].

At present, China's information technology development level has been significantly improved. In the competition of many industries, the key to the competition is how to effectively use big data, which is also the case in the field of enterprise management. Big data has good data resource integration ability, which can play a good role in promoting enterprise management. If big data technology is effectively applied to enterprise informatization construction, enterprise information management will be more detailed and more targeted. Applying big data technology to information management, especially expanding the scope of information management, can make enterprise management more interactive and convenient from top to bottom [5, 6].

## 2 Related Concepts of Enterprise Independent Trust Management Under the Background of Big Data

This chapter will summarize the related concepts of big data, autonomous management and the application of big data in autonomous management.

### 2.1 Big Data Related Concepts

In the 1990s, the concept of big data has been put forward by some scholars, and the arrival of the era of big data development has also been predicted. At the same time, data has become one of the key factors that affect various industries and fields, and data has also become an important part of productivity. Big data emerges with the rapid development of computer and Internet technology. It can realize close contact with other industries through Internet and related technologies, so as to promote the optimization and upgrading of the industry. Since the arrogant data was put forward, other industries have been looking for the combination point with big data and exploring the points that can be optimized and upgraded. At present, there are more than ten different concepts for the definition of "big data", of which several are more typical. However, as a new data information asset, big data relies on the continuous development of information data processing methods, which helps to improve decision-making ability and obtain asset insight [7].

### 2.2 Traditional Management Mode

Traditional management focuses on giving full play to the role of managers. Managers make decisions to deploy and control the overall situation, while employees passively accept various tasks under the command of managers. Employees are all around the manager, not around the market.

Under the traditional management mode, managers pay attention to the management and control of employees' behavior. On the surface, this approach seems to achieve "let employees do what they want". In fact, although managers "control" employees' hands and feet, they "idle" their minds. At the same time, due to the lack of

autonomy of employees, they have no responsibility and responsibility. The traditional management purpose is to organize employees to work hard and forge ahead bravely in accordance with the strategic development of the enterprise and the decision-making and deployment of the managers, which promotes the development and progress of the enterprise, but ignores the personal goals of the employees or the wishes of the employees [8].

### 2.3 Independent Management

Self-management is a system that takes employees as the main body of management, takes cultural construction as the basis, takes the work objectives as the traction, and takes mechanism innovation as the main line to ensure that employees have the conditions, ability and willingness to independently complete the work tasks, and is responsible for the results, so as to form a bottom-up organizational productivity, combat effectiveness and vitality. Self-management regards employees as the main body of management, so that employees have certain decision-making power and autonomy, and promote employees to turn around the market, and take the initiative to find problems, overcome difficulties and achieve goals. The purpose of self-management is to pay attention to the balance and unity of the organization's will and individual's will, as well as the balance and unity of organizational goals and personal goals, in order to achieve the development and progress of enterprises and employees at the same time, that is, to achieve common development and progress of both sides [9].

### 2.4 Combination of Big Data and Independent Management

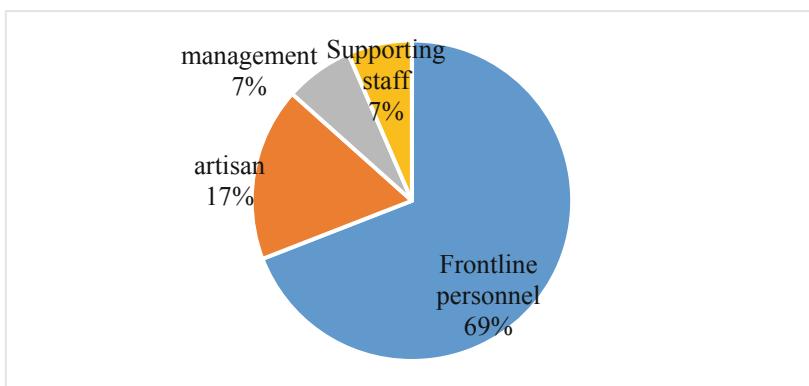
In the context of big data, enterprises should pay more attention to the innovation of their own information management content, methods and technology, and realize the update and breakthrough of big data technology, which is the only way to meet the needs of the development of the times. At the same time, a sharing mechanism should be established to strengthen the ability to sort out information. While establishing the concept of innovation, we need to implement the management concept and mode of "Internet plus". Through the optimized link with the network platform, strengthen the information management and big data analysis ability, and improve the comprehensive ability of data application. Through the combination of big data and self-management, employees can effectively realize their own value in the enterprise. Through the realization of self-worth and the pursuit of self-goal, the self-improvement of employees in the enterprise can be realized, which can be transformed into the overall improvement of the company's value [10].

Under this mode, employees can find and manage the problems on their own initiative. Its management effect is not only high-quality and efficient, but also conducive to the formation of a community of common destiny between employees and enterprises.

### 3 Design Ideas of Enterprise Independent Trust Management Under the Background of Big Data

#### 3.1 Selection of Practical Objectives

Based on social research, technical negotiation and a practical agreement with an enterprise in our city, the company has been established for 11 years, and now the company has a total asset of 120 million yuan, covering an area of 30000 square meters, with more than 1000 employees. The distribution of the number of personnel is shown in Fig. 1, including 691 front-line workers, 175 technical personnel, 69 management personnel, and the rest are auxiliary personnel 65. Nearly nine out of the front-line workers have graduated from technology, and 154 of them have bachelor's degree or above. It can be seen that the proportion of front-line employees accounts for nearly half of the whole company. However, the education level of these employees is not high, their awareness of product quality is not strong enough, and their sense of responsibility and initiative need to be improved, which can be used as an effective practice sample for this practice method. This study will change the management mode of the selected front-line manufacturing employees of the enterprise, bring the big data statistics platform into the management system, and compare the staff enthusiasm, employee performance statistics, and employee work efficiency after the change of management mode (Table 1).



**Fig. 1.** Personnel distribution of the enterprise

**Table 1.** Personnel distribution of the enterprise

	Frontline personnel	Artisan	Management	Supporting staff
Number of people	691	175	69	65

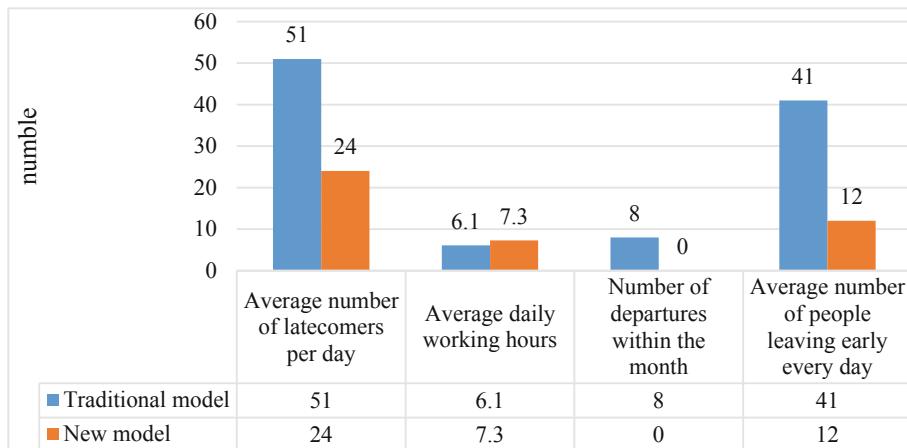
### 3.2 Implementation Method of Practice Mode

The enterprise is a traditional old brand production enterprise with strict class stratification. It is a traditional production enterprise with complex structure and clear division of labor. The enterprise's top-down direction of the implementation of hierarchical management of employees, in the work of employees to adopt a strict system management mode. In this mode, the demands of front-line employees have not been realized, and they have no right to choose. They can only make decisions according to the requirements of leaders. When employees have better employment options or are dissatisfied with the status quo, they will choose to leave.

The main implementation goal of this practice is for the front-line employees of the enterprise. The big data platform is introduced into the daily work management, and the upper and lower class management mode is cancelled. By strengthening the integrity concept of employees, the employees' self-management ability and mutual supervision are improved. Employees can query their own and others' work efficiency and work progress on the mobile terminal in real time according to the corresponding serial number And bonus bonus, can be uploaded in the platform to share their work experience, the company's various requirements and so on.

## 4 Analysis of Practice Results of Independent Trust Management Mode

### 4.1 Employee Motivation Comparison



**Fig. 2.** Performance appraisal of frontline employees in the current month

Work enthusiasm is a kind of active psychological state produced by the task in work. Under the condition of certain ability, the stronger the work enthusiasm is, the better the performance will be, and the higher the work efficiency will be. In this study, the

degree of employees' enthusiasm in the practice time will be judged by the employees' lateness and early leaving, the actual working time in working hours and the number of employees leaving the company, as shown in Fig. 2.

By comparing the new model before and after the practice of the new model, the situation of employee turnover in the traditional mode, the average number of latecomers and early leavers is relatively large. After the issuance of the new self-management mode, the data is obviously improved, and the number of latecomers and early leavers decreases. In this stage, no employees leave voluntarily, and the actual working hours increase on average. It shows that under this mode, employees can be relaxed physically and mentally, and can face work more actively, so as to improve working time and efficiency.

#### 4.2 Employee Performance Results of the Month

Employee performance is the result of the efforts and contributions made by employees to the enterprise within a specified period of time. Performance appraisal is an overall evaluation of employees' performance in this stage from the aspects of work, attitude and status, which affects the actual income of employees. Through the investigation of the performance statistics of employees after the implementation of the new model, we found that the performance appraisal scores of employees in the new mode are generally high, and only a small number of others do not meet the requirements, which undoubtedly reflects the improvement of employee productivity under the independent management mode (Table 2).

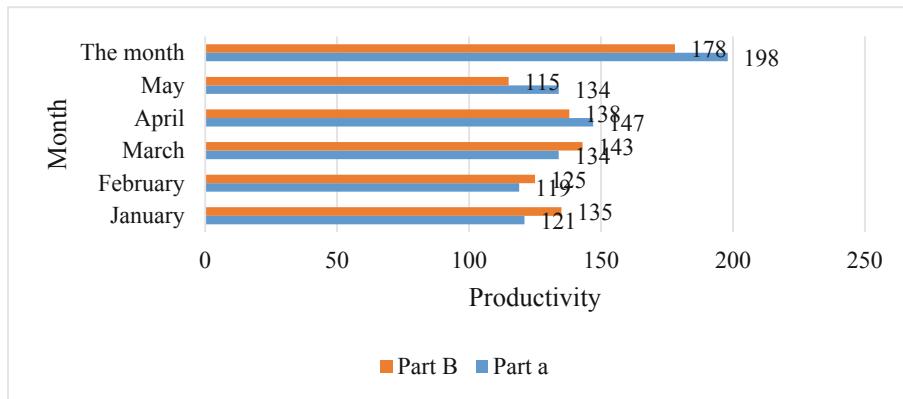
**Table 2.** Performance appraisal results of the month

Assessment items	Number of people corresponding to assessment score				
	100–90	89–80	79–70	69–60	Below 60
Whether the work quality meets the requirements	296	241	78	74	2
Whether the work efficiency and workload meet the requirements	256	147	124	157	7
Is self-management of working hours reasonable	245	158	201	82	5
Can you take the initiative to complete the task	381	264	32	13	1
Can you help others finish their work	396	197	68	26	4

#### 4.3 Productivity Comparison with Previous Management Models

Enterprise productivity refers to all the assets that an enterprise participates in production within a specific time range, including the quantity of products, value or the quantity of raw materials that can be processed. This indicator reflects the production and processing capacity of the enterprise. It is very appropriate to reflect the work efficiency of employees under the traditional mode and the self-management mode through this index.

According to Fig. 3, the productivity of the two types of parts is between 1.1 million and 1.5 million from January to May, while the productivity of this experiment is close to 2 million.



**Fig. 3.** Monthly comparison of productivity

## 5 Conclusion

In the new era, enterprises are required to carry out management innovation on the basis of integrity. From the perspective of independent management, this paper designs a company in our city to carry out employee self-management based on big data. Through the overview and function of self-management and the practice method and implementation of the self-management of the employees of the design company, and the analysis of the data of the enterprise in this experiment, the following conclusions are drawn: the application of big data technology makes human resource management more fair and fair, and also plays a positive role in improving the core competitiveness of enterprises. At the same time, big data technology also creates a more positive and healthy competitive working environment for enterprise employees, effectively solves the problem of large employee mobility, and greatly improves employees' sense of trust, sense of belonging and loyalty to the enterprise. For modern enterprises, winning the loyalty of employees and overcoming the competitiveness of the market is of great practical significance for the long-term development of enterprises.

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# An Empirical Study of the Impact of Margin Financing on the Volatility of the Shanghai Stock Index

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**Abstract.** In this paper, the Shanghai Stock Index is the research object, and an empirical analysis of the relationship between margin trading and stock market volatility is conducted. According to the trading status of the stock market, it is divided into a rising period, a falling period and a normal volatility period. In different stages, a VAR model is established, and then Granger causality test and impulse response analysis are conducted to study the volatility of the two financial services on the Shanghai Stock Index Impact.

From empirical analysis, it can be concluded that the margin trading business at different stages has different impacts on the volatility of the Shanghai Stock Index. During the rising period, the financing business transaction will aggravate the volatility of the stock market, while the margin trading business will slightly reduce the volatility of the stock market. During the down period, both the financing business and the margin trading business will increase the volatility of the stock market, which is caused by the irrational trading status of investors when the stock market falls. As for the normal volatility period, rational investors can capture the signals released by the margin trading business in the stock market, and adjust the structure of the stock market through the rational use of margin trading business to restore their actual value fluctuation So as to suppress the market volatility.

**Keywords:** Financing transaction · Securities lending · Volatility of the Shanghai stock index

## 1 Introduction

China's Shanghai Stock Exchange was established in December 1990, and the Shenzhen Stock Exchange was established in July 1991. At the beginning of the establishment of the exchange, margin trading and securities lending was clearly prohibited. After 15 years of comprehensive prohibition, by October 2005, the state promulgated a new "Securities Law", China began the pilot stage of margin trading and securities lending, and the state formally approved some financial institutions to conduct margin trading and securities lending business. Until November 2011, the "Detailed Rules for the Implementation of Margin Trading on Exchanges" was promulgated, marking the official transition of my country's margin trading business from pilot to regular operation.

The research on margin trading and securities lending business has a long history in foreign countries. The depth of research is ahead of domestic related research. But at present, foreign scholars have not yet reached a unified view on the impact of margin trading and securities lending business on the volatility of stock indexes. There are mainly the following research conclusions:

The first view is that margin trading and securities lending will increase the volatility of the stock market. Allen and Gale (1991) found through theoretical research that the volatility of the financial market that allows securities lending business is greater than that of markets that do not allow securities lending business. In addition, the study also found that margin financing and securities lending business will restrict financial innovation to a certain extent [1]. Henry and McKenzie (2006) analyzed the transaction data of Hong Kong for a total of seven years from 1994 to 2001, and found that when securities lending business is no longer prohibited, traders will increase leverage through securities lending business, making stock prices more volatile [2]. Chang. et al. (2007) divided the individual stocks in the Hong Kong stock market into two lists for securities lending and forbidden securities lending. They found that the volatility of the stocks available for securities lending was greater than that of the prohibited securities lending [3].

Another view is that margin trading and securities lending will curb the volatility of the stock market. Miller (1977) found that when the securities lending business has certain restrictions or even prohibitions, the actual stock prices are higher, that is to say, the securities lending business has an inhibitory effect on stock volatility [4]. Woolridge and Dickinson (1994) showed that the securities lending business can make stock prices fluctuate within its intrinsic value annex, which can suppress the volatility of the stock market [5]. Boehmer et al. (2013) studied the transaction data of the United States during the 2008 financial crisis and found that the ban on securities lending did not reduce the volatility of the stock market as expected, but affected the effectiveness of the market [6]. Beber and Pagano (2013) conducted research on different markets and found that short-selling in the securities market can actually reduce the probability of plummeting. On the contrary, imposing unreasonable restrictions on the short-selling mechanism makes the market Decreased efficiency and increased volatility in the securities market [7].

There is also a view that margin trading and securities lending has little effect on the volatility of the stock market. Battalio and Schultz (2006) showed that whether securities lending business is allowed has no effect on the volatility of the stock market [8]. Kraus and Rubin (2003) used an empirical model to study and found that even if securities lending is allowed in the stock market, the fluctuation of stock market prices is not uniform. It may be a price increase or a price decrease [9]. Sigurdsson and Saffi (2011) found that short buying and short selling represented by margin financing and securities lending may not necessarily bring dramatic fluctuations to the market, and its impact on market volatility is not obvious [10].

## 2 Data Description

### 2.1 Model Introduction

This paper adopts the VAR model to make an empirical analysis on the impact of margin trading and stock market volatility in China. The VAR model can more accurately explain the impact of shock factors in the market on variables, while avoiding interference from other factors, so it is suitable for this article.

### 2.2 Data Selection

The development of margin trading and securities lending business has been slow in the first four years, and the annual growth of transaction balance has been minimal. Therefore, the sample time for this article is from March 31, 2014 to March 31, 2020. China's stock market in seven years was divided into three different states: rising period (2014.06–2015.06), falling period (2015.06–2016.05) and normal fluctuation period (2014.04–2014.06 and 2016.05–2020.03). Daily transaction data was used as a sample for analysis. The sample included 1465 sample points.

### 2.3 Variable Index Selection

This paper selects three variables of financing transaction scale, securities lending transaction scale and stock market volatility as the research objects to construct a vector autoregressive model. The measurement indicators of these three variables are selected as follows: (1) the financing scale (MB) is measured by the natural logarithm of the financing business balance. (2) Similarly, the securities lending scale (SS) is measured by the natural logarithm of the securities lending business balance. (3) Stock market volatility (VOL) is measured by the volatility of the Shanghai Stock Exchange Index. The Shanghai Stock Exchange Index was chosen as the measurement standard because its sample stocks are all listed stocks on the Shanghai Stock Exchange, including A shares and B shares, reflecting the changes in the prices of listed stocks on the Shanghai Stock Exchange. This article uses the parameter VOL to represent the volatility, and the volatility formula is written as:  $\frac{ph - pl}{(ph + pl)/2}$ .

Among them,  $ph$  represents the highest value of the trading data of the Shanghai Composite Index on the day;  $pl$  represents the lowest value of the trading data of the Shanghai Composite Index on the day. Because the data is too large, in order to prevent skewness, and the volatility calculated by the Shanghai Composite Index is logarithmic. The variable names and meanings that may appear in the following are shown in Table 1:

**Table 1.** Variable name and meaning

Variable name	Meaning
VOL	Volatility of the Shanghai Stock Exchange Index
MB	Natural logarithm of financing balance
SS	Natural logarithm of securities lending balance
DMB	First-order difference of MB variable
DSS	First-order difference of SS variable

### 3 Empirical Research

#### 3.1 The Rising Period

Testing whether the data is stable is the first step in constructing a time series model. Therefore, the variables must be united first. In this paper, Dickey-Fuller test is used to detect whether a variable has unit roots. According to the results of the ADF test, when the stock market is on the rise, MB and SS are not stable. Therefore, it is necessary to make a first-order difference in the transaction balance of the two financing businesses. After the first-order difference being performed, the stable variables are DMB and DSS. Therefore, in the VAR model, the stock market volatility VOL and the balance of financing transactions are divided into the natural logarithm of the first-order difference DMB and the balance of securities lending transactions. The first-order difference DSS after the natural logarithm is used as the dependent variable of the equation system.

When the VAR model is used, after the stable dependent variable is determined, the best lag period is selected. This paper uses the standard test of lag length to determine the lag period. If judged according to the LR, FPE, and AIC criteria, the optimal lag order is 6, which will make too many parameters to be estimated and will lose a lot of sample size. Therefore, according to the SC and HQ criteria, the optimal lag order Choose first order.

So far, the VAR model for the stock market rising period is established. The three dependent variables are VOL, DMB, and DSS. The economic significance of DMB and DSS is the growth rate of the original variables, that is, the growth rate of financing business transaction balance and securities lending business transaction balance. Because the VAR model contains too many variables and parameters, even if the regression result is significant, it is difficult to explain its economic meaning. Therefore, this article focuses on analyzing the results of impulse response without reporting the estimated results of the VAR model.

Next, check whether the VAR system is stable. The test results show that all the eigenvalues of the VAR equation fall within the unit circle, so the VAR system is stable.

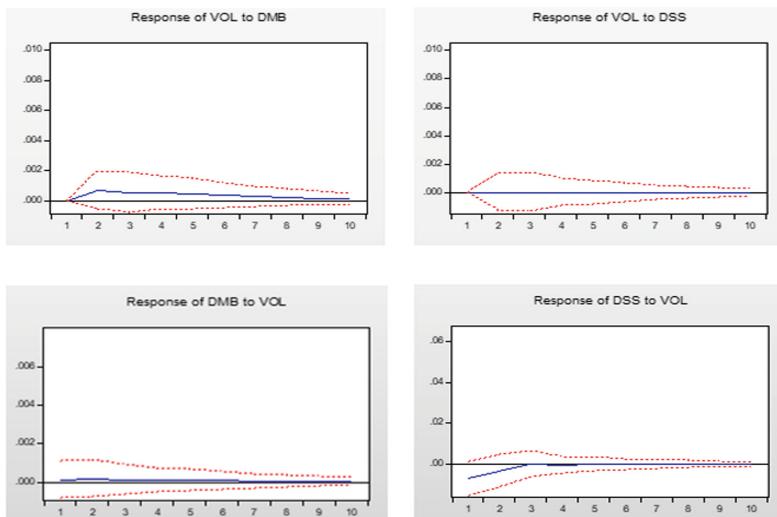
Further research requires methods such as Granger causality test and impulse response function to obtain the influence relationship between these three variables. The results of Granger Causality Test are shown in Table 2.

**Table 2.** The results of Granger causality test

Virtual statistics	F value	P value
VOL is not Granger causality of MB	22.4916	4.00E-06
MB is not Granger causality of VOL	0.30483	0.581
SS is not Granger causality of VOL	30.426	9.00E-08
VOL is not Granger causality of SS	8.218	0.0045
SS is not Granger causality of MB	11.003	0.0011
MB is not Granger causality of SS	7.454	0.0068

From the results of Granger causality test, it can be seen that there is a one-way relationship between VOL and MB. There is a two-way relationship between SS and VOL. For MB and SS, the two are obviously also a two-way relationship of mutual influence.

In the impulse response graph, you can see how the variable is affected by the impact of the shock variable. The main concern of this article is the relationship between stock market volatility and margin financing and securities lending balances (Fig. 1).



**Fig. 1.** Impulse response

When the stock price rises, investors' enthusiasm for the stock market increases. In order to obtain more income, people generate doubled leverage through margin trading and securities lending, so at this stage, as the stock price rises, the balance of financing transactions also increases. As the stock price continues to raise, the funds entering the stock market increase, and the stock price rises accordingly, which will cause a bubble in the stock market. Some investors in the market are aware of the existence of the bubble and are pessimistic about the future stock price. They will conduct securities trading and sell securities. Due to the increase in the stock market supply, the stock prices will no longer rise, but the trading scale of the securities trading business is too small. The effect of adjusting market prices is not as strong as that of financing business. Therefore, financing business is the main factor driving the volatility of the stock market, increasing the volatility of the stock market.

### 3.2 The Down Period and the Normal Period

The empirical analysis method for the down period and the normal period in this section is exactly the same as that during the up period. The specific steps will not be repeated.

If the stock market is in a downturn, both financing and securities lending businesses will obviously push the Shanghai Composite Index to fall further. At this time, the balance of financing business transactions will also decline, which will exacerbate the market decline. In the short term, the market decline will also reduce the balance of securities lending business transactions, which will further promote the decline, which is not conducive to the stability of the stock market. If the stock market is in a period of normal volatility, both financing and securities lending businesses will curb stock market volatility. The period of normal volatility helps investors conduct rational analysis, and the margin trading and securities lending business can play a better role at this time.

## 4 Conclusions

According to the empirical analysis, no matter what the market is, the margin trading business will have a certain impact on the volatility of the Shanghai Stock Exchange Index.

- (1) If the stock market is in a rising period, the financing business will increase the volatility of the Shanghai Stock Exchange Index, and the securities lending business will slightly reduce the volatility. However, due to the small scale of the securities lending business, the effect of restraining volatility is limited, and the overall volatility will increase amplitude.
- (2) If the stock market is in a period of decline, both financing and securities lending businesses will obviously push the Shanghai Composite Index to fall further.
- (3) If the stock market is in a period of normal volatility, both financing and securities lending businesses will restrain stock market volatility. The period of normal volatility helps investors conduct rational analysis, and the margin trading and securities lending business can play a better role at this time.

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# Research on the Construction of Enterprise Accounting Informatization Under the Background of Big Data

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**Abstract.** The development of big data makes all our life work more efficient, and big data also asks higher requirements for enterprise information construction, mainly focusing on the information platform construction, information security protection and laws and regulations. At present, China has a certain market advantage and development potential in the development and big data application. The accounting informatization construction is not only facing unprecedented development opportunities, but also facing many challenges. Therefore, we need to systematically analyze the characteristics of accounting informatization construction under the background of big data, and on this basis summarize the problems exposed in the construction process, and try to find solutions, so as to assure the continuable development of accounting informatization. Focus to those issues existing in the construction of enterprise accounting informatization base on this background of big data, the paper proposes three Suggestions, such as accelerating the construction of information platform, improving the protection of accounting information system and formulating relevant safety regulations, in order to promote the further development of accounting informatization in China.

**Keywords:** Accounting informatization · Big data · Cloud platform

## 1 Introduction

The convergence and synthesis of information technology and economy and society has led to the fast advance of data, which has come to a national fundamental strategic resource. Big data is more and more exerting a considerable influence on worldwide manufacture, turnover, allocation, consuming activities, economic work elements, the way of our life and national administration ability [1]. Research and development of more efficient accounting information system, accelerate the speed of accounting data treating, and constantly improve and actually increase the efficiency and quality of accounting work [3], which is the basic requirements of the era of big data for the construction of accounting information. At present, China has a certain market advantage and development potential in the development and application of big data. The construction of accounting informatization is not only facing unprecedented

development opportunities, but also facing many challenges. Therefore, we need to systematically analyze the accounting informatization construction based on the background of big data, and on this basis summarize the problems exposed in the construction process, and search for solutions, so as to assure the accounting informatization's continuable development.

## 2 Overview of Big Data and Accounting Informatization

Big data promulgated by the State Council in 2015 to promote the development of action programs notice that big data is the high volume, styles, velocity of fetch, high application importance as the essential features of the data clustering, is growing quick for a large quantity, disparate proveniences, multiple forms of data getting, saving, and relevance analyzing, find fresh knowledge and produce more value, upgrade updated capacity of information technology to the next level [2]. There are four traits of big data: first, the data capacity is huge. Second, there are many types of data. Third, access is fast. Fourth, high application value.

Accounting informatization is combined with information technology and accounting [5]. It put a fresh request to the companies' financial information administration and an inevitable arrangement that the company accounting abides by the tide of informatization [6]. It is the main way for a company's managers to get information in the internet circumstance, which facilitate to improve the competitive strength of companies, ameliorate the phenomenon of "isolated island" in computerized accounting, and further the capacity of company administration, and find out how to make a better decision.

## 3 Current Situation of Accounting Informatization Construction in China

At present, our country accountant the informatization construction has made gratifying achievements, accounting software develops gradually from the stand-alone version of the unity of the collectivization software, from the general ledger reporting system evolution of the supply chain system, financing system and asset into a comprehensive accounting system, accounting information systems have been applied in various types of enterprises, large scale and standardized management of enterprises, the accounting informatization level is higher also. Accounting information construction has gradually become an indispensable and important link in the development of enterprise strategy. [4] However, after the system understanding of accounting informatization in our country actual situation, found that in addition to some of the more excellent enterprises, many enterprises accounting system still will accounting as the main content, a line of accounting workers will still plenty of time for reconciliation, accounting, and generate reports, etc., cannot really involved in business activities, accounting, management function has not been fully made use of, and enterprise management has a direct relationship, in addition, also affected by the accounting laws and regulations. Accounting regulations require accountants to complete accounting management in

accordance with the original paper documents and ensure the safety of these paper documents, so accountants need to use a lot of energy and time to review the authenticity, legality and rationality of materials. At the same time, accountants need to build archives and assign special staff to sort out the original materials. Along with the measures for the management of accounting files (amendment) in December 2015, and the electronic signature law of the People's Republic of China in 2015 the implementation of the correction, promoted to national recognition of electronic data [7, 8], it will fundamentally change, accounting system affect the accounting information system reconfiguration, accounting personnel need to improve their business ability and knowledge structure, so as to meet the requirements of accounting informatization development era of big data.

#### **4 Problems Existing in Accounting Informatization Construction Based on the Big Data**

The construction of accounting information sharing platform lags behind. Although gathered speed the development of the information sharing platform in China, can basically meet the need of the current accounting management techniques, but if you want to share information resources better, still need to build a relatively complete information sharing platform, but the current our country accounting information platform for the construction of the work is not very desirable, to suit the requirements of accounting information. As the accounting information platform still needs to meet the diversified needs of users and services, it has a high requirement on the adaptability, ductility and flexibility of information, which needs to be guaranteed by higher level of technology. In recent years, although our country's network technology is also in constant development and white I innovation, but the process is slow, the effect is not significant, still exists many problems, such as technology does not reach the designated position, the imperfection of the capital allocation, the cause of the current accounting information platform is difficult to play its proper role, hindered the accounting informatization.

The protection of accounting information system is weak. The data suggest that most companies keep their accounting information in the “cloud”. In the construction process of accounting information cloud system, two factors need to be considered comprehensively: login system verification protection degree and hidden danger of data storage security. Protection degree to login system validation problem: at present, our country accounting information system is mainly the use of the form of validation to ensure that the identity authentication security, in the process of login, need to ensure the account and password match, but this kind of identity authentication method is simple, has low security, once the criminals in the form of a virus invasion and the violation detection to obtain the account password information, corporate financial information will be faced with great danger. At the same time, some managers have weak security awareness and often use phone Numbers or iconic holidays as passwords, which are easy to crack digitally. Some enterprise account passwords will be used for a long time, which is very easy to lead to password disclosure.

On the hidden security of data storage: Under the background of accounting informatization, all financial data of enterprises are transmitted through the network, and the data carrier is different from the traditional form. From the perspective of the security of accounting information, it is very important to strengthen data confidentiality. China's studies on data encryption technology are still in an initial stage. Many developers design accounting software with too simple encryption mode. During the course of data transmittal, they cannot ensure the security of data, which will give criminals a chance to take advantage of it and cause data leakage and strategic decision-making errors.

Accounting information security laws and regulations lag behind. With the advent of the era of big data, many enterprises begin to focus on the construction of accounting information platform, business management and informatization are gradually combined, and financial staff also begins to accept the new accounting model. In the current era of big data, standards have gradually become the norm to maintain technological progress [9]. However, if the technical standards become low-end, it will cause chaos in the market and industry. On December 1, 2019, China formally implement information security technology of network security level to protect the basic requirements for the measurement of the information security technology of network security rank protection requirements of information security technology of network security level security design technical requirements three state of network security protection system, and 2.0 series, but this series of standards is not related to the accounting information security legislation. If an enterprise has accounting information disclosure and information security issues, it will be “unable to rely on”.

## 5 Suggestions on Accounting Informatization Construction Under the Background of Big Data

Accelerate the development of information technology platforms. The primary task of accounting informatization construction is to develop accounting information system more suitable for China's national conditions. First of all, to build an information sharing platform, the government should give encouragement and support, improve the efficiency of resource integration, increase technical investment, and realize the complementarity between advantages and disadvantages. At the same time, it should reduce the difficulty of independent research and development, so as to reduce the cost of research and development. Secondly, suppliers also need to innovate knowledge structure, improve research and development level, and enhance innovation concept. Finally, the supplier should strive to improve the research and development efforts, not only to introduce foreign advanced technologies, but also to improve these technologies, build demonstration projects, provide theoretical basis and creativity for enterprise accounting informatization construction, and gradually improve the accounting sharing system.

Improve the protection of accounting information system. The main reason why enterprises have concerns about accounting storage is that they do not trust the security of cloud applications. Therefore, to improve the use frequency of the cloud system, it is necessary to ensure the protective performance of the accounting information system

itself and improve the construction of the accounting information system. At present, the main measure of accounting information system security protection is encryption function, that is, the use of identity authentication and encryption to improve the security of the system, but in the practical application process, it is inevitable that some unavoidable factors will affect the operation, generate security risks. So, in the use of accounting information system, the need to build a firewall, use multiple measures to ensure the security of enterprise data and information, and also need to verify the identity of the relevant personnel and information encryption of enterprise accounting information, make the enterprise can use accounting information system security, to ensure the safety of the enterprise accounting information. In addition, the core financial data of an enterprise should be backed up frequently to prevent loss. Managers of accounting information system also need to fully consider the needs of data restoration and restoration, and set up restoration and restoration plates in the system to avoid data loss, so as to ensure comprehensive and accurate accounting data and better use of the system.

Raise the qualifications for market access and speed up institutional standardization. The application of cloud accounting in China has just started, and the relevant laws and regulations are not perfect. First of all, relevant institutions need to formulate relevant standards and regulations as soon as possible, so that the cloud accounting industry can be protected by law. Secondly, on the basis of strengthening the construction of accounting information security, China will improve the admission qualification standards of suppliers, so as to urge service suppliers to seek further development according to their own actual conditions, learn new capabilities and technologies, timely update their concepts and equipment, and provide better services and security guarantees. In addition, it is also necessary to dynamically examine suppliers with technical ability requirements and employ them on a merit-based basis. Only in this way can promote the healthy and stable development of accounting informatization. Finally, the administrative and judicial departments should strictly control and punish illegal behaviors on the Internet, such as malicious destruction of data integrity. In addition, an accounting information security system should be formulated to make the content and form of accounting information disclosure more reasonable, ensure more accurate data and improve the practicability of accounting information.

## 6 Conclusions

Under the background of big data era, big data can effectively promote the reform of accounting informatization [10]. However, the development of accounting informatization also has many risks and problems, such as backward information platform construction, poor protection of accounting information system and other problems, as well as the risk of incomplete legal system. For these exposed problems, the government and enterprises should actively respond to explore the corresponding solutions, so as to ensure the sustainable and stable development of accounting information.

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# Research on the Construction of Smart Financial Management and Control Platform for Small and Medium-Sized Enterprises in the Information Age

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**Abstract.** Comply with the continuous progress of science and technology and the rapid development of the information age. In the context of the information age, opportunities and challenges coexist in the financial management of SMEs, but how to deal with them. Based on the background of information technology, this article further analyzes and discusses the transformation of SME financial management, and puts forward a concept of commanding financial management. This article starts with increasing the construction of enterprise financial intelligence management and control platform, and after closely focusing on the investment of intelligent technology and system innovation, it systematically analyzes the current path and direction of the construction of the current SME financial intelligence management and control platform, and further improves financial management for SMEs. The work laid a solid foundation.

**Keywords:** Information age · Corporate financial management · Smart management and control platform · Smart management

## 1 Introduction

In the information age, the financial management environment of Chinese SMEs has undergone earth-shaking changes. In the traditional financial management era, working procedures are cumbersome, and manual financial calculations are also prone to data errors, which affect work efficiency and work quality [1, 2]. The use of information technology for financial management has completely solved the above problems. Modern information equipment has been used in daily financial management work [1]. Change work methods, improve work efficiency, and standardize and uniformly manage the business activities of enterprises. Therefore, big data technology has fundamentally changed the financial management environment and is an important turning point in financial management [3]. In the era of big data, companies must change the concepts and methods of financial management to carry out financial management activities, which places higher requirements on financial-related personnel. In order to keep up with the development of the times, employees should change their working methods and use big data technology to carry out corresponding financial

work. Only by changing the concepts and methods of financial management can we ensure the healthy and sustainable development of modern enterprise financial management [4].

The main task of the financial management of small and medium-sized enterprises is to reasonably prepare corporate budgets, effectively control the execution of financial budgets, prepare company final accounts completely and accurately, and truly reflect financial status [5]. Enterprises raise funds through various channels in accordance with the law, strive to save expenditures, establish and improve corporate financial systems, strengthen economic accounting, implement performance assessments, improve corporate capital efficiency, strengthen corporate asset management, reflect the truth, use assets in a complete manner, and allocate rationally and effectively. Use corporate assets to prevent asset losses, strengthen financial control and supervision of corporate economic activities, and prevent risks in corporate financial management [6]. Combining the above principles with the main tasks of current corporate school financial management, specific financial management indicators, such as income financial management targets, expenditure financial management targets, carry-over balance financial targets, asset management targets, etc., can also give full play to the role of financial resources, thereby improving the professional capabilities of corporate financial managers [7].

The intelligent financial sharing platform is a kind of human resources and technical resources that can effectively organize the branches and business departments of small and medium-sized enterprises. This is a new type of financial management mode, which makes the financial process of modern enterprises more standardized and simplified [8]. Its advantage is that it can reduce current operating costs and greatly improve the efficiency of financial management of SMEs. In order to adapt to the development trend of financial management in the “informatization” era, promote the construction of financial informatization in our country. This article is based on the stage of smart finance in the information age, guided by the theory of information empowerment, to solve the implementation model of SMEs’ financial integration and value creation issues, and puts forward the optimization suggestions of the financial sharing center in the context of the information age [9].

## 2 Algorithm Establishment and Analysis

### 2.1 Construction Analysis Based on Online Learning Product Quantization Algorithm

First, suppose that there are 5 data in the original space,  $x_1, x_2, \dots, x_5$ , and the quantified center is essentially the expected value formula of a series of data points:

$$\bar{x} = \frac{1}{5} \sum_{i=1}^5 x_i \quad (1)$$

Then the above formula can be transformed, the available formula is as follows:

$$10\bar{x} = \sum_{i=1}^5 x_i \quad (2)$$

At this time, it needs to be processed in the hypothetical space beyond the original 10 data points. When new data comes, it is recorded as  $X_6$ . The relationship formula that can exist is as follows:

$$10\bar{x} + x_6 = \sum_{i=1}^6 x_i + x_6 \quad (3)$$

Let the new center point be  $\bar{y}$ , then:

$$\bar{y} = \frac{1}{6} \left( \sum_{i=1}^6 x_i + x_6 \right) = \frac{1}{10} (10\bar{x} + x_6) \quad (4)$$

Through the calculation process of the above four formulas, the corresponding quantization center in the codebook can be updated. Just to keep the index of the data unchanged, because the index value needs to be updated, it is necessary to use the exit of the knife history to perform a recalculation of the distance between the historical data and the new center point to update the index value. It is contradictory to the idea that the designed online model does not need to use the original traditional data.

The objective function of online product quantization can be given below:

$$\min_{c_m^t} \sum_{m=1}^M \|x_m^t - c_{m,k}^t\|^2 \quad (5)$$

In the online product quantization algorithm, the data is dynamically updated. In order to simulate the changes of the data, the data set is divided into several parts, one of which is used for the traditional product quantization to initialize the parameters, in addition to being able to represent the center point of the subspace. In addition to the codebook and the index representing each data, a new set of parameters need to be added to represent the number of data quantified to the same center point, which is recorded as a counter. The remaining data is used to simulate online learning. In the subsequent update process, the codebook on each subspace will be updated according to the calculation formula of K-means, but the index of the data changes with the update of the data, namely. In the initialization phase, the quantized optimal center point moves in space, so the quantization loss will continue to increase.

In the process of updating, the following k-mean algorithm is used for cluster analysis as shown below:

For each class J, recalculate the centroid:

$$U_j = \frac{\sum_{i=1}^m 1\{C^{(i)} = j\} X^{(i)}}{\sum_{i=1}^m 1\{C^{(i)} = j\}} \quad (6)$$

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \quad (7)$$

Among them  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points in space.

$$d(x, y) = \sqrt{(x_i - y_i)^2} \quad (8)$$

Among them,  $x_i$  is the attribute value of  $X$ , and  $y_i$  is the  $i$ th attribute value of  $Y$ . The criterion function is defined by the following formula:

$$E = \sum_{i=0}^k \sum_{x \in c_i} |x - x_i|^2 \quad (9)$$

Among them,  $k$  is the total number of clustered data, and  $X$  is the center of cluster category  $e$ . using the error sum of squares criterion function, the clustering criterion function application of the K-means algorithm can be obtained, as shown in the following formula:

$$J_c = \sum_{i=1}^k \sum_{p \in c_i} \|P - M_i\|^2 \quad (10)$$

### 3 Modeling Method

#### 3.1 Construction of Smart Financial Management and Control Platform

In the current information age, in the construction of a smart financial management and control platform based on big data analysis, many different algorithms have been produced. However, in terms of application scope, the application of perceptron is the most widely used. Then, for all misclassified samples, the penalty is implemented in a summation manner, which can be specifically based on the following algorithm formula:

$$J_p(W) = \sum_{i \in r} (-W^T X_i) \quad (11)$$

$$W(x, i) = (1 - \alpha) + \alpha \frac{D_{si}}{LX} \quad (12)$$

$$r(x, j) = \sum_{i \in I_x} W(j, I) x sim(i, j) \quad (13)$$

For the given resource, the recommendation degree calculated according to the above formula is as follows:

$$r(x, j) = \sum_{i \in I_x} W sim(i, j) \quad (14)$$

Let  $C_{\max}^k$  denote the maximum process time of  $k$  analytical citations, and scheduling minimizes the maximum process time, so this is a minimization problem.

The cloud data storage security risk rating prediction model judges that the platform risk rating process is a typical two-category model. The logist model is the most widely used model. When Y is 0, the risk level is 0. When the value of Y represents 1, the risk level is 1. The probability can determine the cloud data storage risk level according to whether the threshold is set.

$$p(Y = 1|X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \dots + \beta_n x_n)}} \quad (15)$$

The fitting effect of the rating model is expressed by the pseudo R-square statistic, and its meaning is a proportional model explained by the self-edited amount of the total variation times model of the dependent variable. It can be seen that:

$$\text{Cox\&Snell} - R^2 = 1 - \left[ \frac{\ln(L_0)}{\ln(L)} \right]^{\frac{2}{n}} = 1 - e^{\left\{ \frac{2}{n} - \ln(L_0)(\ln(L)) \right\}} \quad (16)$$

$$R^2 = \frac{\text{Cox\&Snell} - R^2}{1 - (L_n(L_0))^{\frac{2}{n}}} \quad (17)$$

$$eval(v_k) = \frac{1}{C_{max}^k} \quad (18)$$

$P(t)$  is the support provided by ordinary parsers, and  $P(t)$  satisfies:

$$p(t) + \alpha p(t) = kx_{ob}(t) \quad (19)$$

Which is:

$$\{x_0\} = \{\varphi_s\}x_1 \quad (20)$$

From the perspective of the classification of online learning algorithms, the perceptron algorithm is essentially a reward and punishment algorithm. This algorithm is widely used to solve linearly separable problems; and as a relatively basic online learning algorithm, the perceptron algorithm has emerged as a more convergent second-order perceptron, which is a kind of continuous The formula implements the updated calculation method, and it should have a wider application prospect in the future.

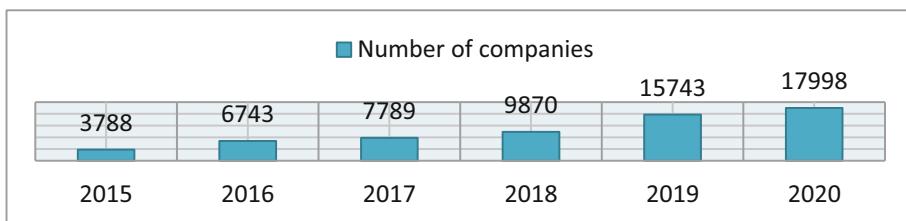
## 4 Evaluation Results and Research

### 4.1 Survey Data Analysis

**Table 1.** Descriptive statistics of the survey samples (N = 100)

Feature	Classification	Sample size	Proportion
Business age	Less than 3 years	75	75%
	3–10 years	25	25%
Number of companies	100–500 people	35	35%
	500–1000 people	65	65%
Industry	Manufacturing	80	80%
	Service industry	20	20%

The questionnaire data statistics are shown in Table 1. Since the main research content is the ability and effect of the company's use of the smart financial management and control platform in the information age, the first part of the survey designed the application of informatization in all aspects of the company the technical situation. If the respondent does not fill in the relevant applications and investments that are not related to informatization by the company, the questionnaire is deemed invalid. Three sample questionnaires from these companies are presented, and 100 valid questionnaires are finally obtained. In the trend of continuous development of modern information science and technology, the focus and development basis of enterprises in the new era are information, and data information is the foundation of enterprise financial management.

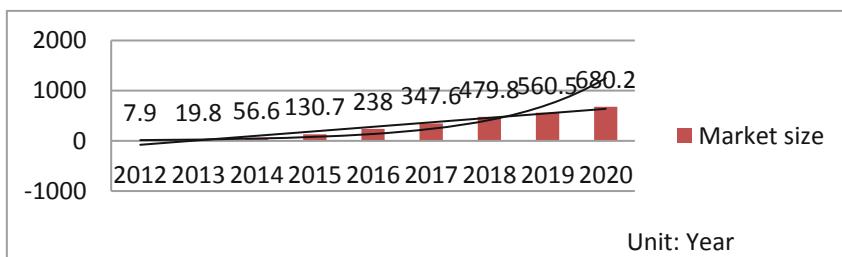


**Fig. 1.** The growth trend data of the number of smart financial management and control platforms for small and medium-sized enterprises from 2015 to 2020

As shown in Fig. 1, the growth trend data of the number of smart financial management and control platforms for small and medium-sized enterprises from 2015 to 2020. After the smart financial management and control platform is adopted to manage the financial affairs of small and medium-sized enterprises, the number of new levels of market entities has increased significantly from 2015 to 2020. There are more and more companies. From this, it can be found that the smart financial management

and control platform is not adapted to the scale and speed of the market economy development of small and medium-sized enterprises. The existing financial management and control platform is not conducive to effectively carrying advanced value concepts for the supervision and management of small and medium-sized enterprises.

#### 4.2 Market Size of SMEs



**Fig. 2.** The market scale of the economic development of SMEs under the blessing of the smart financial management and control platform from 2012 to 2020

From the above figure, we can see that before 2015, the scale of big data was not large enough, and most companies were still very unfamiliar with big data. Less than 20% of the companies recognized big data and brought it to The benefits of the economic management of enterprises are far better than those under the previous manual situation. After 2015, the economic development market scale of enterprises has increased by about 40% compared with that before 2015. The results show that big data has entered a rapid development after 2015. More and more business economic management models adopt big data methods, and the convenience it brings to enterprises has better promoted its economic development (Fig. 2).

### 5 Conclusion

Based on the above, my country's SMEs must carry out comprehensive reforms and innovate management and development models, and accelerate the pace of financial management transformation. According to the current needs of the financial development of SMEs, the construction of a financial intelligence management and control platform for SMEs in the future will be discussed and conducted a theoretical analysis of its future development trend. What SMEs need is technical talents who can control the smart financial platform, rather than employees with traditional financial management. In order to be able to continuously improve the company's ability to build a financial management platform as the first to upgrade the more valuable intelligent management and control platform.

**Acknowledgements.** This work is supported by 2019 Guangdong University Characteristic Innovation Project (Undergraduate): Research on the Supply-side Structural Reform of Agricultural Products with Precise Drip Irrigation of Small and Micro Finance in Western Guangdong (Project No.: 2019WTSCX160); Guangdong Ocean University Cunjin College in 2019 Application Research of Flipped Classroom Model – Taking Tax Accounting and Tax Planning as an example. (Project No.: ZLGC2019009).

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# Impact of Internet Finance on SMEs Financing Under the Background of Big Data

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**Abstract.** The status of SMEs in China's economic development is unquestionable and the difficulty of financing of SMEs has been one of the problems that have plagued the development of SMEs for many years. The emergence of Internet finance seems to bring hope to solving this problem. As big data and cloud computing technologies are widely used in Internet finance, Internet finance has had a huge impact on the financing of small and medium-sized enterprises. While it has brought improvements to the development of small and medium-sized enterprises, it also brings a series of risks to them. Starting from the current situation of SMEs financing, this article explores the impact of Internet finance on SMEs financing under the background of big data and analyzes how to make good use of the Internet finance platform to better provide financial services for SMEs, thereby breaking through the financing bottleneck of SMEs.

**Keywords:** Big data · Internet finance · SMEs financing

## 1 Introduction

The rapid development of small and medium-sized enterprises has led to the gradual increase in their own demand for funds. At present, the financing bottleneck problem that is difficult to break through seriously restricts their development. For small and medium-sized enterprises, financing problems need to be solved urgently. At the same time, with the continuous innovation of Internet technology in recent years, the rapid development of big data and cloud computing technology has brought many conveniences and possibilities to various fields. From the perspective of enterprises, the development of Internet finance not only improves corporate management efficiency and optimizes operating costs, but also provides a new path for SMEs to finance and broadens their financing channels.

At present, domestic and foreign scholars have done in-depth research on the financing of small and medium-sized enterprises. Scholars generally believe that small and medium-sized enterprises are facing serious financing problems and information asymmetry is the main reason for the financing difficulties of enterprises [1]. With the rise of big data, the development of Internet finance has had a huge impact on the investment and financing environment of enterprises, however there are relatively few

studies on the impact of Internet finance on SMEs financing based on the background of big data at present.

In order to further study the financing problems of SMEs, this article discusses the impact of Internet finance on SMEs financing in the context of big data based on the analysis of the current situation of SMEs financing, and proposes suggestions on how to use Internet finance to solve the financing difficulties of SMEs, which helps enterprises develop better and enriches theoretical research on financing issues.

## 2 Current Status of SMEs Financing

According to the “Research and Analysis Report on the Status Quo of China’s Small and Micro Enterprises Industry”, as of the end of June 2019, SMEs reached 31.237 million in China, accounting for 88.5% of the total number of domestic enterprises. It can be seen from the above data that the importance of small and medium-sized enterprises in the national economy. But so far, financing problems such as poor financing structure, high costs, and narrow channels that have plagued the development of SMEs have still not been resolved. According to the annual “China Banking Industry Social Responsibility Report”, there was a large gap between the loan application and acquisition limits of SMEs in 2019, the loan satisfaction rate failed to reach 70%. Due to the problems such as imperfect financial statements of SMEs and asymmetry of information, commercial banks out of their own risk control considerations often require financing companies to use their own sites and products as collateral and take dynamic monitoring measures, which imposes certain restrictions on business activities of enterprises and aggravates the difficulty of financing for SMEs [2]. At present, the problem of difficulty in financing for small and medium-sized enterprises is the common urgent need of all interest groups. According to the survey, more than half of SMEs still choose traditional bank loans when making financing decisions, only a few of SMEs borrow from Internet financial platforms. In this context, the rise of Internet financial platforms is undoubtedly a good choice.

## 3 The Impact of the Internet Finance on the Financing of SMEs in the Context of Big Data

### 3.1 The Benefits of the Internet Finance to SMEs Financing

#### (1) Increase financing channels

Traditional financing methods include bank loans, stock issuance, bond investment and private lending. Currently, bank loans and financing from non-financial institutions have also become an integral part of the financing structure of SMEs. However, the financing structure of SMEs is still not coordinated enough and the problem of financing difficulties remains unsolved. Moreover, the three-dimensional capital market suitable for private SMEs financing is not sound enough. From the perspective of the direct financing market, we can find that whether it is securities, insurance, funds or trusts, their targets are basically large

and medium-sized enterprises. Out of the consideration of safety, most banks' thresholds are relatively high when selecting financing objects. Moreover, SMEs also lack financial institutions commensurate with their own scale, which greatly reduces the possibility of SMEs financing through indirect means. Because stocks and securities are biased towards large-scale enterprises, the second stock exchange market for SMEs is also in its infancy. Therefore, in the stock market, the size of enterprises is a barrier to the issuance of stocks to private SMEs [3]. The most obvious feature of private lending is that it has higher interest rates than general lending in the market, which undoubtedly increases the financial risks of enterprises. Internet finance broke through the bottleneck period of traditional SMEs financing, using the latest IT technology to change the information collection source, risk pricing model and credit rating system of traditional financial services. Moreover, it cleared the credit barriers of private SMEs financing, making it has differentiated competition compared with traditional financing, which brings better choices to SMEs.

(2) Information search and price comparison functions reduce financing costs

Information search and price comparison functions not only greatly reduces the information acquisition cost of Internet finance, but also improves the collection, screening and processing functions of SMEs' information, which reduces operating costs. At the same time, Internet financial platform pays real-time attention to the operating status of private SMEs and uses the comprehensive comparison function of Internet big data to provide a solid foundation for accurate pricing. In addition, Internet finance is committed to the long tail market based on the long tail principle. The large and scattered small customer groups in the long-tail market cannot obtain funds because of the high cost of traditional financing methods [4]. Internet finance accumulates these markets and provides them with related financial services. What's more, it use a large customer base to share costs, thereby reducing the average unit cost. All of the above ensure that Internet financial entities can build a win-win loan pricing for SMEs. In conclusion, Internet finance plays a significant role in reducing resource matching costs and transaction costs, which greatly reduces transaction time, speeds up value creation to a certain extent and reduces financing costs.

(3) Big data cloud computing makes it easier to obtain financing

Internet finance uses big data cloud computing to screen users' consumption needs, income status and credit status information, moreover lenders can directly fill in relevant information and content through the Internet platform which brings the convenience to financing parties. Taking the lending network platform as an example, the lending process is relatively simple and the approval speed is also very fast. In general, the fastest commercial bank loan is one month, but most Internet platforms have a loan period of less than half a month, after the loan is issued, there is only regular post-loan management, others are not needed. In the past, there were very few guarantee institutions for private SMEs, the types of guarantees and loans were single, which made it more difficult for SMEs to seek insurance. What's more, banks require mostly real estate such as land and real estate as collateral, while most of the assets of small and medium-sized enterprises

are lease operations and housing loans, which is inconvenient to mortgage. The simple guarantee procedures have resolved the difficulty of the lack of collateral for SMEs, making it easier to obtain financing.

### 3.2 The Risks of the Internet Finance to SMEs Financing

#### (1) Network security risks are greater

The first problem that SMEs need to solve when using Internet finance to financing is the issue of network security. Because the vast majority of transactions in Internet finance are relied on network big data and cloud computing. However, the problem of personal information leakage and malicious loan fraud have appeared one after another at present. Since Ali launched Yu'ebao, various Internet financial products have sprung up in the Internet financial market such as P2P, crowd-funding and other modes. Beginning in 2013, a large number of illegal fund-raising cases using Internet finance continue to appear. For example, "ezubao" absorbed about 58 billion, making 840,000 investors suffer from it deeply. Due to the problem of network security, the leakage of personal information and corporate operating conditions has severely hindered the development and growth of Internet finance, affecting the financing of small and medium-sized enterprises [5].

#### (2) The borrowing rate risk is relatively high

At present, the domestic Internet lending environment is uneven with potential risks and benefits being parallel, coupled with the large fluctuations in the interest rate of online lending, which may cause price risks. Because the online loan interest rate is higher than the market base interest rate, even if Internet finance takes advantage of its savings and reduces time-consuming costs, greatly improving the efficiency of successful transactions, but its higher online loan interest rate does not really reduce the financing cost of the entire financial industry, therefore small and medium-sized enterprises can't resolve financing problems thoroughly. What's more, the Internet has the function of quickly transmitting information, making some market traders often blindly follow the trend and others behaviors, which intensifies the degree of free competition in the loan market and causes vicious competition.

#### (3) Financing risk monitoring capability is weak

Internet finance is an emerging channel to solve financing needs, but it cannot be separated from the objective risks of the financial industry, such as lending risks and operational risks. Although it is convenient to use the Internet to fill in information and finish various business operations, too simple borrowing method makes SMEs face many potential risks. What's more, Internet finance is based on dynamic big data carrying out risk supervision and pricing, network data deviations and network security may directly affect the daily business decisions of SMEs and indirectly do harm to consumers' rights. In addition, the central bank's credit investigation system has not yet included Internet finance, and a sound information credit sharing mechanism has not been established among major e-commerce platforms. This undoubtedly increases the credit risk of SMEs. Therefore, SMEs under the Internet finance model still lack a sound risk monitoring system [6].

(4) The laws and regulations are not complete

The emergence of Internet finance has given private SMEs more choices in the financing process, at the same time they are also facing greater risks. Although the government has issued a series of policies and regulations for Internet finance, there is still a long way to go before the formation of a sound legal and regulatory mechanism. Although the incidents of the information leakage based on the Internet finance are endless, some corresponding laws and regulations are still blank. Compared with financial institutions offline, online Internet finance does not have the strict license management system and the barriers to entry are lower. Although Internet finance provides more options for SMEs financing, it also faces higher risks. Therefore, effective regulation and supervision of the Internet financial market is an urgent problem for relevant departments to solve.

#### **4 Strategies for Using Internet Finance to Promote SMEs Financing in the Context of Big Data**

(1) Improve network security

In the context of the Internet finance, if small and medium-sized enterprises want to make full use of the advantages of the Internet, they must confirm whether network security is guaranteed firstly. Because the transaction parties of the Internet platform are all in a virtual environment, when SMEs use the Internet financial platform for financing, once the third-party network platform disappears, it is very difficult to find the entity responsible for it, which intensifies the risk of SMEs financing [7]. Therefore, making the transaction process of financial business more transparent and improving the network security are the primary problems that the Internet financial industry needs to solve. In addition, the relevant regulatory authorities should formulate laws and regulations suitable for the real situation, clarifying the responsibility of network information security.

(2) Strengthen the prevention of borrowing interest rate risk

For high-risk and high-yield Internet lending that wanders through the boundaries of legal supervision, the introduction of corresponding laws and policies to strengthen financial policy regulations is particularly important for SMEs financing in the context of Internet finance. SMEs need to pay close attention to the relationship between the characteristics of online loan interest rates and risks, accurately understand the pros and cons of online loan interest rates and avoid blindly following behavior. At the same time, financial regulatory authorities should also improve the supervision of online lending platforms to prevent unreasonable and sharp fluctuations in lending interest rates from accumulating lending risks, and effectively guide the development of the lending market, promoting Internet finance to provide a healthier financing environment for SMEs.

(3) Improve the risk management system

Improving the risk management system of Internet finance can promote the development of my country's Internet finance on one hand and help small and medium-sized enterprises to achieve efficient financing on the other hand. In order

to better serve private SMEs, Internet financial platforms need to increase their awareness of risk aversion and continuously upgrade network technology. Moreover, they should increase investment in Internet technology and introduce high-tech talents, building a strong firewall to block the loopholes on the Internet finance platform which ensures the security and authenticity of data information [8]. In addition, Internet financial platforms need to implement dynamic risk warnings for private SMEs and formulate corresponding financial service products based on the company's credit rating, dividing private SMEs of different types and adopting corresponding risk management mechanisms for them. What's more, the current Internet finance still lacks a complete credit sharing system. The establishment of a credit sharing mechanism can not only facilitate the search for the credit ratings of small and medium-sized enterprises, but also avoid certain credit risks among the major e-commerce platforms which has a promoting effect on the long-term development of the company [9, 10].

(4) Improve the legal system

The government must do a good job in the construction of relevant laws and provide legal institutional guarantees for the healthy and orderly development of Internet platforms. Since the development of Internet finance of China is in its infancy, various Internet finance platforms have not yet formed an orderly market competition environment [11]. If relevant departments do not intervene the development of Internet platforms, it is easy to form a monopolistic market. Therefore, the government should provide different levels of support policies for the scale of Internet platform companies and give policy preference to some platforms that have development prospects but have a low start, promoting the formation of a benign competitive environment in the Internet financial platform market and providing high-quality services for the future of SMEs financing.

## 5 Conclusions

The need of small and medium-sized enterprises to urgently have funds to expand production can no longer be met by traditional financing methods [12]. Under the background of big data, information technology is becoming more and more mature, new business forms are constantly emerging and Internet finance is born. The emergence and development of Internet finance has expanded the effective demand for capital, helped to eliminate information asymmetry and reduced financing costs, thus having a positive impact on the financing of SMEs. Through the research in this article, we have also found that although Internet finance has brought many benefits to SMEs, SMEs also face a series of risks and problems in the context of Internet finance. Therefore, facing the influence of Internet finance on the financing of small and medium-sized enterprises, SMEs can reduce risks by improving network security, strengthening prevention of lending interest rate risks, improving risk management systems, improving legal regulatory systems and deepening the construction of credit systems. In the context of big data, make better use of the development of Internet finance to promote SMEs financing.

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# Based on Financial Management Mode of Construction Enterprises Based on Computer Technology

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**Abstract.** Based on the rapid development of modern science and technology, modern computer technology has developed to a certain degree of maturity. As one of the pillars of China's economy, how to optimize the financial management of construction enterprises in China has become one of the problems that experts and scholars think about. First of all, the computer age has brought a more complete and accurate data analysis platform to the financial management of enterprises. The emergence and development of everything has two sides. The advent of the computer age has also had a certain impact on the traditional financial management of enterprises. Therefore, enterprise financial management is facing new challenges in the field of computer technology. Enterprise financial management must be innovated and reformed. Through the implementation of computer technology, to create a new era of enterprise financial management reform and innovation, through literature research, output analysis and other methods, this paper concludes that the investors of construction companies have different attitudes towards risk management, among which risk aversion accounts for up to 55%.

**Keywords:** Computer technology · Construction enterprises · Financial management · Literature research

## 1 Introduction

With the rapid development of information technology, such as the integration of computer and information processing technology, human society is no longer owned, excluded from information, but entered a new information society. Information has become the third largest resource of social development, second only to material and energy. With the continuous improvement of the internationalization of manufacturing industry and the intensification of construction market competition, information and modern management means to strengthen enterprise competition are the new characteristics and trends of international construction market competition. How to integrate the construction of financial data resources and improve the awareness of rational use of financial data support has become a problem that enterprise financial managers must solve. With the rapid development of information and Internet technology and the continuous improvement and development of financial theories and methods, management provides an effective way to solve this problem.

James think construction industry is the pillar industry of our country. Construction enterprises have their particularity in financing and cost budget. At present, China's construction enterprise financial management is weak, the construction market is not standardized, the project investment risk is increasing, the company's Financial Distortion and other issues are increasingly prominent, accounting information has made the inconsistency of enterprise accounting management system increasingly apparent [1]. Shan think the internationalization and globalization of economy make many experts focus on information technology in enterprise financial management and strive to promote its implementation in China, so as to improve the level of enterprise financial management in China and make enterprise development become a new power [2]. Chung think financial risk is considered as one of the achievements of other financial management, and integrated risk management is a risk management method with financial risk management as the core [3]. Gallo think the purpose of financial control of construction enterprises is to obtain more profit, duration and plan with lower cost on the premise of ensuring project quality. Whether the financial control of project management is effective or not is related to the sustainable development of construction enterprises and the stable growth profits of enterprises, and is a crowding factor restricting the survival and development of construction enterprises [4]. Although these experts and students have made great contributions to the financial management of construction enterprises, there are still some deficiencies.

In this paper, the concept of financial management of enterprises is defined. Based on the theory of agent, financing cost and bankruptcy cost, the financial risk management is helpful to the realization of enterprise objectives. Combined with modern computer technology, some suggestions are given for financial management of construction enterprises.

## 2 Method

### 2.1 Financial Management

The goal of financial management is to maximize the enterprise value. It emphasizes the value-added of capital. The index of evaluating the operation of an enterprise is the operation status of capital. Financial management is not only a kind of economic management, but also the fundamental guidance of financial management activities. What is the goal of an enterprise determines the direction of its financial management. It is the basic purpose of financial activities and coordination of financial relations, and the starting point of financial management. How to choose the purpose of financial management, we should cut into the various elements of enterprise financial management and make a suitable choice. There are two kinds of financial relationship. Generally speaking, it can be divided into internal financial relationship and external financial relationship. Internal financial relationship the relationship between employees, departments and leaders and finance [5]. The external is mainly the financial relationship between the enterprise and investors, sales, dealers and so on. Capital management is an important part of financing management, which can be divided into operation management and operation management. Financing activities

have an impact on the capital structure, operation mode and major decisions of enterprises. Investment management is a management activity of increasing the total supply of funds for the development of enterprises. Working capital is the difference between current assets and current liabilities. It manages both of them comprehensively and scientifically. Reasonable profit distribution can better reflect the economic benefits of enterprises, transmit favorable information to the outside world, and promote enterprises to adjust their target strategies. In the long run, it is of great significance to the sustainable and healthy development of enterprises. Financial management emphasizes the principle of cost-effectiveness, rather than blindly controlling costs and expenses [6]. Cost leadership will make the enterprise obtain excess profit, and the reduction of cost will increase the net profit of the enterprise, while the increase of cost will not necessarily reduce the net profit of the enterprise. Therefore, how to scientifically control the financial affairs of a company is a problem that every enterprise should seriously consider.

## 2.2 Overview of Analytic Hierarchy Process

AHP, which combines qualitative analysis with quantitative analysis, is an analytical method used in decision-making [7]. It is mainly through the decomposition of the problem factors in the decision-making process—the highest level (target), the middle level (Zhuze Zeng), and the lowest level (scheme level), to truly express the relationship between the factors. In the analysis process, the logic and hierarchy are more prominent, It is also a hierarchical and systematic analysis method. Analytic hierarchy process (AHP) is widely praised by experts and scholars for its super practicability and simplification of complex problems. Experts in the industry evaluate the factors of each problem, and then get the scale of the factors at all levels:

$$A = (a_{ij})n \times n \quad (1)$$

In the above equation  $a_{ij}$  is the relative importance of the two elements is obtained by comparing the two values. Then we need to establish a matrix (compare each other) and use the square root method to solve it. Finally, we check the consistency of judgment matrix A and rank the weights one by one. The various risks faced by China's construction industry and the characteristics of the construction industry determine that the financial risk evaluation is very important in the financial risk management system.

## 2.3 Principle of Yolov2 Algorithm

Yolov2 has been modified on the basis of yolov1 to remove the dropout layer. BN layer operation is the batch processing specification, which is to normalize the image data after each convolution pooling and before input to the activation function, that is, the data mean value is 0 and the variance is 1 [8]. The formula is:

$$x_i = \frac{x_i - \mu}{\sqrt{\sigma^2 + \varepsilon}} \quad (2)$$

$$y_i = yx_i + \beta \quad (3)$$

Among  $x_i$  is the i-th dimension feature in a batch data,  $\mu$  It's the mean,  $\sigma^2$  It's the standard deviation,  $\varepsilon$  Is used to control the denominator to be positive. Formula (3) introduces additional parameters  $y$  and  $\beta$ , the feature distribution of the original data is not destroyed and the expression ability of the model is maintained.

## 2.4 Net Present Value (NPV) Method

Net present value (NPV) refers to the net cash flow of each year during the project period. Its basic principle is: Forecast and calculate the present value of the cash flow of the investment project, forecast and determine the current expenditure investment project required by the investment project. Then, according to the given standard discount rate (basic rate of return), the difference between the above two current prices is converted into its total value at the beginning of the construction period (at the beginning of the first year of the project calculation period) [9]. The calculation formula is as follows:

$$NPV = \sum_{t=0}^n (CI - CO)_t (1 + i_c)^{-t} \quad (4)$$

NPV—net present value;  $(CI - CO)_t$ —Net cash flow in year t; n—project calculation period;  $i_c$ —Standard discount rate. In the comparison and selection of multiple alternatives, it is a common method to determine the merits and demerits of alternatives by calculating the net present value of each alternative and comparing their sizes [10].

## 3 Experiment

### 3.1 Literature Research Method

This paper focuses on this issue and collects relevant information through library, network, books and other channels to understand the practical application of relevant economic management theory in computer technology, so as to provide reference for writing.

### 3.2 Yield Analysis

In this paper, by using the specific methods of induction, elimination and generalization, based on the previous theories and viewpoints, this paper analyzes the existing problems. Under the background of financial management big data, it analyzes the problems existing in enterprises and enterprise financial management, and puts forward the innovation of financial management.

### 3.3 Talent Seminar

Participate in the Talent Forum on financial management of construction enterprises, record their experience in financial management of construction enterprises, and then write the financial management system of construction enterprises based on computer technology.

## 4 Discussion

### 4.1 Managers' Attitude to Risk and Financial Strategy

Everyone has his own subjectivity, and the investors of enterprises are no exception. If the senior managers of each enterprise have different attitudes towards venture capital, there will be great differences in the choice of financial strategy.

**Table 1.** Managers' attitude to risk

	Managers' attitude to risk		
	Risk averse	Risk moderator	Risk averter
The proportion of financial strategy choice	25%	55%	20%

From Table 1, we can see that the investors of each construction enterprise have different attitudes towards risk management, among which more are risk moderators, accounting for up to 55%. In their view, there can be certain risks, but the risk degree should not be too high. This is too risky and in consideration of safety, they choose scientific and systematic financial management Investment goal, this will be more conducive to their enterprises to create value, to achieve a virtuous cycle of financial management. How to realize the financial maximization, benefit maximization, stakeholder value maximization and shareholder wealth is their first choice.

### 4.2 Control of Project Material Cost

The cost of engineering materials accounts for 50% to 60% of the project cost, which is the top priority of the cost control of construction enterprises. There are many kinds of materials, so it is difficult to control the cost of materials. It is suggested to use analysis method to classify materials, implement classification management, take appropriate control measures, distinguish different situations and effectively control materials. According to the specific amount, they are divided into three categories: A, B and C. The total consumption of different materials and their percentage in the total cost should be calculated, and different control measures should be taken according to the specific situation (Table 2).

The distribution of materials is the key link to control the cost and quantity of materials. The material distribution personnel must distribute according to the quantity on the material receiving sheet, and the material receiving personnel must take the

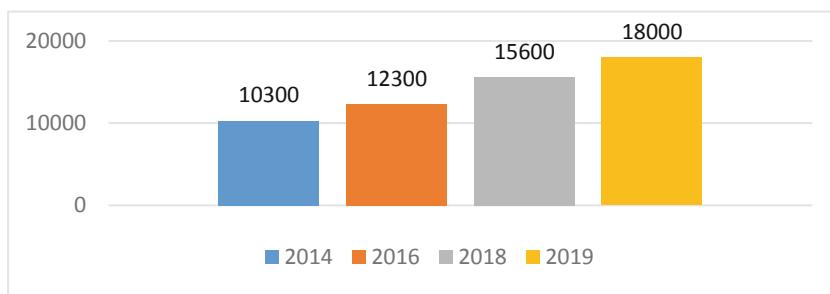
materials according to the cost control plan to get the construction materials needed. In addition to the material requisition personnel must strictly abide by the provisions, the distribution personnel must strictly in accordance with the data and quantity in the quota material requisition list, and no over issuance is allowed. Excess materials must be approved by the upper level before issuing. Only in this way can we save a certain amount of enterprise expenses, and only under such circumstances can we save certain enterprise expenses and ensure the financial settlement of construction enterprises.

**Table 2.** ABC classification of materials

Material science	Proportion in total consumption	Proportion in total consumption cost	Characteristic
A	15%	75%	The variety is few, but the unit value is big
B	Between A and C		
C	75%	15%	More varieties but less value

#### 4.3 Opportunities and Challenges to International Construction Market

With the further development of China's economy and opening to the outside world, foreign construction enterprises enter the domestic market, which brings great impact to the domestic construction market. However, domestic excellent construction enterprises cannot be complacent. They should communicate with foreign excellent construction enterprises, thrive, survive with management and develop with quality. In the situation of fierce competition at home and abroad, a higher level of project management financial control is conducive to the integration with international practice and the requirements of domestic and international competition.



**Fig. 1.** Added value of construction industry from 2014 to 2019 (unit: 100 million yuan)

As can be seen from Fig. 1, after joining the international market, the construction industry shows an upward trend year by year. From 1030 billion yuan in 2014 to

1800 billion yuan in 2019, the construction industry has a net growth of 770 billion yuan in five years.

#### 4.4 System Guarantee – Establishment of Financial Management Information System

**Table 3.** Authority setting of financial center operators

System permission configuration list	
Position Mingchen	Permission name
Operator	Input
Auditor	To review
Executive director	Examine and approve
Manager	Secondary examination and approval

Business and it management is based on an interactive feedback process. In this process, its corresponding information technology and methods will be improved and revised, and the corresponding management behavior will change with the use of information technology. Frequency of use and impact of usage changes. Based on computer technology, in-depth company budget management, control the company's overall capital flow, control costs. Using accounting information, further strengthen the development and implementation of information system, timely adjust the time according to the change of sales situation, timely update production and operation budget, reduce cost, cost and other related financial budget, so as to ensure that all the monthly information system related to the project can meet the update requirements. The goal is to ensure that the production and operation activities are not affected and the budget assessment goes smoothly that's ok (Table 3).

## 5 Conclusion

This paper discusses the financial decision support system of construction enterprises from the aspects of system analysis, design, implementation and testing by using software engineering design ideas and rapid prototyping technology. The main contents of this paper are as follows:

- (1) Taking the user demand and intelligent financial forecast management as the center, the user demand analysis is carried out, which is an essential part of the system development. In the process of research, firstly, through the form of research and forum, the multi-directional communication mechanism is used to obtain the user requirements, and the symbolic design language is used to describe and analyze the user requirements. On this basis, the user requirements report is used to confirm the user requirements. At the same time, user demand report can also be used as one of the main basis for system delivery to customers in the next step.

- (2) Based on the analysis of user requirements, the design of financial decision support system for construction enterprises is completed. Based on the user requirements and the business process of financial data analysis and management of construction projects, the financial decision support system of construction enterprises is designed in brief and in detail. The system business logic architecture, network topology, module structure and other general design contents are defined, and the detailed design contents such as system module class, database logical model and conceptual model are confirmed.

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# Analysis on the Practical Operation Mode and Innovative Application of 3D MAX in Interior Space Design

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**Abstract.** In terms of range of application, 3DMax is widely used in the advertising, film and television, industrial design, architectural design, 3D animation, multimedia production, games, auxiliary teaching, visualization and other fields. With the continuous advancement of computer technology, the drawing software of interior space design, such as 3DMax, is also gradually updated, becoming more perfect and mature. A modern designer should not only improve the professional ability but also master various interior design drawing software, skillfully use its various functions, continuously improve the functions of all kinds of drawing software in the field of interior design, so as to complete more excellent interior design works.

**Keywords:** Application · Production · Parameters · Innovation · Works

## 1 Introduction to 3DMax

3DMax is the abbreviation of 3D Studio MAX software, often abbreviated as 3ds Max or MAX, which is a PC-based 3D animation rendering and production software successfully developed by Autodesk, US. Its predecessor was the 3D Studio series of software based on the DOS operating system. In terms of range of application, it is widely used in the advertising, film and television, industrial design, architectural



**Fig. 1.** 3D MAX software icons

design, 3D animation, multimedia production, games, auxiliary teaching, visualization and other fields [1] (Fig. 1).

## 1.1 Modeling

As its basic function, modeling is the most basic and powerful function of the software (Fig. 2). By constructing standardized geometric shapes and geometric extension shapes for multi-dimensional combination, the final 3D model is gradually created. In the process of 3D modeling, a modular combination of basic shapes is used. By creating a basic shape, various editing operations are carried out to create more forms, so that thousands of combined models can be formed in this way. In addition, modification editing commands can be used to modify the basic shape to make it more flexible [2]. In the powerful modeling function, 3D models can also be generated through modification commands such as rotation, lofting, extrusion and so on. During the process, most of the operation commands are implemented through “EditSplines”, among which the first-level line editing of the line-type point and segment mainly includes commands such as “Attach”, “Refine”, “Outline”, “Boolean”, “Weld”, “Fillet”, you can be proficient in editing various graphics freely only after mastering these commands proficiently in practical applications [3] (Fig. 3).

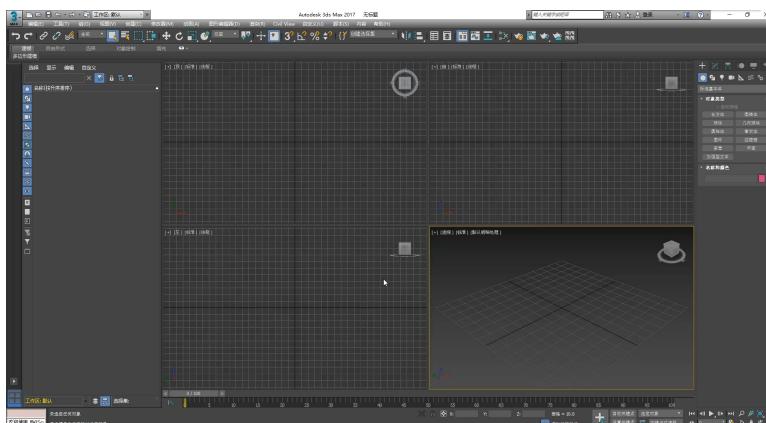
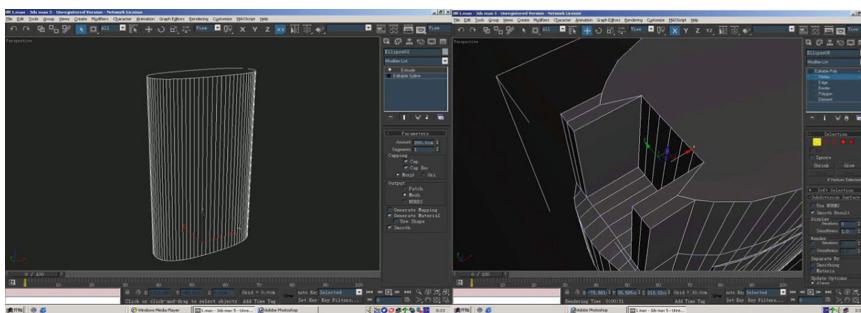


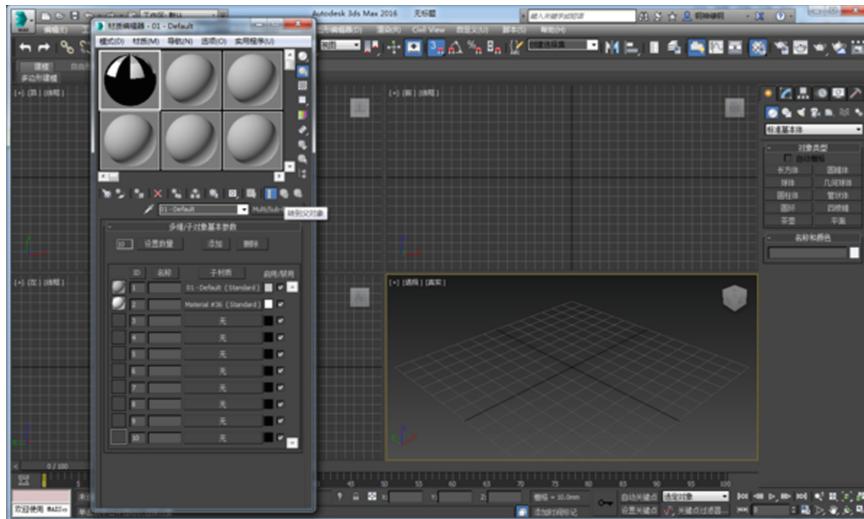
Fig. 2. 3DMAX software interface demonstration



**Fig. 3.** 3DMAX modeling interface

## 1.2 Material

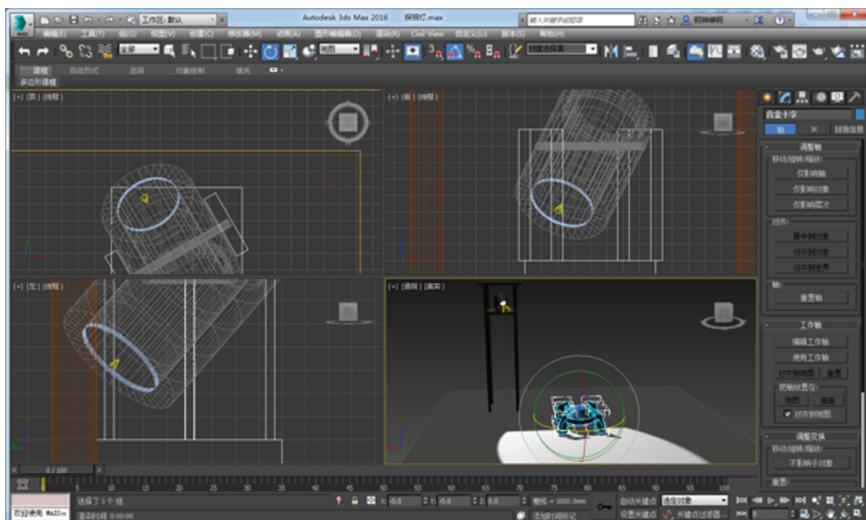
In 3DMax, the mapping of the real scene and materials can be used to restore the real environment effect, so that the realistic environment can be reflected (Fig. 4). Objects in the scene can only be endowed with a realistic sense of reality through materials. Meanwhile, more interesting parameters can be added to the model, such as changes in color, texture, reflection, refraction, surface roughness, and texture, so that the originally dull and rigid scene can be brought to life and simulate reality [4]. A comprehensive visual reproduction can be obtained through the material editor, and the flexible use of material effects is the core technology of 3D renderings [5].



**Fig. 4.** 3DMAX material editor

### 1.3 Lighting

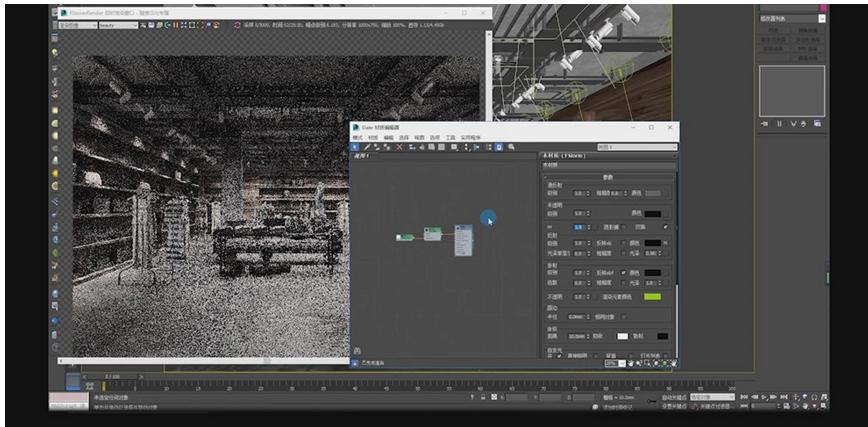
Light is a response to the shape and color of its main objects in real life. If there is no light, the world will not reflect its richness. Therefore, in order to show the level of the object or the illumination, the different lighting shall be inevitably involved. When designing the scene, the arrangement of its light sources should include the main body's light source, background light source and auxiliary light source. Through the interweaving of this kind of light, the real environment change can be simulated. in this regard, when designing the light, it is necessary to master the intensity, color, projection parameters of the light, and carefully layout the light [6] (Fig. 5).



**Fig. 5.** 3DMAX lighting interface

### 1.4 Rendering

VRay Renderer is a powerful renderer loaded in 3DMax, which can weigh a special material called VrayMtl. More accurate physical lighting can be obtained by using this material in the scene, which not only renders faster, but also makes the adjustment of reflection and refraction parameters more convenient (Fig. 6). By using VrayMtl, the lighting and materials can be rendered to obtain the final renderings. The rendered pictures can also be saved in JPEG, TIF and other formats.



**Fig. 6.** The VARY renderer rendering process

## 2 Application of 3DMax in Interior Design

As the first step of 3DMax learning for interior designers, modeling should follow the basic rules below:

Be familiar with the basic functions of the software and able to use it accurately. The different structural styles of the building can be reflected very realistically through the drawing, at the same time, the different ideas of the interior design from the different designers can be fully displayed. Therefore, when designing, it must be modeled strictly in accordance with the relevant requirements of the designer [7].

Under the condition of ensuring the meticulous modeling, the model parameters can be selectively simplified. In the process of drawing, the effect is to be accurate, but unnecessary parameter settings can be reduced under the premise of ensuring the basic effect. in this way, the pressure of the software load can be reduced, the work efficiency can be increased, and the overall work speed can be improved.

The selection and editing of materials is particularly important in the interior space design [8]. The application and editing of materials can make some data in the design drawings to accurately construct the image, and the application of materials can only be judged by the designer's own requirements and experience, so that the more realistic material can be made through repeated debugging. Therefore, in design, we must give full play to the designer's keen insight, and be good at observing various things in life, such as various metal materials. Although their surface is smooth, it can actually not only reflect the image, but also refract. in this regard, when making it, the designer's own professional and practical ability can also be reflected [9].

Lighting is the finishing touch of a space. The perfect implementation of any indoor space is inseparable from various lighting effects. Therefore, lighting plays a very key role in interior space design. The light reacts to the object through its texture and color, thus gradually reflecting in the space. in the 3DMax software, only by mastering the lighting production function and making full debugging, designers can describe the

various details of the interior space, highlight the color, temperature and layering of the space, so as to bring people a warm and comfortable space to use.

### 3 Conclusion

The innovative development of interior design is the overall planning and layout of the interior space. In the interior design, the designer can comprehensively explore a new design style in accordance with the architectural situation, space area, and interface conditions of the interior space, so that the practical space can be finally formed to meet the needs of space users. At this stage, with the continuous advancement of computer technology, the drawing software of interior space design, such as 3DMax, is also gradually updated, becoming more perfect and mature. A modern designer should not only improve the professional ability but also master various interior design drawing software, skillfully use its various functions, continuously improve the functions of all kinds of drawing software in the field of interior design, so as to complete more excellent interior design works [10].

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# Liquidity Risk Management of Commercial Banks Under the Background of Big Data

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**Abstract.** The development of financial technology has a significant impact on the operation and risk control of banks. Financial innovation continuously promotes the development of the financial industry, but it also brings a lot of potential risks to commercial banks, especially liquidity risk. The banking industry holds a large amount of customer data. How to strengthen data management and analysis to reduce risks has become an important issue that commercial banks are faced with. Big data provides new means for liquidity risk management of commercial bank, and provides more security for banks and customers. By researching the liquidity risk problems of commercial banks, this article analyzes the impact of the development of big data on commercial banks and offers suggestions on how banks use big data to strengthen liquidity risk management.

**Keywords:** Big data · Commercial bank · Liquidity risk management · Risk warning

## 1 Introduction

With more and more unstable factors affecting the international society and economy, the liquidity crisis in the financial market has severely affected the soundness of China's banking industry.

With the rapid growth of financial market scale and banking business innovation, the liquidity risk of banking financial institutions has been increased, and systematic risk has also been strengthened. Liquidity risk occupies an increasingly important position in the management of commercial banks. Famous international banks such as the Bank of Bahrain and Bear Stearns have all gone bankrupt due to liquidity risk. The Basel Committee on Banking Supervision has also proposed several liquidity supervision indicators. In this case, it is very important to put forward new requirements for the liquidity risk management of the banking industry.

This article focuses on the impact of big data on banks, and make reasonable recommendations to banks and regulatory authorities [1].

## 2 Big Data Financial Risk Management

With the rapid development of the Internet, a large amount of data has appeared on the Internet, and big data has also emerged. Through big data, various data sets can be collected, sorted and analyzed. The development of financial technology, especially big data finance, has promoted the transformation and upgrading of the financial industry. With the help of big data technology, we can comprehensively analyze the financial activities and identify the potential risks in financial activities, so that targeted prevention can be carried out to ensure stable financial operation and promote better development of the financial industry [2, 3].

Big data analysis and mining technology can help financial institutions effectively manage various risks such as credit risk, market risk, liquidity risk, operational risk and so on. Through data analysis, banks can identify and monitor various risks and establish a complete risk prevention system. For the management and control of various risks, big data technology is an indispensable important means and tool. The Basel Agreement proposed liquidity risk indicators such as the liquidity coverage ratio and the net stable capital ratio. For the detection of these indicators, the key is to use big data technology to collect relevant data in a timely and accurate manner, analyze bank problems, and make timely decisions to avoid risks.

## 3 Liquidity Risk and Existing Problems

### 3.1 Definition of Liquidity Risk

The liquidity risk of commercial bank refers to the risk that a commercial bank cannot obtain sufficient funds in a timely manner or at a reasonable cost to deal with the risk of asset growth or payment of due obligations, although it has the ability to pay off.

The goal of commercial banks for liquidity risk management is to ensure the fulfillment of customer withdrawal and payment obligations, to achieve a balance between structure of total assets and liabilities. And through proactive management, banks reduce liquidity costs and avoid their own liquidity crisis, and can effectively handle with systemic liquidity risks.

### 3.2 Liquidity Risk Problems of Commercial Banks

#### (1) The Maturity Mismatch of Assets and Liabilities

The proportion of demand deposits in commercial banks continues to rise, while the proportion of time deposits in total deposits is relatively low. Loans business account for a relatively high proportion of the assets of commercial banks. Medium and long-term loans business account for an increasing proportion of the total bank loans. And the average loan period continues to extend. In the course of operations, banks are more inclined to extend medium-term and long-term loans with poor liquidity and high yields to improve operating performance, which in turn leads to a mismatch of assets and liabilities. Due to the high liquidity of the debt business, once the external environment changes, economic development will be hit [4], and

the financial situation of the company will deteriorate. At the same time, the debt-to-asset ratio of banks will increase so that the liquidity of loans will be greatly affected. Meanwhile, customers will also withdraw large amounts of funds, which will make it difficult for banks to meet customers' withdrawal needs and financing needs. Finally it will eventually lead to serious liquidity risks.

## (2) Relatively High Inter-Bank Debt Dependence

The development of Internet finance has resulted in many financial products in the market. Bank deposit funds are dispersed to other channels such as the money market. When commercial banks have insufficient liquidity, they will also raise money in the money market, thereby increasing the bank's debt cost. At the same time, the cost of personal and corporate deposits is relatively high, while the costs of institutional deposits, interbank deposits, and issuance of interbank deposit certificates are relatively low. Therefore, banks are more inclined to increase the scale of interbank liabilities. However, once there is a decrease in market funds and a tightening of monetary policy, financial institutions seek to obtain liquid assets, and the interbank liabilities of banks will experience greater fluctuations. Since banks cannot find alternative sources of financing in a short period of time, this may lead to liquidity risks in commercial banks [5, 6].

## 4 Liquidity Risk Monitoring

For the liquidity risk of commercial banks, the following main indicators are monitored.

### 4.1 Capital Adequacy Ratio

The capital adequacy ratio is the ratio of the bank's total capital to risk-weighted assets. A reasonable capital adequacy ratio can prevent new financial risks caused by credit problems, so that before the depositor's assets suffer losses, the bank can bear the loss through its own capital and ensure the normal operation of the bank. At the same time, a reasonable capital adequacy ratio can also enable banks to maintain a certain degree of resistance to risks, more effectively protect the interests of depositors and other creditors, and ensure banks' normal business development.

### 4.2 Liquidity Coverage Ratio

The establishment of the liquidity coverage ratio is to enable commercial banks to hold enough high-quality liquid assets to meet the liquidity demand in the next 30 days by realizing them in time at a reasonable price. Commercial banks can reduce their own liquidity risks when meeting the liquidity coverage ratio, but they will also weaken the profitability of banks to a certain extent and reduce the market demand for non-high-quality corporate bonds and other securities, which have a certain negative impact on the real economy.

### 4.3 Proportion of Net Stable Funds

The net stable fund ratio is the ratio between the available stable funds and the stable funds required by the business. It is used to indicate the extent to which the bank's long-term stable funding sources can support the development of on-balance-sheet and off-balance-sheet assets, and can be used to optimize the structure of long-term liabilities.

### 4.4 Liquidity Ratio

The liquidity ratio refers to the ratio of liquid assets to liquid liabilities due within one month. Regulators require that this liquidity ratio should reach 25% or more for commercial banks to ensure that banks have sufficient high liquidity assets to satisfy banks' short-term debt payment needs.

### 4.5 Liquidity Matching Rate

The liquidity matching ratio is equal to the ratio of the weighted capital source to the weighted capital utilization. By reasonably meeting the indicator requirements of the liquidity matching ratio, commercial banks can alleviate the current situation of high short-term liabilities and long-term assets to a certain extent, and make long-term and short-term assets and liabilities reach a reasonable amount and ratio, reduce the risk of mismatch of bank assets and liabilities. Meanwhile, it can control the degree of leverage in the financial system, and prevent the resulting liquidity risks [7].

### 4.6 Non-performing Loan Ratio

Estimate of non-performing loan ratio can analyze the quality of bank loans and bank liquidity. The lower the non-performing loan ratio, the lower the amount of non-performing loans of the bank, the higher the liquidity of asset, and the stronger the ability to resist risks.

## 5 The Impact of Big Data on Commercial Banks

### 5.1 Impact on Profitability

Under the traditional financial model, commercial banks have problems of high cost and low efficiency in data processing. With the application of big data technology, banks can strengthen cooperation with e-commerce companies and use powerful computer systems to fully excavate customer data, greatly reduce the cost of data collection, statistics and analysis, and improve the operating efficiency of the bank.

### 5.2 Impact on Operating Efficiency

The application of big data can improve the completeness of information, reduce information asymmetry, and reduce financing risks for banks. When issuing loans,

banks can fully get the customer transactions and credit data, thereby reducing the problems caused by adverse selection. At the same time, through big data analysis, banks can fully understand the operation and credit status of more middle and small-sized enterprises, so as to serve middle and small-sized enterprises more extensively and better support the development of the real economy. At the same time, the bank possesses a large number of customer transaction information. Through the collection and analysis of customer data, the bank can fully get the preferences and needs of customers, thereby designing personalized financial products and improving the quality of financial services [8, 9].

### 5.3 Impact on Risk Management

Through big data, information asymmetry can be reduced in the future, and information such as changes in market interest rates and exchange rates, macroeconomic conditions and economic development trends can be fully grasped, and market risk can be effectively reduced. Banks conduct data analysis to measure the financial and operating conditions of borrowers and reduce credit risk. At the same time, the bank analyzes various liquidity indicators and makes timely decisions based on changes in liquidity data to reduce liquidity risk. In a word, big data improves the completeness of information, help banks reduce the risks they face, measure the losses that risks may bring, which is beneficial for banks to conduct more effective risk management.

## 6 Countermeasures for Liquidity Risk Management of Commercial Banks Under the Background of Big Data

### 6.1 Use Big Data to Improve Liquidity Risk Management and Control Capabilities

Commercial banks should make full use of big data and other technologies to establish a liquidity risk management system to improve the bank's liquidity risk management and control capabilities and efficiency. The first is to continuously optimize data quality and improve data analysis capabilities. The second is to expand the coverage of information, extract all kinds of information related to liquidity in a timely manner, which can help banks improve the identification, monitoring and control of liquidity risks, reducing the possibility of liquidity risk.

Through big data, banks can analyze changes in various business data promptly. And based on these changes, banks can strengthen asset and liability management. On the one hand, it is necessary to intensify the adjustment of asset structure and maintain a reasonable flow of assets. Commercial banks should moderately reduce the proportion of loans in the asset structure, increase the proportion of non-loan assets, and hold more secure and stable securities assets such as government bonds. At the same time, the loan business should be innovatively developed to avoid the simplification of loan types and improve the liquidity of corporate loans.

On the other hand, banks can strengthen active liability management through the establishment of risk early warning and supervision mechanisms and the use of risk

early warning systems to screen and supervise data information. Through business innovation, banks attract individuals and companies to put more time deposits into the banks and increase the proportion of active liabilities in the liability structure. At the same time, banks can increase long-term stable funds by issuing financial bonds, CDs and so on, increasing the proportion of core liabilities. The funds absorbed through these channels have great stability and flexibility, which make commercial banks more proactive in liquidity management, and effectively improve the problem of mismatches in the maturity of commercial banks' assets and liabilities, thereby reducing liquidity risks [10].

## **6.2 Perform Data Analysis on Interbank Business and Adjust Interbank Business**

On the one hand, banks should improve the monitoring indicator system for interbank activities, which can reasonably assess the liquidity risk of interbank activities. Banks must establish and implement an indicator system, use big data to obtain data such as interbank liabilities in a timely manner, and make rational decisions based on changes in the data. If necessary, the bank and relevant departments should jointly collect and analyze indicator data to improve risk identification capabilities.

On the other hand, banks should diversify business risks among banks. If funds are sufficient, inter-bank loans can be borrowed through reverse repo and other way to ensure the safety of funds. Before starting investment business, banks should scientifically establish long-term and short-term investment ratios and keep the maturity assets and debts roughly the same to avoid liquidity risks caused by mismatched maturity.

## **6.3 Use Big Data to Analyze Credit Data and Reduce the Rate of Non-performing Loans**

Through big data technology, banks can comprehensively monitor customer transaction data, analyze customer historical data, and make reasonable assessments of the borrower's credit status, so that banks can make timely adjustments. Through a comprehensive review of customer credit, banks can improve asset quality, reduce bank non-performing loan rates to ensure sufficient cash inflows, and thereby reduce liquidity risks.

For pre-loan management, the banks obtain the borrower's financial and credit information from the enterprise credit system and other channels. And based on the customer's credit status, banks decide whether to issue loans and loan pricing. For post-loan management, banks can use big data technology to record customer transaction behaviors, fully grasp the customer's financial transactions. And then banks combine customers' financial information, risk appetite, and degree of operational risk to conduct reasonable risk warnings to reduce morality so as to decrease the probability of the moral hazard.

## 6.4 Use Big Data to Promote the Development of Intermediate Business

At present, the profits of commercial banks are more dependent on the spread between deposits and loans. And banks are more inclined to obtain income by issuing loans, thereby relatively increasing loan supply. Due to factors such as low liquidity caused by an excessively high loan ratio of total assets, banks are restricted in asset management to some extend. With the development of the economy and society and the advancement of financial opening, customers' needs for financial services will become more diversified, which will provide a broader market for commercial banks to develop intermediary business.

Intermediary business can bring stable cash income to banks, improve asset liquidity, and improve the single asset-liability structure. Through big data technology, banks can use Internet products such as online banking, or cooperate with various companies to accumulate customer data resources, and analyze customer data to understand the demands of individuals or companies in the market for various services, so as to provide clients with consulting, custody, and agency services.

## 6.5 Strengthen the Training of Financial Technology Talents and Enhance the Bank's Risk Management Awareness

Banks should change their traditional thinking mode, fully realize the role of data, and make rational use of their customer data resources. Banks should introduce more financial technology talents and strengthen the training of existing employees, so that employees can fully understand big data and other technologies. And banks can make full use of various emerging technologies to better reinforce their own business management and risk management. At the same time, banks should establish an excellent big data risk management team, improve the training, evaluation and incentives of big data talents, and strengthen the application of big data to liquidity risk management.

Meanwhile, commercial banks must enhance their own risk management awareness. The market generally believes that the government will guarantee the credit of state-owned commercial banks and the possibility of commercial bank bankruptcy is very small. As a state-controlled bank, commercial banks inevitably have such problems, and this often leads to weak consciousness of risk inside the bank. Thus, banks need to strengthen internal liquidity risk management and attach great importance to the application of big data to liquidity risk management throughout the bank.

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# Based on Data Analysis of the Influence of Sellers' Humorous Responses on Users' Purchase Intention

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**Abstract.** Seller responses in the current online shopping environment are mechanized and standardized as a whole. It is difficult to attract consumers' attention and convey effective information. Personalized seller responses have gradually become a new communication method for sellers to perform service remedies. This study takes humorous seller responses as the research object, uses user uniqueness perception and risk perception as intermediaries, constructs a research model, combines scenario simulation experiment method and questionnaire survey method, collects and organizes data, and uses SPSS tools to analyze seller humorous responses. The impact on users' purchase intentions reveals the role of users' unique perception and risk perception, and provides new ideas for seller response strategies in the e-commerce environment.

**Keywords:** Seller humorous response · User purchase intention · Data analysis · Uniqueness perception · Risk perception

## 1 Introduction

Seller response is one of the ways for sellers to communicate with consumers. As consumers take more initiative in the transmission of online word-of-mouth, the range of services provided by sellers has gradually expanded from responding to consultations to responding to comments. But now some sellers reply that it is difficult to show efficient comment management when replying to comments. At present, sellers' responses in the online shopping environment are mechanized and standardized as a whole, which makes it difficult to attract consumers' attention and transmit effective information, resulting in service failure. In addition, seller replies to negative reviews mainly adopt rational response strategies with a higher level of explanation. Such low-emotion communication strategies cannot effectively resolve the negative emotions of negative reviews [1], so it is necessary to explore new seller responses Strategy.

Humor, as a highly personalized communication style, can integrate novelty, complexity and inconsistency when responding to negative word of mouth, bringing positive emotional experience and spiritual satisfaction, thereby strengthening consumers' brand attitudes. According to the basic theory of benign conflict, which explains the mechanism of humor: service failure is essentially a conflict between consumers and sellers, and proper humor treatment will make consumers think that the

conflict is acceptable, thereby improving their perception of sellers and products. Attitude [2]. At the same time, the interaction of humor and self-deprecation in the seller's response can make consumers perceive the seller's willingness and ability to take responsibility and correct mistakes. In order to explore the influence of reply style on users' purchase intention, this article takes humorous seller's reply as the research object, explores the influence of seller's humorous reply on users' purchase intention, and examines how users' perception of uniqueness and risk perception play between the two effect.

## 2 Literature Review

### 2.1 Seller Response

In the strict network supervision environment, in view of the negative impact of online negative comments and the characteristics that cannot be changed or deleted at will, more and more sellers are beginning to use the reply function to try to weaken the negative impact when facing this situation. Behavioral activities are called management feedback, management response, seller response, and seller feedback. The seller reply is the seller's feedback on the user's online comments. After the purchased user posts a comment on the online shopping platform, the seller will make a targeted response based on the content of the comment and openly communicate with the reviewer. In the characteristic study of sellers' responses, Sparks and Bradley [3] analyzed the seller's responses from the perspective of the context of the response and the response action framework, and found that the seller's response existence, response form, response frequency, and response quality are four characteristic pairs. Both product sales and consumer satisfaction have a significant impact.

### 2.2 Humorous Communication

Gervais et al. [4] defined humor as a psychological response. The main feature is that it takes amusement as a positive emotion, discovers the taste of things, and tends to trigger laughter. They believe that humor is a positive defense mechanism or coping method, and humor can even help people cope with anxiety, embarrassment, sadness and physical pain. The research of Zhang et al. [5] found that when humor is organically integrated with the advertising theme, it can enhance the audience's attention, credibility, memory, evaluation and purchase intention. Regardless of the level of involvement, the audience's appeal to humorous advertising (relatively Non-humorous people) and their brands showed obvious preference. Participants indicated that they were more willing to buy products promoted by humorous advertisements. The study of Kuiper NA et al. [6] shows that the proper use of humor can effectively regulate the individual's negative emotional experience and enhance the positive emotional experience.

### 3 Research Hypothesis

#### 3.1 The Impact of Sellers' Humorous Responses on Users' Purchase Intention

Based on previous research, this research defines seller replies that can discover the taste of things, trigger laughter, and bring positive emotional experiences as seller humorous responses. Different types of humorous responses have different effects on alleviating consumer complaints. Self-reinforcing humorous complaint responses are more effective in improving consumer brand attitudes under the mutual relationship paradigm, and self-deprecating humorous complaint responses can help improve the mutual and transactional relationship paradigm. Understand consumers' brand attitudes. Information with humorous appeals can more arouse consumers' emotions and influence consumers to produce positive product evaluations. Therefore, sellers' humorous replies can provide users with positive emotional experience and psychological satisfaction while alleviating user complaints, and have an impact on consumers' attitudes. According to this assumption:

H1: The seller's humorous reply has a significant positive impact on users' purchase intention.

#### 3.2 The Mediating Role of User Perception

Compared with non-humorous seller replies, seller humorous replies can make people feel funny, happy, and funny in language expression. It is a unique communication style; as a service remedial behavior, it has the effect of reducing user risk perception. Studies have shown that users' perceptions of uniqueness and risk of products or services will affect their willingness to purchase.

According to the uniqueness demand theory, although individuals need to abide by popular social norms to avoid conflicts and win recognition, approval or rewards from others, everyone also has the desire to embody individuality and pursue differences. This unique motivation stimulates people to embrace new things, subvert traditions, and pursue unusual items. According to the market resonance theory, under the conditions of ultra-differentiated markets, the higher the heterogeneity, the more likely it is for consumers to agree with the product, and the higher the degree of agreement, the higher the intention to pay. The humorous seller reply reflects the linguistic creativity of service thinking. Through easy and humorous communication, it stimulates users' thinking associations and pleasant mood. This is different from other mechanized and homogenized seller replies. Its unique communication style enhances users' Perception of the uniqueness of the seller's service. When the seller's humorous response brings users a strong enough sense of uniqueness, the more they can satisfy the user's desire and demand for specific attributes. Driven by the need for uniqueness, users are more willing to buy products with sellers' humorous responses.

In the theory of perceived risk, users may not be sure whether the expected results of their purchase behavior are correct, and some results may make users unhappy. Users often have a positive attitude towards products before reading reviews, but

negative reviews bring users an imbalance of information perception, which makes users unable to determine whether the results of their purchase behavior can meet the expected goals and form a higher risk perception. Thereby reducing the willingness to buy. At the same time, according to the risk perception theory, an individual's decision-making is related to his emotional experience in the decision-making process. The more positive the emotional experience of an option, the more inclined to choose that option. Faced with the cognitive imbalance caused by negative reviews, sellers' humorous responses can affect users' emotional experience by awakening users' joy, relieve users' psychological conflicts and nervousness, and help users evaluate the product information described by sellers. Form a positive cognitive consistency, obtain a lower risk perception, and then maintain a stable or higher level of purchase intention.

Therefore, sellers' humorous responses can affect users' different perceptions on users' purchase intentions. Therefore, the following hypotheses are proposed:

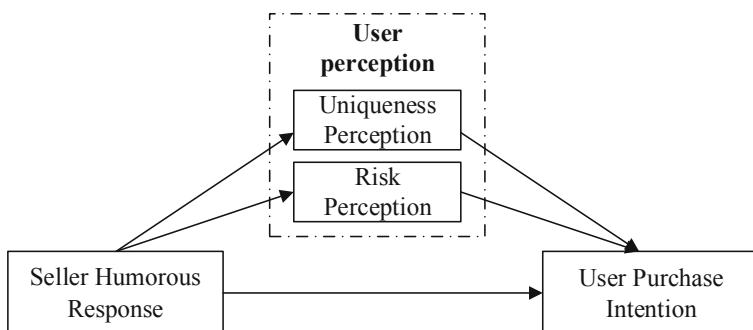
H2: The seller's humorous reply will affect the user's perception and thus affect their purchase intention.

H2a: Seller's humorous reply improves users' willingness to buy by enhancing users' perception of uniqueness.

H2b: Seller's humorous reply improves users' willingness to buy by reducing users' risk perception.

### 3.3 Research Model

In order to explore the two-sided effects of sellers' humorous responses and the boundary conditions that affect users' purchase intentions, this study is based on the uniqueness need theory and risk perception theory to analyze the mechanism by which sellers' humorous responses affect users' purchase intentions through user perception (The theoretical model is shown in Fig. 1).



**Fig. 1.** Theoretical model

## 4 Conclusions

### 4.1 Questionnaire Design

The questionnaire design is mainly divided into three parts: the first part surveys the basic information of the participants, including five items such as gender, age, education, and whether to follow the seller's response; the second part is a situational question and answer session, involving humor perception, uniqueness perception, Variable measurement of risk perception and purchase intention. The measurement items are adapted from the maturity scale proposed by Amitava [7], Franke [8], Huber [9], and Ajzen [10], based on online shopping scenarios and the objects of this research. Rationalization adjustment; the third part is the measurement of user characteristics, involving the user's experience\rational processing system, and the measurement of variables that promote\defense adjustment orientation. The measurement items of experience\rational system are adapted from the research of Novak & Hoffman [11] scholars. The measurement items of adjustment orientation are adapted from Higgins [12] Scholar's Measurement Scale. All items were measured using the 5-point Likert method. In order to improve the validity and authenticity of the test results, 60 users were first invited to fill out the initial questionnaire, and the items were modified and improved based on related questions and the initial reliability and validity test results.

### 4.2 Data Collection and Collation

A total of 320 questionnaires were collected in the study, and 294 valid questionnaires were obtained, with an effective rate of 91.9%. Using SPSS 26.0 tool to test the reliability and validity of the data sample, the overall reliability of the total scale reached 0.786, and the reliability of each subscale was higher than 0.7, indicating that the scale has good internal consistency reliability; The KMO value of is 0.812, the KMO of each variable is above 0.7, and the Bartlett sphere test significance of each variable is less than 0.001. Through exploratory factor analysis, it is found that the original variable in the model has a higher degree of interpretation, so the validity is better. Can be used for further analysis and research.

### 4.3 Hypothesis Testing

#### a. Main effect test

The study uses SPSS 26.0 to conduct a main effect test (Table 1). The test results found that sellers' humorous responses have a significant impact on users' purchase intentions. Hypothesis H1 holds.

**Table 1.** Tests of between-subjects effects

Tests of between-subjects effects					
Dependent variable	Y				
Source	Type III sum of squares	df	Mean Square	F	Sig.
Corrected Model	44.968a	12	3.747	8.923	0.000
Intercept	465.751	1	465.751	1108.978	0.000
X	44.968	12	3.747	8.923	0.000
Error	118.015	281	0.420		
Total	3241.333	294			
Corrected total	162.983	293			

a. R Squared = .276 (Adjusted R Squared = .245)

### b. Intermediary effect test

The study uses the intermediary analysis method of Baron and Kenny (1986) to conduct regression analysis, including 6 models (Table 2 and Table 3): In Model 1, sellers' humorous responses have a significant impact on users' purchase intentions. In Model 2, humorous responses from sellers have a significant impact on the perception of uniqueness. In Model 4, uniqueness perception has a significant influence on users' purchase intention, and the mediating effect of uniqueness perception exists; after adding uniqueness perception, sellers' humorous reply has a less significant impact on users' purchase intention, so uniqueness perception is part of the mediation. The role exists. In Model 5, risk perception has a significant influence on users' purchase intention, and the mediating effect of risk perception exists; after adding risk perception, sellers' humorous response has a significant influence on users' purchase intention, and part of the mediating effect of risk perception exists. In Model 6, uniqueness perception and risk perception have significant effects on users' purchase intentions. Therefore, uniqueness perception and risk perception have a common intermediary effect in the influence of sellers' humorous responses on users' purchase intentions; adding uniqueness perception and risk after perception, the seller's humorous reply has a less significant impact on the user's purchase intention, so a common part of the intermediary effect exists.

**Table 2.** Tests of intermediary effect (1)

Variable	N = 294					
	Model 1 purchase intention		Model 2 uniqueness perception		Model 3 risk perception	
	B	T	B	T	B	T
Seller humorous reply	0.598***	3.687***	0.960***	6.868***	0.205	1.131
Uniqueness perception						
Risk perception						
R <sup>2</sup>	0.243		0.438		0.054	

Note: \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

**Table 3.** Tests of intermediary effect (2)

Variable	N = 294					
	Model 4 Purchase intention		Model 5 Purchase intention		Model 6 Purchase intention	
	$\beta$	t	$\beta$	t	$\beta$	t
Seller humorous reply	0.423*	2.443*	0.635***	3.978***	0.436*	2.578*
Uniqueness perception	0.183**	2.711**			0.211**	3.186**
Risk perception			-0.179**	-3.468**	-0.197***	-3.855***
$R^2$	0.260		0.271		0.293	

Note: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

#### 4.4 Discussion of Results

Through data analysis, it is found that for negative reviews caused by non-seller's main responsibility, sellers' humorous responses can help alleviate users' negative emotional experience and enhance their willingness to buy, and users' perceptions of uniqueness and risk are both developed in this process. Part of the intermediary role. Therefore, when sellers use humorous replies to alleviate users' negative emotions, they should grasp the uniqueness and risk perception that humor brings to users. Appropriate humor can help enhance users' perception of uniqueness, but insincere humorous replies will Promote users to have a higher risk perception, strengthen the negative emotional experience, and then reduce the willingness to buy.

### 5 Management Implications

In terms of management practice, this research provides a reference for sellers to respond to user negative comments in social media. First of all, sellers can adopt a humorous response strategy for the entertainment attributes of social media and the increasing number of negative consumer reviews. Second, sellers need to pay attention to users' uniqueness perception and risk perception, use their own humorous image construction to strengthen users' uniqueness perception, meet their uniqueness needs, and use sincere, interesting and easy-to-interpret humorous responses to reduce users' risks Perception, promoted by both, enhance users' purchasing intention.

**Acknowledgements.** This work was supported by National Social Science Fund (No. 16BGL089).

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# Analysis on the Causes of Risks of Internet Finance's Platforms

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**Abstract.** In recent years, risk events on Internet finance's platforms have occurred frequently, among which P2P platforms are particularly prominent. According to statistics, as of the end of 2019, there have been more than 5,800 risky cases involving platform disconnection or withdrawal difficulties, suspension of operations, or police intervention. The occurrence of these Internet finance's platform risk events has seriously infringed on the interests of financial consumers and small and medium investors, disrupted the normal financial order, undermined the integrity system of the entire society, and brought major hidden risks to social stability. Therefore, it is of great practical significance to deeply study the risks of Internet finance's platforms, analyze the reasons for their formation, and explore targeted solutions. This article starts from the concept of Internet finance and Internet finance platform, based on the characteristics of Internet finance and platform operation characteristics, and dynamically analyzes the generation, development and impact of risks from the operational links; Platform users) proceed to analyze the elements that may cause risks. On this basis, corresponding countermeasures and suggestions to prevent and resolve risks are put forward.

**Keywords:** Internet finance · Internet finance's platform · Causes of risk

## 1 Overview of Internet Finance's Theory

### 1.1 Concept of Internet Finance

Internet finance means the combination of Internet technology and financial services. On the one hand, Internet finance is a “financial model+operating structure”. Financial business and Internet technology complement each other. Internet finance enriches the connotation of Internet technology. At the same time, Internet technology also optimizes the operating structure of financial activities to make it more efficient and convenient. On the other hand, the Internet is a financial “financial services+technology”, emphasized the Internet technology services to financial activities. Internet technology is a means or tool, and its essence is still finance, and ultimately it serves the allocation of resource [1]. Both of these perspectives show that Internet finance is dominated by finance, with the aid of Internet technology to enrich its financial development. The practical application of this view gave rise to the concept of an Internet finance's platform.

## 1.2 Concept of Internet Finance's Platform

The Internet finance's platform is the carrier and basic support for the operation of Internet finance, and is a witness to the development of Internet finance in my country. The concept of an Internet finance's platform can be divided into a broad sense and a narrow sense. In a broad sense, it refers to all institutions, organizations or enterprises that operate financial services through Internet technology. Specifically, it can be divided into three categories: (1) Traditional financial institutions open online business; (2) Internet companies enter the financial industry and create Internet finance's platforms; (3) Other private institutions establish Internet finance's platforms [2]. Among them, (2) and (3) refer to the narrowly defined Internet finance's platform. The basis for this division is their ability to face and resist risks. Because traditional finance has fundamental advantages in financial operations, whether it is facing systemic or unsystematic risks, it has a good risk management mechanism [3]. For the narrowly defined Internet finance's platform, due to its own fragility, irregular operation and imperfect management methods, it fails to prevent it before facing risks, and is unable to resist risks when risks come.

## 2 Analysis of the Causes of Internet Finance's Platform Risks

Starting from the various elements of the Internet finance's platform operating system (Internet finance's platforms, investors, platform users, platforms in the same industry, and external regulatory authorities), clarify its operations and behaviors in the entire Internet financial financial chain, and then Analyze the reasons why each element may cause risks to the platform. Specifically, it is to correspond each risk to the subject of the risk: from the risks from the Internet financial industry (external supervision and platforms in the same industry), the risks that exist in the operation of the platform (the Internet finance's platform), the risks from investors, The risks brought by users of Internet finance's platforms are analyzed. The last three items are platform risks at the micro level.

### 2.1 Risks in the Internet Finance's Industry

Regulatory risk refers to the risk that due to legal changes or the absence of regulatory agencies, the orderly operation of the Internet finance's platform may be hindered, or the platform may suffer losses. At present, the supervision of my country's financial industry adopts a separate supervision model, which separates banking, insurance, and securities business. However, in my country's internet finance industry, most internet finance platforms adopt a mixed business business model. On the one hand, the mode of mixed operation makes the supervisory subject unclear, and the supervisory department and the department are not well coordinated, which leads to lack of supervision or insufficient supervision; on the other hand, in the supervision process, the business scope and business rights of financial entities The responsibilities are not clear, leading to regulatory negligence or excessive regulation, which in turn discourages the enthusiasm of Internet finance's platforms [4]. Moreover, the inclusive

nature of Internet finance has led to a further expansion of the transaction scope of the platform. The business model involving platform transactions has also shown a diversified development trend, and the business entities participating in Internet finance have become more diversified. Therefore, the financial supervision of Internet platforms needs to keep pace with the times and escort them. The application of Internet technology breaks the constraints of traditional financial business by time and space [5]. On the one hand, it improves the business efficiency of Internet finance's platforms and reduces financial costs; on the other hand, the effective supervision of Internet finance proposes a new combination of technology and science. It is required that non-technical supervision will give criminals in the industry an opportunity to conduct reverse operations through the gaps in the Internet technology of industry supervision and disrupt the financial order within the Internet finance's platform and even the entire industry.

Industry self-discipline is mainly manifested in the Internet finance industry, where there are no or very few Internet finance autonomous associations formed between platforms. This will make it difficult for the Internet finance's platform to actively form a standardized industry transaction process when conducting financial business, and when the platform has operating problems, it is more inclined to act in line with the platform's own interests, rather than in line with the normal order of the industry., Disrupt the financial market environment and pose risks to other platforms. There are two main reasons for industry self-regulation risks: (1) the development of the Internet finance industry is not sufficient, and it has not yet reached the level of decentralization of relevant autonomous powers to industry associations. This is the inherent reason for industry self-discipline risk. Internet finance is an emerging industry in China [6]. The individual platform's awareness of legal norms is not high, and the interest representatives on the platform are complex, and it is difficult to form a unified awareness. In addition, there is a lack of communication between platforms and there is no atmosphere of mutual restraint. (2) The existing industry associations are highly administrative, with low work efficiency and insufficient transmission of industry self-discipline. Moreover, in the existing Internet finance's platforms, few platforms can represent the interests of the entire industry.

## 2.2 Risks in Platform Operation

The risks in the operation of Internet finance's platforms are mainly manifested in the operation link. In the operation link, after financing, the Internet finance's platform uses the funds to develop platform financial products and sell the financial products of this platform to Internet finance's platform users. We can analyze the operation link from two aspects: First, the operation link of the Internet finance industry includes two parts, namely the development of financial products and the sale of financial products. Both parts are supported by Internet technology. The one-way behavior of the Internet finance's platform to users of the Internet finance's platform is a dynamic concept of operation. Second, the operating link of the Internet finance's platform is the link where the Internet finance's platform uses Internet technology and uses platform financial products as a medium to create new value for currency or capital. This is a static concept of operation [7]. It can be pointed out that whether it is understood from the

dynamic and static concepts of operation, the essence of operation is the same as that of traditional financial institutions operating and creating new value of currency or capital through user financial activities with institutions.

Internet technology is the support for the operation of the Internet finance's platform. Such technical support not only provides an efficient operation mode of Internet finance, but also redefines finance and restructures it. Financial products, financial services, and the organization of financial markets, etc. Therefore, whether the Internet finance's platform uses Internet technology correctly and properly is directly related to the basic conditions of the Internet finance's platform based on the financial market. Incorrect use or improper use is bound to have a huge negative impact on the Internet finance's platform. In view of the particularity of the application of Internet technology on the Internet finance's platform, Internet technology risks are specifically divided into: (1) Information security risks; (2) Network security risks [8]. The risks caused by user information security are mainly determined by the nature of the Internet. It is virtual and open. On the one hand, these two attributes break the time and space constraints of financial services, and help the platform provide users with personalized financial services at low cost and efficiently.

The financial risk of the Internet finance's platform refers to the fact that due to various internal factors during the turnover of platform funds, the maturity return of platform funds is less than the expected return or capital losses occur, which in turn causes the platform to operate poorly and even paralyze the platform. The Internet finance's platform itself is a carrier of capital operation. When the platform manages user funds for financial business, its capital scale is not as strong as that of traditional financial institutions, and its ability to withstand capital risks is weak. And there is no central bank as the lender of last resort, so it is more sensitive to capital risks. A slight error in capital management may bring a crisis to the entire platform. Take third-party payment as an example: In the operation of third-party payment platforms, there is a large amount of funds circulating between the platform and the real economy.

## 2.3 Risks for Investors

The risk of investors is mainly from the financing link of Internet finance. Different from the Internet finance's platform ontology, the purpose of investors in the financing link is to obtain income after investment. The amount of income determines whether future investors will increase or stop investing. What we want to discuss here are the risk factors that exist when investors are faced with deciding whether to invest in an Internet finance's platform, including whether to invest, which Internet finance's platform to invest in, and how much to invest. This part is indirect to the operation of the platform. Such influencing factors are generated before investors become part of the operation of the platform. However, such risk factors are continuous, and leaving it alone will eventually lead to a crisis of the platform.

## 2.4 Risks to Users of Internet Finance's Platforms

The risks posed by users of Internet finance's platforms are mainly manifested in the fact that in the process of financial business, users' irregularities or irrational and non-

standard financial operations cause the platform to bear risks. Credit risk is mainly manifested in the online loan platform industry of Internet finance. For the Internet finance's platform, credit risk refers to the economic loss caused to the platform when the user fails to fulfill the due obligations in the business when a certain financial business reached on the Internet finance's platform expires. The operation of the Internet finance's platform is highly virtual. While users and the platform complete financial services through the Internet, the virtuality of the Internet is prone to information asymmetry. In addition, the Internet finance's platform has a low threshold for user screening, an incomplete user information review mechanism, and it is difficult to guarantee the true information of users, resulting in a lack of scientific basis for business establishment and increasing the possibility of user default [9].

### **3 Countermeasures to Resolve the Risks of Internet Finance's Platforms**

#### **3.1 Improve the Construction of Laws and Regulations for the Supervision of Internet Finance's Platforms**

The market access supervision of the Internet financial industry refers to the use of administrative means and measures to ensure that the Internet finance's platform is capable of fulfilling its obligations, thereby ensuring the legitimate rights and interests of Internet finance's platform users. The specific measures mainly include determining the company's size, capital structure, platform risk-bearing capacity, platform business scope, and Internet-related security issues. On the one hand, strictly review the qualification requirements for platforms to enter the financial sector, and classify different types of platforms to establish access requirements; on the other hand, under the premise of ensuring the implementation of access supervision, reduce the administrative process of access. The platform's access system must be strictly enforced, and access to platforms that do not meet the qualifications will be prohibited to ensure the standardized operation of the platform while maintaining the fairness of market access.

#### **3.2 Enhancing the Risk of Internal Control Capabilities on Internet Finance's Platforms**

To standardize the operation of the Internet finance's platform, we must first establish the selection of personnel who meet the platform. One is to attach importance to the continuing education system for financial business personnel within the platform, and to conduct systematic training based on the characteristics of the industry's business. Second, attach importance to the recruitment of "Internet+finance" compound talents, and coordinate the communication and exchanges between the financial department and the technical department within the platform. Under the premise of stable and positive development, the financial business of each platform will pursue market share [10]. Secondly, clarify the difference between the traditional financial business of the platform and the traditional financial business of traditional financial institutions, give full play to the advantages of the efficiency and convenience of the Internet, avoid

competition with traditional financial institutions on risky projects, and use their own inclusive enthusiasm Deal with my country's "three rural" issues and implement a blue ocean strategy.

### 3.3 Effectively Resolve the Network Risks of Internet Finance's Platforms

The user's weak information security awareness is the source of information security risks on Internet finance's platforms. Therefore, to resolve the risks of the Internet finance's platform, it is necessary to increase the popularization and education of users' information risk knowledge, and effectively combine financial risk reminders with information security education, so that users can subtly improve the quality of user security in the use of platform software. The network security of the Internet finance's platform must first start with the platform network hardware equipment, strengthen the support of the platform operation on the hardware equipment, and improve the platform's own ability to resist network viruses and hacker attacks from objective conditions [11]. Secondly, the Internet is the support for the operation of the platform, and the security of the Internet is the prerequisite and foundation for the operation of the platform. On the one hand, it is necessary to reduce the possibility of vulnerabilities in its own system. The overall stability and security of the platform. Third, it is necessary to introduce or develop advanced user identity confirmation technology. The confirmation of identity information on the platform is a guarantee of safe and fair transactions. However, the virtual nature of the network leads to the possibility of information distortion during the transmission process. The purpose is to ensure the authenticity of transactions, which is an inherent requirement for the platform to conduct financial services normally.

## 4 Conclusions

This article aims to summarize the risks that Internet finance's platforms may face in each link of operation, and analyze the causes of their risks, and make targeted recommendations. The following conclusions are drawn: (1) Risks of Internet finance's platforms It includes not only the similar risks of traditional financial institutions in financial business, but also the risks of Internet technology, which makes the risks of Internet platforms unique. (2) The risks of Internet finance's platforms are mainly determined by two parts: First, the platform itself is not fully developed, and the demand and supply of various elements have not reached the overall general equilibrium, but the elements have reached mutual equilibrium with each other. Second, the external environment is not compatible with the development of Internet finance. (3) The resolution of Internet financial risks should focus on the entities in each link. While regulating the behavior of each entity, attention should be paid to coordinating the relationship between the entities in order to give full play to the overall advantages of Internet finance. It can be pointed out that the Internet finance's platform has its special social functions. Various Internet finance's platforms in the market systematically mobilize idle resources in society, and rely on Internet technology to carry out productive investment, personalized design, and multi-channel sales. The purpose is to

better implement financial inclusion and financial democracy. Therefore, the so-called risks of the Internet finance's platform are only a “by-product” of its advantages, and the analysis of the causes of its risks is also due to its platform advantages. But for this Internet application industry, its attributes determine the objective requirements that must keep pace with the times. These requirements also bring new advantages to the Internet finance's platform, and new advantages also bring new risks. Analyzing the causes of risks of Internet finance's platforms is always a risk “Inventory” analysis: It is time-sensitive and understood from a micro level. To truly clarify the risks of Internet finance and fundamentally resolve risks, reduce the possibility of risk occurrence and mitigate the impact of risks, it is more important It is necessary for the government to understand the operation of the Internet finance's platform from a macro level, discover and analyze the problems in it, and formulate corresponding policies to optimize the structure of the Internet financial industry, and guide the orderly, rational and standardized operation of various platforms and their elements.

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# Construction of Energy Scheduling Model for Iron and Steel Enterprises Based on Big Data

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**Abstract.** With the development of social economy and the expansion of the scale of iron and steel enterprises, as an important symbol of national industrialization level and international competitiveness, energy management of iron and steel enterprises has gradually become the key issue of national development strategy and national long-term interests. In recent years, with the rapid development of big data technology, the application of big data technology in energy scheduling of iron and steel enterprises is more extensive. At present, most dispatchers of iron and steel enterprises estimate roughly the fluctuation of blast furnace gas production in the future based on historical data, and the accuracy of the estimation mainly depends on the experience of the dispatchers. At the same time, the existing point by point prediction model cannot meet the requirements of energy system for prediction accuracy. Through long-term field research and investigation, it is found that the dispatcher often pays more attention to the reliability of its estimation results, rather than a single estimation value. With the support of today's big data. The decision support based on data analysis is being integrated into the energy management ideas of equipment manufacturing enterprises, which improves the level of energy management of equipment manufacturing enterprises, optimizes the industrial structure of enterprises, improves work efficiency and creates social wealth. Through literature research and other methods, and through certain experiments, it is concluded that the average energy consumption of China's steel industry is 15% higher than that of the world-class countries; and in the cost of energy consumption, the average level of China's enterprises is about 30%, and some enterprises even exceed 40%. It can be seen that China's iron and steel enterprises are still struggling in energy conservation.

**Keywords:** Big data · Iron and steel enterprises · Energy dispatching · Literature research

## 1 Introduction

China, as a major consumer of the steel industry, and its fuel consumption accounts for nearly half of the total production. In recent years, information-based energy management plays an increasingly important role in energy-saving work of iron and steel enterprises. However, the current informatization of energy management is mainly aimed at business operation level. A large number of data services generated in this process have not been effectively utilized in other links such as decision-making, and lack of analysis and diagnosis operation.

In view of the construction mode of energy scheduling for iron and steel enterprises based on big data, different experts have given different answers and suggestions. Wang's think through the analysis of energy consumption in the energy management and control process of my country's iron and steel enterprises, the current status and existing shortcomings of energy management and control models of iron and steel enterprises are studied, and ways to optimize energy management and control models of iron and steel enterprises are proposed Approach and analyzed with high data [1]. Fukuyama believes that in order to win the battle of energy saving, steel enterprises must start from the aspects of cost and quality, and put cost control in the first place [2]. Zhang thinks that different from the current robust optimization methods based on uncertainty set and worst-case, we assume that the generation capacity of unstable renewable energy follows a fuzzy distribution with known expectation and variance, and the probability distribution function (PDF) is limited to the uncertainty set of the function. The goal of d-rerd is to minimize the total expected production cost in the worst-case renewable energy distribution system [3].

Under the guidance of energy informatics and big data, this paper analyzes the status and characteristics of energy consumption in the process of equipment manufacturing enterprises. On this basis, the energy management model of equipment manufacturing enterprises is constructed. Through data exchange and information coupling mechanism, various information systems in equipment manufacturing enterprises are connected. Information system is the center, Optimize the construction of enterprise flow network, sensor network and sensor network, integrate the energy information of each system, so as to reduce energy consumption and improve energy utilization efficiency. It is hoped to provide theoretical reference for relevant theoretical researchers and help equipment manufacturing enterprises to achieve sustainable development strategy [4].

## 2 Method

### 2.1 Processing and Use of Big Data

This paper introduces the idea of big data into energy management information system, combines traditional data warehouse and business intelligence technology, establishes energy data warehouse based on big data technology, carries out data centralization and system architecture optimization, integrates enterprise energy management information system, realizes the transformation from energy statistics to energy management, and

promotes management innovation with theoretical innovation, Energy management plays an important role in the strategic development of enterprises to improve enterprise insight and management efficiency. With the processing function of big data, traditional business intelligence has been developed and promoted. In most of the market cycles, the rapid formation of modeling and deployment will become a strong support for the new business intelligence platform, which may change the state that has been difficult to withstand changes in business operations for many years [5].

## 2.2 Storage and Management of Big Data

Most of the large-scale business systems (such as banking, securities trading, e-commerce, etc.) still mainly use relational databases, and the large number of applications of cloud computing will have a great impact on the development of relational databases, and then affect the construction of the system and the development and operation mode of the system. Therefore, the development of cloud database service products based on relational database will become the main development direction of database. It is a highly scalable, highly secure and fault-tolerant software. Customers not only manage multiple data while reducing obsolete costs, but also better serve business decision-making [6].

## 2.3 Interval Estimation of Occurrence Based on Esne Model

The operation and scheduling mode of gas directly affects the energy consumption cost and output cost of iron and steel enterprises. Due to the problems of hot blast stove replacement, blast furnace air shut-down and air reduction, the occurrence of blast furnace gas fluctuates greatly, which has a great impact on the modeling and balanced scheduling of the whole blast furnace gas system [7]. In addition, due to the limited capacity of blast furnace gas holder, it can only be used as a buffer and stability when a small amount of gas is unbalanced. If there is a serious imbalance between the amount of gas produced and used in the system, it will not only affect the normal production of the gas system, but also cause the loss of energy, which will affect the overall efficiency of financial enterprises. Therefore, it is of great significance to accurately estimate the amount of blast furnace gas. At present, most dispatchers of iron and steel enterprises estimate roughly the fluctuation of blast furnace gas production in the future based on historical data, and the accuracy of the estimation mainly depends on the experience of the dispatchers. However, the experience of different workers is different, and the output of blast furnace itself fluctuates greatly, so it is difficult to make accurate quantitative estimation only by manual experience. In addition, there are many uncertain factors and disturbances in the industrial production process, and the collected data generally contain noise signals and outliers. When the field data is directly used to establish its prediction model, the accuracy of the model is often greatly reduced due to the influence of uncertain factors such as noise data and outliers [8]. The reliability of the existing system is often not satisfied by the researchers' point by point estimation rather than the long-term prediction accuracy. Therefore, only when the accuracy of the prediction model is described quantitatively, that is, the interval

estimation of energy data can the results be used more effectively to guide the work of energy dispatching.

## 2.4 ESN Model

Aiming at the problem that it is difficult to predict the intake of blast furnace gas, the data collected from the steel plant is preprocessed to analyze the factors that have a great influence on the amount of blast furnace gas, and the noise is removed. Then, the traditional echo state network is composed of input layer, dynamic reserve pool and output layer, and the internal reserve pool contains a large number of sparse connected neurons. It has good short-term memory function, and the dynamic characteristics of nonlinear system are generated by its reserve pool, which has shown good performance in time series prediction [9]. It can effectively predict the end carbon content and temperature of converter, and provide more accurate operation guidance for converter steelmaking process:

$$x(k+1) = f(w^{in}u(k+1) + wx(k)) \quad (1)$$

$$y(k+1) = f^{out}[x(k+1), u(k+1)] \quad (2)$$

Where  $u(k)$  is the input of the model,  $X(k)$  is the internal state, its dimension is  $n$ , and  $Y(k)$  is the output,  $w^{in}$  Is the input weight matrix,  $W$  is the connection weight matrix of the reserve pool neurons,  $w^{out}$  Is the output weight matrix,  $f$  is the reserve pool neuron activation function, here defined as the tanh function,  $f^{out}$  It is the activation function of the output neuron, generally using linear function.

## 3 Experiment

### 3.1 Literature Research

Through the collection of energy Informatics, equipment manufacturing enterprise energy conservation and energy utilization management research and big data related technical literature, the literature is classified, compared and summarized, and the research entry point is determined. Under the support of the original theory, the material support and analysis method are provided for the theoretical research and empirical research of this paper.

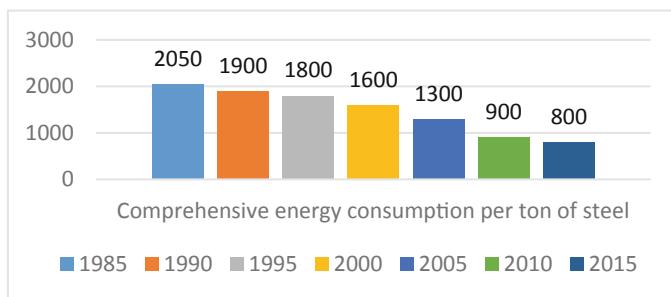
### 3.2 Normative Study

After reading the literature carefully, and then summarizing the research application status and the possible future development trend, this paper summarizes the energy consumption status and characteristics of equipment manufacturing enterprises, analyzes the three elements of energy information science of energy system, and constructs the energy management information system model. Analyze the objectives, requirements and functions of energy management information system, and support the design and implementation of the system combined with big data technology [9].

## 4 Discussion

### 4.1 Development of Energy Consumption in Iron and Steel Industry

As an energy intensive industry, iron and steel industry is also a large energy consumer. In order to deal with energy shortage, China's steel industry has taken a series of effective measures in terms of management and technology. After decades of technology accumulation and development, great achievements have been made in energy saving.



**Fig. 1.** Development of energy consumption in iron and steel industry

It can be seen from Fig. 1 that although our country's total steel consumption is declining, there is a fact that we must admit that my country's steel consumption level is still much higher than that of developed countries. Take the Japanese state-owned company closest to us as an example. my country's average energy consumption per ton of steel is 15% lower than my country's. In terms of cost, the average level of Chinese companies is around 30%, and some companies even exceed 40%. This shows that my country's steel companies still have a big mountain to overcome in terms of energy saving. In response to the problem of energy waste, relevant state departments have begun to take certain measures to release energy survey reports to steel companies across the country to implement the energy-saving and consumption reduction work of steel companies in an important strategic position. At the same time, they have introduced a series of policies to eliminate high energy consumption. Steel companies. Although iron and steel enterprises can bring great economic benefits to our country, with the proposal of "Golden mountains and silver mountains, not as good as green mountains", only sustainable development is the last word.

### 4.2 Statistics of Oxygen Consumption in Converter Process

Oxygen is the top priority in the production of iron and steel enterprises, and plays an irreplaceable role in the steel manufacturing process system. In the process of steel-making and steelmaking, oxygen enriched elements are eliminated by oxygen blowing into molten iron and steel rolling process.

**Table 1.** List of oxygen consumption in iron and steel production

Scale and consumption	Steel-making	To smelt iron	Other
Baosteel	50%	30%	4%
WISCO (8 million tons)	63%	38%	2%
WISCO (16 million tons)	56%	42%	5%

In the oxygen consuming steel manufacturing unit, converter is the main oxygen consumption. According to the oxygen consumption ratio table of main oxygen consumption processes in iron and steel production (Table 1), the total oxygen consumption of converter steelmaking accounts for more than half of the total oxygen consumption of iron and steel enterprises on average. However, in the process of converter production, it is difficult to predict the oxygen consumption, which leads to the imbalance between the actual oxygen consumption and the actual supply in the converter process, resulting in oxygen emission and waste of resources.

### 4.3 Analysis and Calculation of Converter Energy Recovery

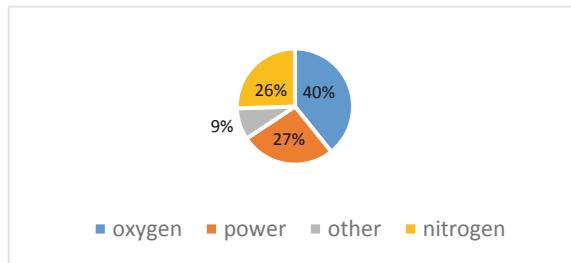
In the process of converter steelmaking, in addition to consuming a large amount of oxygen, electricity, nitrogen, argon and other energy media, it can also recover the gas and water vapor produced in the process of converter steelmaking. Improving the energy recovery rate is the key to realize negative energy steelmaking.

**Table 2.** Statistics of converter gas recovery data

	N	Minimum value	Maximum	Average
Gas recovery/day	92	1542000	2920000	2553500
Amount of iron smelting/day	92	17500	34300	29500
Effective/N	92	45%	50%	55%

It can be seen from the data in Table 2 that according to the statistical data of energy medium in a certain month of a steel plant, the daily recovery amount of converter gas can be obtained. Combined with the actual production data of converter, the total amount of molten iron in the converter can be obtained every day. After collecting the actual data of the steel plant for 4 months, a total of 92 available sample data are sorted out, and the daily gas recovery is in the order of million cubic meters, Therefore, converter gas is an important medium for converter energy recovery, which accounts for the main proportion in the energy recovery.

#### 4.4 Calculation of Comprehensive Energy Consumption of Converter Heats



**Fig. 2.** Converter consumption and proportion of recovered energy

Low oxygen consumption is the main energy saving measure of converter unit. Through the analysis in Fig. 2, it is found that oxygen consumption accounts for 40% of the total energy consumption. Therefore, in converter blowing process, it is necessary to vigorously develop high-efficiency oxygen supply technology, improve oxygen blowing efficiency, speed up ladle turnover and shorten smelting time through automatic operation such as dynamic oxygen lance control; meanwhile, improving hot metal quality and strengthening pretreatment effect will help to reduce oxygen consumption in steelmaking process.

## 5 Conclusion

Energy consumption is an important part of blast furnace ironmaking. The establishment of blast furnace gas production and consumption prediction model provides a small amount of data support for gas dispatching and plays a great role in promoting energy conservation and emission reduction in iron and steel enterprises. On the basis of investigation, analysis and research on this problem, and on the basis of clarifying the traditional energy forecasting methods and the limitations of iron and steel enterprises, a solution to the problem of energy forecasting is established. Refinement of energy management has become an inevitable requirement for sustainable development of iron and steel industry. The construction of energy management center of iron and steel enterprises is conducive to the collection of steel energy data, which is more conducive to the control of energy consumption and energy conservation of iron and steel enterprises. This study scientifically understands the changing law of energy demand in iron and steel enterprises, and establishes a comprehensive and reasonable by-product gas optimal scheduling model.

**Acknowledgements.** This work was supported by the Science and Technology Research Program of Chongqing Municipal Education Commission, China (Grant No. KJQN202000839) and The Dr. Scientific Research Funds of CTBU (Grant No. 1956042).

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# Ratio Test for Mean Change Based on Financial Time Series Under the Background of Big Data

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**Abstract.** In the era of big data, it is very necessary to research the volatility of the financial market, and the heavy-tailed dependent series can well describe the characteristics of the peak and heavy tail in financial data, which is favored by many scholars. In this paper, ratio test is proposed to analysis a mean change of heavy-tailed sequence. On the basis of general functional central limit theorem, the validity of the statistic is proved.

**Keywords:** Big data · Financial time series · Heavy-tailed dependent sequence · Mean change

## 1 Introduction

With the advent of the era of big data, the application of statistical thinking and methods to mining hidden values in the data has become a hot research direction in the field of big data. The mean change point test has always been the core of the research on the change point problem, which refers to the change of the mean value of a set of data at an unknown time. There're a lot of literature literatures about the mean change, see Hawkins [1], Kokoszka [2], Lavielle [3], etc. The aforementioned works consider the case that the variance sequence are finite, but the case of infinite variance sequence are more realistic.

In fact, many economic and financial data have the characteristics of “peak and heavy tail”, heavy-tailed distribution models are often used in the fields of communication, transportation, insurance and finance. Many scholars have studied the heavy-tailed sequence. Han et al. [4] estimated the mean change point of infinite variance heavy-tailed model by truncation method, Jin and Tian [5] used the cumulative sum method to research the change points in the mean of the infinite tail sequence. Based on subsampling method, Kokoszka and Wolf [6] consider the mean change point test of infinite tail variance sequence. In addition, examples of linear processes with infinite heavy-tailed distributions are given by Cline and Brockwell [7], Miamee and Pourahmadi [8] and Kokoszka [9] et al.

In this paper, the test statistic is the ratio form of the CUSUM statistic, it was introduced by Horvath et al. [10] and we applied it to the heavy-tailed sequence. We consider using rate-type test statistics, which do not require any variance estimates to be standardized.

## 2 Model, Hypotheses and Test Statistics

We considered the model:

$$\begin{aligned} X_t &= \mu + \Delta I_{\{t > k^*\}} + u_t, \quad t = 1, 2, \dots, n, \\ u_t &= d(L)\xi_t = \sum_{j=1}^{\infty} d_j \xi_{t-j}, \quad d_0 = 1, d(1) \neq 0. \end{aligned} \quad (1)$$

Where  $\mu$ ,  $k^*$  and  $\Delta \neq 0$  are unknown parameters. Let  $k^* = [n\tau^*]$ ,  $\tau^* \in (0, 1)$ ,  $I_{\{A\}}$  is the indicator of the set  $A$ , the coefficients  $d_j$  satisfy the condition  $\sum_{j=0}^{\infty} j|d_j|^\gamma < \infty$  with  $0 < \gamma < \kappa \wedge 1$ .  $\xi_t$  is a heavy-tailed random sequence with the heavy index  $\kappa$ .

We consider under the null hypothesis, there is no mean change point, and under the alternative hypothesis, there is a mean change point at some unknown time  $k^*$ , i.e.

$$H_0 : k^* = n \text{ versus } H_1 : k^* < n,$$

The test statistic is the ratio form, as follows:

$$T_n(\psi, \delta) = \frac{\max_{1 \leq i \leq t} \left| \sum_{j=1}^i \psi(X_j - \hat{\mu}_{1t}(\psi)) \right|}{\max_{t \leq i \leq n} \left| \sum_{j=i+1}^n \psi(X_j - \hat{\mu}_{2t}(\psi)) \right|}. \quad (2)$$

where  $0 < \delta < 1/2$ ,  $\psi$  is a score function,  $\hat{\mu}_{1t}(\psi)$ ,  $\hat{\mu}_{2t}(\psi)$  are an M – estimate about the parameter  $\mu$  based on the series  $X_1, X_2, \dots, X_t$  and  $X_{t+1}, X_{t+2}, \dots, X_n$  (under  $H_0$ ), That means the estimator  $\hat{\mu}_{1t}(\psi), \hat{\mu}_{2t}(\psi)$  are the solution of the equation  $\sum_{i=1}^t \psi(X_i - \mu) = 0$  and  $\sum_{i=t+1}^n \psi(X_i - \mu) = 0$ .

We discuss typical considered  $\psi'$ s. For the choices of  $\psi(x) = x$ ,  $x \in R$ , it is called  $L_2$  procedure, and usually used under heavy-tailed distribution, e.g., in Koul et al. [11], Csörgő and Horváth [12] and Hušková and Picek [13, 14]. De Jong and Davidson [15] studied an procedure ( $\psi(x) = sign x$ ,  $x \in R$ ) based on  $S_k(\psi)$ ,  $k = 1, \dots, n$  for dependent errors. We can also consider the choice  $\psi(x) = xI\{|x| \leq K\} + Ksign(x)I\{|x| > K\}$ ,  $x \in R$  for some  $K > 0$ .

In the paper we assume the following.

**Assumption 2.1.** The strictly symmetrical innovation  $\xi_t$  is in the normal domain of attraction of a stable law with tail index  $\kappa$  ( $1 < \kappa < 2$ ),  $E(\xi_t) = 0$  and  $n^{-1/\kappa}(\xi_1 + \dots + \xi_n) \equiv \xi_1$ , where “ $\equiv$ ” signifies equality in distribution.

**Lemma 2.1.** If  $\xi_t$  satisfies the Assumption 2.1, then

$$a_n^{-1} \sum_{t=1}^{[n\tau]} \xi_t \xrightarrow{d} U(\tau), n \rightarrow \infty. \quad (3)$$

Where  $0 \leq \tau \leq 1$ ,  $a_n = \inf \{x : p(|\xi_t| > x) \leq n^{-1}\} = n^{1/\kappa} L(n)$ ,  $L(n)$  is slowly varying function, and  $U(\tau)$  is a stable process and the heavy index is  $\kappa$ . The notation “ $\xrightarrow{d}$ ” signifies convergence in distribution.

**Lemma 2.2.** If  $\xi_t$  satisfies the Assumption 2.1, and  $u_t = \sum_{j=1}^{\infty} d_j \xi_{t-j}$ , then

$$a_n^{-1} \sum_{t=1}^{[n\tau]} u_t \xrightarrow{d} \omega U(\tau), n \rightarrow \infty. \quad (4)$$

Where  $\omega = d(1) = \sum_{j=0}^{\infty} d_j$ .

### 3 Main Results

The following theorems collect the asymptotic property of Ratio test under null hypothesis, and the consistence of the Ratio test is proved under alternative hypothesis.

**Theorem 3.1.** (Under null) Assume the Assumption 2.1 holds, under null hypothesis  $H_0$ , then

$$T_n(\psi, \delta) \xrightarrow{d} \sup_{\delta \leq t \leq 1-\delta} \frac{\sup_{0 \leq s \leq t} |U(s) - (s/t)U(t)|}{\sup_{t \leq s \leq 1} |U^*(s) - (1-s)/(1-t)U^*(t)|}. \quad (5)$$

Where  $\{U(t), 0 \leq t \leq 1\}$  is a standard stable process and  $U^*(t) = U(1) - U(t)$ .

**Proof of Theorem 3.1.** Assume that  $\mu = 0$ . Under  $H_0$ , we know  $X_t = U_t$ . Let

$$S_n(t) = a_n^{-1} \sum_{j=1}^{[ns]} \psi(u_j) \text{ and } S_n^*(t) = a_n^{-1} \sum_{j=[ns]}^n \psi(u_j),$$

In Hušková [16], We have

$$\sup_{1 \leq i \leq ns} \left\{ n^\kappa \sqrt{\frac{[ns]}{i([ns]-i)}} \left| \sum_{j=1}^i \psi(X_j - \hat{\mu}_{1,[ns]}(\psi)) - \left( \sum_{j=1}^i \psi(u_j) - \frac{i}{[ns]} \sum_{j=1}^{[ns]} \psi(u_j) \right) \right| \right\} \xrightarrow{p} 0, n \rightarrow \infty \quad (6)$$

Where  $\kappa > 0$ , hence,

$$a_n^{-1} \sup_{1 \leq i \leq ns} \left| \sum_{j=1}^i \psi(X_j - \hat{\mu}_{1,[ns]}(\psi)) \right| = \sup_{1 \leq i \leq ns} \left| S_n\left(\frac{i}{n}\right) - \frac{i}{[ns]} S_n(t) \right| + o_p(1), n \rightarrow \infty. \quad (7)$$

Similarly,

$$a_n^{-1} \sup_{ns \leq i \leq n} \left| \sum_{j=i}^n \psi(X_j - \hat{\mu}_{2,[ns]}(\psi)) \right| = \sup_{ns \leq i \leq n} \left| S_n^*\left(\frac{i}{n}\right) - \frac{n-i}{n-[ns]} S_n^*(t) \right| + o_p(1), n \rightarrow \infty. \quad (8)$$

Applying the Lemma 2.2, we know

$$(S_n(t), S_n^*(t)) \xrightarrow{d} \omega(\psi)(U(t), U^*(t)), n \rightarrow \infty \quad (9)$$

Hence, we get for all  $0 < \delta < 1/2$

$$\begin{aligned} & \left( a_n^{-1} \sup_{1 \leq i \leq ns} \left| \sum_{j=1}^i \psi(X_j - \hat{\mu}_{1,[ns]}(\psi)) \right|, a_n^{-1} \sup_{ns-1 < i \leq n-1} \left| \sum_{j=i+1}^n \psi(X_j - \hat{\mu}_{2,[ns]}(\psi)) \right| \right) \\ & \rightarrow^d \omega(\psi) \left( \sup_{0 \leq s \leq t} \left| U(s) - \frac{s}{t} U(t) \right|, \sup_{t \leq s \leq 1} \left| U^*(s) - \frac{1-s}{1-t} U^*(t) \right| \right). \quad n \rightarrow \infty \end{aligned} \quad (10)$$

By the continuous mapping theorem, we get

$$T_n(\psi, \delta) \xrightarrow{d} \sup_{\delta \leq t \leq 1-\delta} \frac{\sup_{0 \leq s \leq t} |U(s) - (s/t)U(t)|}{\sup_{t \leq s \leq 1} |U^*(s) - (1-s)/(1-t)U^*(t)|}. \quad n \rightarrow \infty \quad (11)$$

**Theorem 3.2.** (Under Alternative) Assume the Assumption 2.1 and the alternative hypothesis  $H_1$  hold, let  $0 < \delta < 1/2$  and  $na_n^{-1} \rightarrow \infty$ , then

$$T_n(\psi, \delta) \xrightarrow{p} \infty \quad (12)$$

**Proof of Theorem 3.2.** Let  $t > k^* + 1$ ,  $t = [\zeta n]$  and  $\zeta < \xi < 1 - \gamma$ . When  $n \rightarrow \infty$ , we have  $k^* = O(n)$ ,  $t = O(n)$ . Using the mean value theorem, then

$$0 = \sum_{i=1}^t \psi(X_i - \hat{\mu}_{1,t}(\psi)) = \sum_{i=1}^t \psi(X_i - \mu) + \left[ \sum_{i=1}^t \frac{d}{d\mu} \psi(X_i - \mu) | \mu = \mu^* \right] (\hat{\mu}_{1,t}(\psi) - \mu), \quad (13)$$

Where  $\mu^*$  lie between  $\mu$  and  $\hat{\mu}_{1,t}(\psi)$ . By the Lemma 4.3 in Hušková[16],

$$\sum_{i=1}^t \psi(X_i - \mu) = \sum_{i=1}^t \psi(u_i + \Delta I_{\{i > k^*\}}) = \sum_{i=1}^t \psi(u_i) + \sum_{i=1}^t E\psi(u_i + \Delta I_{\{i > k^*\}}) + o_p(t^{\theta-v+1}). \quad (14)$$

As  $t \rightarrow \infty$  for any  $\theta \in [-1/2, 0]$  and  $v \in (0, \eta/(3(2+\chi+\chi')))$ . Using Taylor's expansion theorem about  $\psi$  in the neighborhood of 0, then

$$\begin{aligned} \sum_{i=1}^t E\psi(u_i + \Delta I_{\{i > k^*\}}) &= \sum_{i=k^*+1}^t E\psi(u_i + \Delta) = t(1 - \varsigma/\xi)\Delta\lambda'(0) + t(1 - \varsigma/\xi)o(\Delta), t \rightarrow \infty. \\ \end{aligned} \quad (15)$$

By the Lemma 4.4 in Hušková [16] and the Lipschitz property,

$$\begin{aligned} \sum_{i=1}^t \frac{d}{d\mu} \psi(X_i - \mu) | \mu = \mu^* &= \sum_{i=1}^t \frac{d}{dd} E\psi(u_i + \Delta I_{\{i > k^*\}} - d) | d = 0 + O_p(t^{1/2 + (1/2 + \theta)/3 + \chi}) \\ &= - \sum_{i=1}^t \lambda'(\Delta I_{\{i > k^*\}}) = -t(\lambda'(0) + O(\Delta)) + O_p(t^{1/2 + (1/2 + \theta)/3 + \chi}). \\ \end{aligned} \quad (16)$$

As  $t \rightarrow \infty$  for any  $\theta \in [-1/2, 0]$ . Combining (13)–(16), we have

$$\begin{aligned} \hat{\mu}_{1t}(\psi) - \mu &= \frac{\sum_{i=1}^t \psi(u_i) + t(1 - \varsigma/\xi)\Delta\lambda'(0) + t(1 - \varsigma/\xi)o(\Delta) + o_p(t^{\theta-v+1})}{t(\lambda'(0) + O(\Delta)) + O_p(t^{1/2 + (1/2 + \theta)/3 + \chi})} \\ &= \frac{1}{t\lambda'(0)} \sum_{i=1}^t \psi(u_i) + (1 - \varsigma/\xi)\Delta + o_p(t^{\theta-v}). \\ \end{aligned} \quad (17)$$

So, we get,

$$\max_{1 \leq i \leq t} t^{v-\theta-1} \left| \sum_{j=1}^i (\psi(X_j - \hat{\mu}_{1,t}(\psi)) - \psi(u_j) - E\psi(X_j - \hat{\mu}_{1,t}(\psi))) \right| \xrightarrow[n \rightarrow \infty]{P} 0. \quad (18)$$

We obtain,

$$\max_{1 \leq i \leq t} \frac{1}{\sqrt{t}} \left| \sum_{j=1}^i \psi(X_j - \hat{\mu}_{1,t}(\psi)) \right| \geq \frac{1}{\sqrt{t}} \left| \sum_{j=1}^{k^*+1} \psi(X_j - \hat{\mu}_{1,t}(\psi)) \right| \xrightarrow[n \rightarrow \infty]{P} \infty. \quad (19)$$

By the proof of Theorem 3.1, we have

$$\max_{[\xi n] \leq i \leq n-1} \frac{1}{\sqrt{t}} \left| \sum_{j=i+1}^n \psi(X_j - \hat{\mu}_{2,t}(\psi)) \right| \xrightarrow{d} \omega(\psi) \sup_{\xi \leq s \leq 1} \left| U^*(s) - \frac{1-s}{1-\xi} U^*(\xi) \right|. n \rightarrow \infty \quad (20)$$

Now we complete the proof.

## 4 Conclusions

This paper focuses on the study of the mean change point of heavy-tailed data, and the topic is closely related to the current big data background and financial security. The ratio type test statistics is proposed to study the existence of the mean point variation method for heavy tail dependent sequences. We assume that there are weak correlation errors in the model and combine an unknown function in the test statistic. And the validity of the statistic is proved in the paper.

**Acknowledgments.** This work is supported by Science and Technology Foundation of Shaanxi Province of China under Grant No. 2013XJXX-40; Natural Science Foundation of Shaanxi Province of China under Grant No. 2017JM1042. Scientific Research Program Funded by Shaanxi Provincial Education Department (Program No. 16JK1500); Natural Science Foundation of Shaanxi Province of China under Grant No. 2018JM1041.

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# How Nostalgia Affect Purchase Intention Under the Background of Big Data

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**Abstract.** In the era of big data, individuals have to face a fast-paced lifestyle. Nostalgia as an emotional appeal, to a certain extent, can affect individuals' purchase behavior. Through the guidance of nostalgia, businesses can awaken people's good memories of the past, and then release this emotional appeal through consumption. Besides, brand identification has always been regarded as an important medium for the influence of nostalgia on consumers' purchase intention. This paper divides brand identification into two dimensions, namely cognitive attitude and emotional identification, trying to explore the relationship between nostalgia and consumers' purchase intention. This paper focuses on the influence mechanism of three types of nostalgia on consumers' purchase intention. This research aims to enrich the research on nostalgia marketing and provide practical ideas for enterprises' nostalgia marketing.

**Keywords:** Nostalgia · Brand identification · Purchase intention

## 1 Introduction

Nostalgia is a natural emotion for everybody. Nowadays, many enterprises add some nostalgic elements into their marketing strategies to stimulate consumers' nostalgic emotion, so as to promote consumers purchasing products [1]. This study uses brand identification as the mediator to explore the impact of consumer nostalgia on consumers' purchase intention. This paper divides nostalgia into three dimensions: personal nostalgia, family nostalgia and interpersonal nostalgia. Brand identification is divided into two dimensions, namely cognitive attitude and emotional identification.

By studying the impact of nostalgia on consumers' purchase intention, it not only provides a theoretical basis for enterprises to formulate nostalgic marketing strategies more reasonably and effectively, but also enriches the theoretical research on nostalgia marketing.

## 2 Theoretical Model and Hypothesis

Scholars have found that consumers' nostalgia positively affected purchase intention [2]. Once consumers show nostalgic emotion, which will trigger nostalgic demand, and finally generate the desire to purchase [3], exercise the purchase behavior and complete

the purchase process. According to Jiaxun He, we divide nostalgia into three dimensions: personal nostalgia, family nostalgia and interpersonal nostalgia.

H1: Nostalgia has a positive impact on purchase intention

H1a: Personal nostalgia has a positive impact on purchase intention

H1b: Family nostalgia has a positive impact on purchase intention

H1c: Interpersonal nostalgia has a positive impact on purchase intention

Through the memory of the past, consumers have nostalgia for the old brand, so as to buy the products or services of the old brand [4]. According to Rosenber & Hovland, we divide brand identification into two dimensions: cognitive attitude and emotional identification [5]. Therefore, this study makes the following assumptions:

H2: Consumers' nostalgia has a positive impact on brand identification;

H2a: Personal nostalgia has a positive impact on cognitive attitude;

H2b: Personal nostalgia has a positive impact on emotional identification;

H2c: Family nostalgia has a positive impact on cognitive attitude;

H2d: Family nostalgia has a positive impact on emotional identification;

H2e: Interpersonal nostalgia has a positive impact on cognitive attitude;

H2f: Interpersonal nostalgia has a positive impact on emotional identification.

According to self-consistency theory [6], in the process of purchase behavior, consumers will generally choose products that match their imagination, because consumers will choose products according to their consumption preferences [7]. Howard clearly pointed out that brand identification is an important factor influencing purchase intention [8]. Therefore, this paper makes the following assumptions:

H3: Brand identification has a positive impact on purchase intention.

H3a: Cognitive attitude has a positive impact on purchase intention;

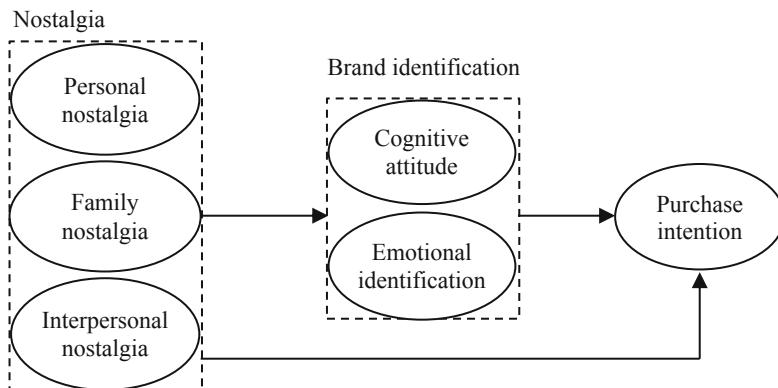
H3b: Emotional identification has a positive impact on purchase intention.

It is not easy for consumers to directly generate purchase intention only by imagination or recall [9]. There must be some mediating factors between nostalgia and consumers' purchase intention [10]. Based on previous literature, this study believes that brand identification plays a mediating role in the influence of nostalgia on purchase intention. Therefore, this paper makes the following assumptions (Fig. 1):

H4: Brand identification plays a mediating role between nostalgia and purchase intention

H4a: Cognitive attitude plays a mediating role between nostalgia and purchase intention

H4b: Emotional identification plays a mediating role between nostalgia and purchase intention



**Fig. 1.** Conceptual model

### 3 Empirical Analysis

#### 3.1 Research Methods

In this paper, the measurement of nostalgia is based on CHINOS (Jiaxun He), and the nostalgia emotion is divided into three dimensions: personal nostalgia, family nostalgia and interpersonal nostalgia. There are 6 items of personal nostalgia, 3 items of family nostalgia and 3 items of interpersonal nostalgia. A total of 12 items are used to measure nostalgia. For brand identification, we divide it into two dimensions: cognitive attitude and emotional identification. Cognitive attitude is measured by three items, and emotional identification is measured by three items. There are six items for brand identification.

#### 3.2 Reliability and Validity Analysis

##### 3.2.1 Reliability Analysis

This paper uses SPSS to obtain the values of Cronbach's  $\alpha$  of all the variables to measure the reliability of scales. If the value of Cronbach's  $\alpha$  is less than 0.5, it indicates that the reliability of the measurement is relatively poor; when  $0.5 < \alpha < 0.7$ , it indicates that the reliability of the scale is acceptable; when the  $\alpha$  value is greater than 0.7, the reliability of the scale is good.

**Table 1.** Reliability analysis

Variables		Items	Cronbach's $\alpha$
Nostalgia	Personal nostalgia	6	0.919
	Family nostalgia	3	0.883
	Interpersonal nostalgia	4	0.926
Brand identification	Cognitive attitude	3	0.946
	Emotional identification	3	0.917
Purchase intention		3	0.649

From Table 1, we can see that the Cronbach's  $\alpha$  values of nostalgia, brand identification and purchase intention are all greater than 0.7. Besides, the Cronbach's  $\alpha$  value of the holistic scale is 0.961, also greater than 0.7. Therefore, the internal consistency of the questionnaire is relatively good, and all the variables of the conceptual model can be effectively measured.

### 3.2.2 Validity Analysis

Validity analysis is to test the accuracy of measurement. CFA was used to analyze the validity. The results showed that AVE values of all the factors were greater than 0.5 and CR values were higher than 0.7, which means that the data has good convergence validity. In addition, Table 2 shows that the scale has good discriminant validity.

**Table 2.** Reliability analysis

	1: Personal nostalgia	2: Family nostalgia	3: Interpersonal nostalgia	4: Cognitive attitude	5: Emotional identification	6: Purchase intention
1	0.818	0.859	0.871	0.923	0.894	0.831
2	0.843	0.643	0.572	0.871	0.749	
3	0.568	0.632	0.506	0.711		
4	0.642	0.609	0.467			
5	0.576	0.554				
6	0.529					

## 4 Hypothesis Test

From the results of Table 3, we can see that the specific correlation coefficients of the three dimensions of consumer nostalgia with purchase intention are 0.197 ( $p > 0.05$ ), 0.272 ( $p < 0.001$ ) and 0.180 ( $p < 0.05$ ). Therefore, H1b and H1c were supported. The significant level of personal nostalgia is greater than 0.05, indicating that there is no significant relationship between personal nostalgia and purchase intention. Therefore, H1a are not supported. Table 4 shows that H2a, H2b, H2d, H2e and H2f are supported and H2c is not supported. Table 5 shows that brand identification has a significant positive impact on purchase intention, that is, H3a and H3b are supported.

**Table 3.** Regression analysis of nostalgia and purchase intention

Model		Unstandardized coefficients		Standardized coefficients Beta	t	p
		B	Std. Error			
Dependent variable	(Constant)	.932	.260		3.583	.000
Purchase intention	Personal nostalgia	.207	.111	.197	1.868	.063
	Family nostalgia	.266	.111	.272	2.396	.000
	Interpersonal nostalgia	.174	.072	.180	2.433	.016

**Table 4.** Regression analysis of nostalgia and brand identification

Model		Unstandardized coefficients		Standardized coefficients Beta	t	p
		B	Std. Error			
Dependent variable	(Constant)	2.987	0.222		13.455	0.000
Cognitive attitude	Personal nostalgia	0.257	0.058	0.280	4.400	0.000
	Family nostalgia	0.191	0.060	0.260	3.176	0.102
	Interpersonal nostalgia	0.296	0.057	0.323	5.145	0.000
Emotional identification	(Constant)	.980	.237			
	Personal nostalgia	.200	.101	.199	1.987	.048
	Family nostalgia	.303	.101	.323	2.997	.003
	Interpersonal nostalgia	.171	.065	.185	2.633	.009

**Table 5.** Regression analysis of brand identification and Purchase intention

Model		Unstandardized coefficients		Standardized coefficients Beta	t	p
		B	Std. Error			
Dependent variable	(Constant)	.457	.190		2.405	.017
Purchase intention	Cognitive attitude	.264	.099	.246	2.672	.008
	Family nostalgia	.558	.096	.534	5.802	.000

**Table 6.** Mediating effect test of cognitive attitude

Dependent variable	Independent variable	Unstandardized coefficients		Standardized coefficients Beta	t	p
		B	Std. Error			
Purchase intention	Nostalgia	.656	.064	.579	10.249	.000
Cognitive attitude	Nostalgia	.734	.053	.694	13.906	.000
Purchase intention	Nostalgia	.187	.076	.165	2.467	.004
	Cognitive attitude	.639	.072	.597	8.925	.000

According to the data in Table 6, the relationship between nostalgia and cognitive attitude is significant. Besides, nostalgia positively affects purchase intention. When cognitive attitude was used as a mediator, the relationship between nostalgia and purchase intention was still significant. It is concluded that cognitive attitude plays a mediating role between nostalgia and purchase intention, so H4a is supported. Table 7 shows that the mediating role of emotional identification is significant. Therefore, H4a and H4b are both supported.

**Table 7.** Mediating effect test of Emotional identification

Dependent variable	Independent variable	Unstandardized coefficients		Standardized coefficients Beta	t	p
		B	Std. Error			
Purchase intention	Nostalgia	.656	.064	.579	10.249	.000
Emotional identification	Nostalgia	.685	.058	.632	11.747	.000
Purchase intention	Nostalgia	.201	.066	.177	3.046	.003
	Emotional identification	.665	.061	.637	10.954	.000

## 5 Conclusion

This paper uses structural equation method to study the influence mechanism of nostalgia on consumers' purchase intention. The results show that: (1) nostalgia promotes consumers' purchase intention; (2) brand identification plays a mediating role in the influence of nostalgia on purchase intention.

Therefore, if enterprises combine nostalgic marketing with brand construction, the effect will be better. With the rapid development of economy, people's living has been

greatly improved, and the consumption ability of consumers will naturally improve. In the process of consumption, consumers will be prior to high quality products. However, brand is always regarded as the guarantee of product quality. It is more likely that enterprises integrate brands into nostalgic marketing strategies to stimulate consumers' purchase intention.

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# Development Status and Optimization of E-Commerce Logistics Under the Background of the Internet

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**Abstract.** With the development of the times, the financial industry is getting bigger and bigger, and because of the advent of the information age, various emerging industries are springing up, and the angle we have to consider is about e-commerce. But how to deal with is a problem, after thinking about comparison we found that we can make a certain deal from the logistics aspects of e-commerce. Therefore, the purpose of this paper is to analyze and optimize the development of e-commerce logistics based on the background of the Internet. Based on the basic principles of data security and economic stability, this paper analyzes and processes the economic wind and news reports on the market, and simulates the experimental process by using the economic management mining model based on the Internet and computer technology, and then produces the experimental results. The test results show that our model can be selected by analyzing the logistics status quo of e-commerce in enterprises, which can improve the efficiency by about 20%.

**Keywords:** Internet · E-commerce · Process optimization · Logistics development

## 1 Introduction

Through the evaluation and analysis of the current environment, we find that under the intervention of capital, the logistics competition of Internet enterprises has entered a stable equilibrium state from the beginning of the barbaric era. If there is no significant impact, this state may continue, that is, valuables are transported to Shunfeng, confidential goods are transported to postal service, and ordinary parcels are sent to one destination. However, in the current environment, it is difficult for other enterprises to develop logistics to take a share of the market. However, in the current environment, due to the uneven efficiency of goods delivered by outsourcing enterprises, it is difficult to ensure the rationality of goods. Therefore, Jingdong has established its own Jingdong dispatch to deliver its own goods, and some other small enterprises, such as various places, will also be so the agricultural fresh market is the logistics service established by ourselves. So, what we think now is how to optimize it, which is the purpose of our research.

E-commerce breaks the limitation of time and space, and realizes the effective connection between producers and consumers [1]. From an international perspective, a successful e-commerce enterprise is a key link to combine logistics network and e-commerce platform to achieve the purpose of control process [2]. From the domestic point of view, why e-commerce enterprises choose self-built logistics is often caused by the level imbalance of third-party logistics enterprises [3]. Outsourcing is difficult to meet the long-term development of e-commerce enterprises. Some experts pointed out that the reason why China's e-commerce enterprises choose to establish their own logistics is mainly due to the slow development of the third-party logistics enterprises, unable to meet the development needs of e-commerce enterprises. Through the study of different modes of e-commerce enterprise logistics distribution, we believe that we should control and stabilize the self-built logistics of e-commerce enterprises [4]. From the perspective of gender, we should make more cautious choices according to our own development strategies [5]. Some experts compared and analyzed Amazon self-built logistics and domestic electric power, and commercial enterprises established their own logistics. This paper puts forward the logistics mode of centralized logistics in the United States, and emphasizes the construction of "integrated logistics management system" [6]. Self-built logistics not only requires e-commerce enterprises to have strong funds to do it, but also requires e-commerce enterprises to have enough professional logistics personnel. Electric business enterprises not only need to spend a lot of money to build their own logistics, but also have more energy and huge challenges in the business they are not good at [7]. In view of the rapid development of China's e-commerce enterprises. According to the research, self-built logistics of e-commerce enterprises is of great significance [8].

Therefore, after analysis, we found that China's logistics system seems to have been done on the surface, but with the development, it is found that the logistics industry of major enterprises is still in the process of improvement. No matter which Internet company can confidently deliver its products to the outsourcing logistics company, they have their own business and develop their own logistics enterprises, and most of them only serve their own homes [9]. But this will lead to high transportation cost, low efficiency, low efficiency of logistics transportation, and cannot adjust the amount of logistics according to the order quantity, which will lead to problems. Therefore, we propose this method to analyze the development status of e-commerce logistics and put forward optimization scheme.

## 2 Algorithms and Models Are Established

### 2.1 The Basic Spider Monkey Algorithm is as Follows

#### (1) Representation and initialization of solutions

$X_i = (x_{i1}, x_{i2}, \dots, x_{in})$  is a feasible solution of the objective function, Represents the current position of the  $i$ th spider monkey, which is generated by the following formula:

## (2) Dispersion between clusters:

$$X_{ij} = X_{min\ j} + R(0, 1) \times (X_{max\ j} - X_{min\ j}) \quad (1)$$

Where  $I = 1, 2, P, P$  are the population size,  $X_{ij}$  is the  $i$ th spider,  $X_{min\ J}$  and  $x_{max\ J}$  are lower than  $j$  dimension, Limit and upper limit,  $j = 1, 2, N, n$  is the dimension of optimization problem,  $R (0,1)$ , which is a uniformly distributed random number on  $[0,1]$ .

## (3) Local leadership stage

The process is that each spider monkey passes through its own local small area. Iterative search for the objective function value of the optimization problem, spider monkey based on local, Experience of department leaders and other members of the team to update the current position. If the new position fitness value is better than the original position fitness value, the spider monkey will. Update to the new location, the specific process is as follows:

$$X_{new\ ij} = X_{ij} + R(0, 1) \times (LL_{kj} - X_{ij}) + R(-1, 1) \times (X_{rj} - X_{ij}) \quad (2)$$

Among them,  $LL_{kj}$  is the  $J$ -dimension component of the  $k$ th local group leader,  $X_{ij}$  is the  $r$ -the spider monkey randomly selected from the  $k$ -the population.  $J$ -dimensional component ( $R \neq I$ ),  $R (0,1)$  is a uniformly distributed random number on  $[0,1]$ ,  $R (-1,1)$  is a uniformly distributed random number on  $[-1,1]$ ,  $K \in [1, Mg]$ ,  $Mg$  was the maximum number of groups.

## (4) Overall leadership stage

In this stage, spider monkeys are based on global leaders as well as local small ones, group members' experience was used to update their position, and spider monkey position update was affected by. If  $rand(i) < probi$ , the following is done. Update of:

$$X_{new\ ij} = X_{ij} + R(0, 1) \times (GL_j - X_{ij}) + R(-1, 1) \times (X_{rj} - X_{ij}) \quad (3)$$

$$probi = 0.9 \times fitness_i \max fitness + 0.1 \quad (4)$$

$$fitness_i = \{ \{ |1/(1+f(xi)), f(xi) \geq 0 | + |f(xi)|, else \} \quad (5)$$

$GL_j$  is the global leader in  $J$  ( $J \in 1,2,\dots$ ) The partition of,  $n$  dimension. Fitness  $i$  is the fitness value corresponding to the  $i$ th spider monkey, Max fitness is the maximum fitness value and  $f (XI)$  is the corresponding target function value.

## (5) Global leadership learning stage

Global leaders use the greedy selection process to update their positions and integrate them, the spider monkey with the largest fitness value in each population was selected as the global leader; Check whether the global leader's location is updated, if not, the global limit count (GLC) is increased by 1.

## (6) Local leadership learning stage

Local leaders use greedy selection processes to update their positions, the spider monkey with the highest fitness value in each local population was selected as the

local area. If the local leader's position is not updated, the local limit the LLC was increased by 1.

#### (7) Decision making stage of local leadership

If the position of the local leader is not in the predetermined number of iterations, if there is an update, that is, LLC has reached the local leadership limit (LLL), then the based on the size of perturbation rate (PR), all members are randomly initialized by formula (1), which change or update the position with the following formula:

$$X_{\text{new } ij} = X_{ij} + r1 \times (GL_j - X_{ij}) + r2 \times (X_{ij} - LL_{kj}) \quad (6)$$

Where R1 and R2 are uniformly distributed random numbers on [0,1].

#### 8. Decision making stage of overall leadership

If the position of the global leader is not in the predetermined number of iterations, and if there is an update, that is, the GLC reaches the global leadership limit (GLL), then the groups were grouped. Each time this phase is carried out, local leadership is also activated the learning stage is used to select the local leaders of the new group and divide groups.

After reaching  $m_g$ , a new group was formed, i.e.  $m_g = 1$ . Through the above process, the spiders and monkeys can constantly update their positions until they reach the order the optimal value of the scalar function does not change in successive iterations or reaches the preset value. The number of iterations, the algorithm is terminated and the optimal position and function value are output.

## 2.2 Applied Research on Economic Management Mining of Big Data Enterprises

For big data enterprises, big data tools, such as SCWS, JIEBA and other word-split tools, have basically met the requirements of a variety of natural data management and processing (Language Nature Process NLP). A large amount of data is divided into TF-IDF (term frequency-inverse document frequency) to assess the importance of enterprise management, mainly based on the number of times it appears in economic management and the frequency of the emergence of e-commerce enterprises as a reference, mainly to assess whether there is a good differentiation ability. That is:

$$w = \frac{n_{1,1}}{\sum n_{k,j}} \times \log \frac{|D|}{1 + |\{j : t.d,\}|} \quad (7)$$

The above indicates the  $n_{1,1}$  number of times it has occurred, the sum of the number of  $\sum n_{k,j}$  appearances, the sum  $|D|$  of the total quantity, and the  $1 + |\{j : t.d,\}|$  trend of change in the economic management of the enterprise.

The card-side test is a commonly used method in mathematical statistics to test the independence of two variables, in the characteristic selection stage of the enterprise management trend classification, in order to ensure that a word w is independent of each other in category t, the card-side test is performed on it, the formula is as follows:

$$\chi^2 = \frac{N(ad - bc)^2}{(a + c)(a + b)(b + d)(c + d)} \quad (8)$$

Among the children: N for the total number; a for the number that contains w but does not belong to the t class; b for the number that contains w but does not belong to the t class; c does not contain the number that belongs to him; and d for the number that does not contain w and does not belong to the t class.

### 3 Experiment

#### 3.1 Selection of Experimental Data

Randomly selected several counties and cities on the establishment of anti-poverty agricultural products online purchase mall to investigate the actual operation, and finally we selected three representative enterprises as the object of research and analysis. By using the questionnaire method, we take two sets of questionnaires, respectively, the purchase of the product and staff anonymous questionnaire, and then based on their views, we use our algorithm optimization model to build an optimization program to make some changes to the enterprise, and then try to run for a period of time to conduct a second questionnaire to analyze the results, and then compare with the previous.

#### 3.2 Analysis of Experimental Data

Because of the intricacies of the data, it is difficult to analyze each data, we want to obtain the effective information, we have to follow the data mining algorithm and data analysis algorithm to analyze and process the data we need, and then classify it to get the category we need, and finally get the experimental results. Based on this, the model is built and optimized, the optimization scheme is drawn, and then the application is carried out to get the results. Finally, the comparison is made, and the validity of the experiment is referenced.

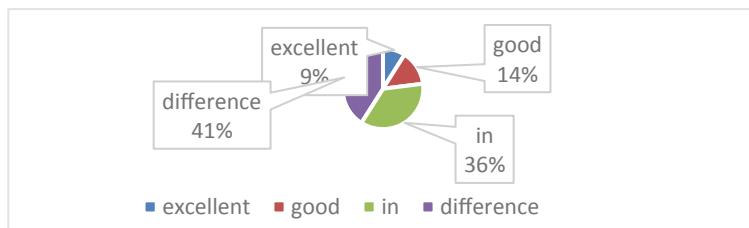
### 4 Evaluation Results

#### 4.1 Survey Results of the Original Business

**Table 1.** An online anonymous survey of three companies

Enterprise	Praise rate			
	Logistics speed	Product quality	After - sales service	Comprehensive judgment
A	77%	80%	74%	65%
B	75%	86%	70%	62%
C	68%	90%	66%	72%

Through the analysis of Table 1, we find that the actual operating efficiency is not optimistic, because the volume of agricultural products transportation will be sent a wave of orders and because some goods have a short shelf life, so the middle will produce losses, and these losses sometimes cannot be properly handled, will accumulate poor evaluation, and then produce a chain reaction leading to market collapse, and finally hastened to close. So, in order to get a comprehensive analysis, we also conducted an attitude analysis of the staff, and finally selected one of the more typical B to get Fig. 1.



**Fig. 1.** How satisfied the worker is with the enterprise

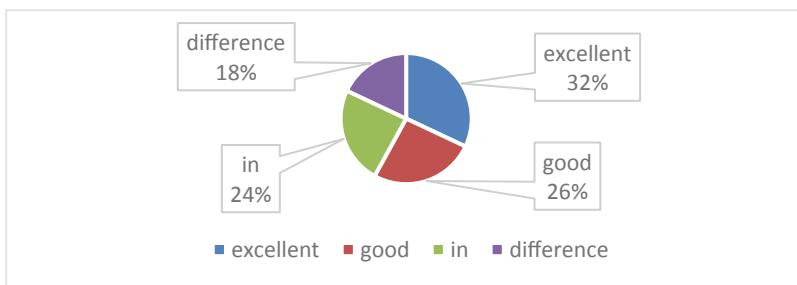
According to the comprehensive analysis and treatment of Fig. 1, Table 1, we learned that the internal leadership of the enterprise is not reasonable, otherwise the staff will not have so many bad reviews, which shows that the enterprise has been broken up, and later after in-depth understanding, we found that the main reason is the exploitation and unfair treatment of employees. Since the shipment of agricultural goods is not immediately processed without an order being placed, it is necessary to wait for some orders to be processed uniformly. But sometimes because of the large number of orders, and did not get timely feedback on the truck driver is very tired, and when few people will lead to some people have nothing to do without performance pay, do not meet the psychological expectations of the standard, so think this is unreasonable. The result is a disgruntled assessment. Therefore, for this, we can analyze the optimization scheme and implement it, the results of the three-month experiment are shown below.

## 4.2 The Results of the Optimized Experiment

**Table 2.** Anonymous survey of three companies online (new)

Enterprise	Praise rate			
	Logistics speed	Product quality	After - sales service	Comprehensive judgment
A	86%	87%	82%	83%
B	84%	90%	86%	84%
C	80%	94%	94%	87%

Through the experimental results of Table 2 we can know that the experimental method is effective, the user's complaints less, the praise rate is high, because we have its big data analysis, so that it needs to improve the place, and then in the early stage of the attack to obtain optimization results, and then continue to carry on, so that the order to obtain an increase, and then make word-of-mouth better, continue to snowball, the bigger the roll, the better the business.



**Fig. 2.** Employee satisfaction with the business (new)

And in the end, we get a reasonable transfer of people to raise wages, and because the company is performing well and everyone has a hope for life, then the good feelings naturally rise, as shown in Fig. 2.

### 4.3 E-commerce

E-commerce in the current situation is probably a state of comprehensive competition. Reference such as Taobao, Jingdong, Suning e-buy, pinduoduo. Every shopping festival, these big e-commerce companies will compete wildly. For example, the total sales volume of mall is 498.2 billion, and that of Jingdong is 271.5 billion. The total turnover of nearly 800 billion indicates the popularity of e-commerce. Moreover, in today's China, most people choose online shopping, which shows the vigorous development of e-commerce in China, but why do you choose to shop online? This is because most of the things on the Internet can be said to be of high quality and low price. As long as they are not greedy for small and cheap prices, and due to the development of big data, e-commerce will automatically recommend the goods you want to promote people's consumption. With the improvement of after-sales service, e-commerce is now in a more popular level in China.

## 5 Conclusion

We all agree that if a logistics company can effectively and reasonably integrate all logistics enterprises and make unified deployment, then the efficiency will be greatly improved, and it will be possible to solve the problem of internal friction of logistics enterprises. The express industry will develop rapidly. Unfortunately, this is not

realistic. Because of the floating of people's minds and different social backgrounds, we can only propose to build a certain type of enterprise Finally, it is internal friction. Therefore, I hope that the logistics industry in the future should make concerted efforts to develop for the sake of socialism and the people. This is the real enterprise serving the people.

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# Research on Supply Chain Capacity Control of an Automobile Enterprise Based on Mega Data Analysis Technique

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**Abstract.** Modern message technology represented by mega data analysis technique supplies split-new idea and mode for the reform of traditional enterprise supply chain management. Perfect supply chain management can help enterprises quickly obtain market demand, order allocation and production planning, so as to improve the effectiveness of internal management. But in the context of mega data, the supply chain capability administration and control mode of enterprises is also facing great impact and challenge. This paper analyzes the status quo of the supply chain of Chinese auto companies and puts forward a research on the supply chain capacity control of an automobile enterprise based on mega data analysis technique. Based on the investigation and analysis of 160 employees of an automobile enterprise in China, and the comparison of cost, scientificity and standardization between traditional supply chain and mega data technique supply chain, the paper talks and analyzes the consequent, and proposes the development strategy of supply chain capacity administration and control of automobile enterprises under mega data analysis technique. It offers technical support for the growth of supply chain administration and control of automobile enterprises. The research in this article plays an significant role in further boosting the use of mega data analysis technique in automobile companies.

**Keywords:** Mega data analysis · Supply chain · Capacity control

## 1 Introduction

With the introduction of policies related to mega data, the theoretical research on mega data has been gradually carried out, and the use of mega data in related fields has been refined [1–3]. The general secretary proposed to implement the national strategy of mega data, focus on the growth of industrial Internet of manufacturing enterprises, and gradually strengthen the construction of new infrastructure such as industrial Internet. The policy content related to mega data industry has gradually extended from comprehensive and overall guidance planning to every trade and subdivided realms, and the relationship between artificial intelligence and mega data is getting closer and closer [4, 5]. Mega data construction is an important measure to implement the national

development strategy, which has important implications to increase the development of science and technology and boost the healthy development of economy and society.

In China, most manufacturing companies believe that reducing production costs and improving product performance are their core competitive advantages. However, as customer needs change faster and faster, the corresponding product life cycles are getting shorter and shorter, and the market environment is becoming more and more complex and changeable, the automobile manufacturing industry is facing a series of problems including decreasing profits, increasing costs, and other issues [6, 7]. At present, the competition between different companies has gradually become a competition between their supply chains. In the automotive manufacturing industry, how to establish a complete supply chain system, how to use the supply chain to integrate different stakeholders, with the help of management and operation, how to improve the supply chain management efficiency of auto parts companies, and ultimately achieve the goal of improving the business efficiency of the company have become problems that need to be solved urgently in the theoretical and practical sessions [8–10].

This article analyzes the practical circumstances of the supply chain capacity administration and control of an automobile enterprise. The analysis shows that some automobile enterprise leaders don't have a profound comprehension of mega data analysis technique, which leads to some deficiencies in the supply chain capacity control. This article does a study on the supply chain capacity control of an automobile enterprise based on mega data analysis technique. In this research, according to the characteristics of supply chain capacity administration and control of automobile enterprises, combined with mega data technique, construction suggestions are put forward, which has a positive impact on the capacity control of automobile enterprises' supply chain, and effectively improves the efficiency of automobile enterprises. Through the examine and analysis of the influence factors of distinct groups on the supply chain capacity control of automobile enterprises, this artical thinks that the application of mega data analysis technique is able to improve the competitiveness of automobile enterprises.

## 2 Mega Data Analysis Technique and Supply Chain Administration and Control

### 2.1 Mega Data Analysis Technique

Data mining is from a tremendous amount of data, through a unique analysis mode, to obtain valuable information, and then closely combined with the actual business and demand information of enterprises. Mega data processing process mainly includes data processing and analysis, data application and other links.

Mega data processing technique is closely related to the type of data storage. The major algorithm models of mega data processing include distributed computing framework, distributed stream computing system, etc. Among them, the distributed stream computing system is mainly used to process data streams and is suitable for processing various structured and unstructured data. The choice of mega data storage form and processing system depends on the actual data storage type. For the known

data, the mega data analysis technique is the distributed statistical analysis technology, and for the unobtained data, the mega data analysis technique is the distributed mining and deep learning technology. Data analysis is a pivotal link in mega data mining, and plays a decisive role in the accuracy of analysis and prediction results.

## 2.2 Supply Chain Administration and Control

Supply chain administration and control is based on internet information technology, effectively connecting all links in the supply chain. The realization of scientific and standardized supply chain administration and control is conducive to the supply chain enterprises to obtain stronger market competitiveness. In the process of supply chain administration and control, through the implementation of logistics management, the flow of raw materials and products in the supply chain system is smoother, the corresponding cost is effectively controlled, so that the circulation of goods has a stronger cost advantage. Make a scientific purchasing and supply chain plan to make the raw material supply in the upstream of the supply chain meet the actual demand. All members of the supply chain analyze the relevant information in the business process, and strengthen the financial administration, so as to make the information flow and capital flow smoothly, so as to boost the orderly work and growth of enterprises. With the development and progress of social economy, the content and scope of supply chain management are also in a state of continuous expansion and extension, and some new management concepts appear in various industries and fields. In the future, the upgrading and innovative development of supply chain management has become an inevitable trend.

## 3 Investigation Results and Analysis of Supply Chain Capacity Control of Automobile Enterprises

Research shows that more than 90% of China's automobile enterprises look on mega data analysis technique as a key element of enterprise competitive edge. Mega data analysis technique has progressively entered enterprises in different industries through various ways. Compared with the previous supply chain administration and control mode, the supply chain administration and control under mega data analysis technique is more reasonable and normative. Mega data analysis supply chain can replace the previous supply chain administration and control mode, improve the cost advantage of enterprises, improve the procurement process, and effectively ensure the scientific operation of supply chain capacity of automobile enterprises, so as to raise the competitive power of automobile companies.

There are two ways to do the research in this paper: electronic questionnaire investigation and sampling investigation. 160 employees of an automobile enterprise in China were chosen as the survey samples. Through survey, this article discovered that whether managers or ordinary staff used mega data analysis technique in enterprise supply chain capacity control. In this survey, we conducted a data survey on two groups of people in automobile enterprises. One group is the leadership of the enterprise; the other group is the general technical personnel of the enterprise. This article

analyzes the comprehensive circumstances of mega data analysis technique of China's automobile companies. Table 1 shows the outcomes. Based on the findings of investigation, supply chain capacity administration and control can strengthen the competitive power of automobile companies under the promotion of mega data analysis technique.

**Table 1.** Investigation and analysis of the impact of mega data analysis technique on supply chain capacity control of automobile enterprises

Investigation items	Enterprise leadership (%)	General technical personnel of enterprises (%)
It has a promoting effect	93	90
No effect	4	6
Play a limiting role	3	4
Hope to increase technology investment	95	93

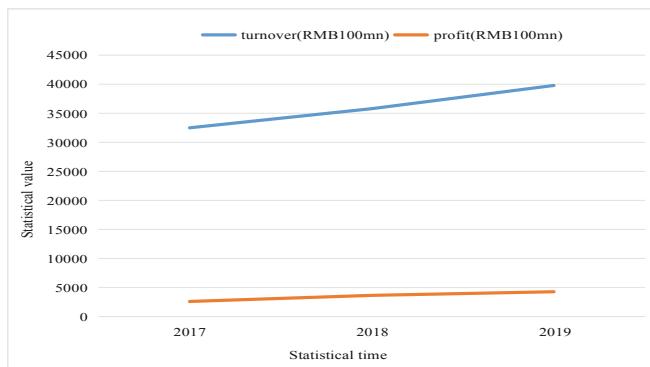
## 4 Discussion

### 4.1 Analysis on the Advantages of Supply Chain Capacity Control Based on Mega Data Analysis Technique

- (1) The implementation of supply chain management can effectively match supply and demand. On the one hand, it can stimulate consumers' awareness of the demand, and on the other hand, it can improve the service level and quality of the supplier. In a consumer-centric buyer's market, customers are the core of everything, and the first thing to do is to meet customer needs. Consumers generally require the seller to deliver the goods in advance to obtain consumer goods quickly and efficiently.
- (2) For companies that have implemented supply chain management, the increase in product sales and the reduction in product costs are their obvious advantages. Companies that have implemented supply chain management can make better use of the parameters of each link, and find out the relationship between the parameters, to provide a reference for all parties in the supply chain so that they can make correct decisions and guide the company's production going in the right direction, it also avoids inventory accumulation, reduces the company's sunk costs, and reduces the waste of resources.
- (3) Another benefit of supply chain administration and control is to reduce the transfer rate of materials, so that the company can develop on a large scale, thereby enhancing the strength of the company. The functional network structure mode of the system is the content of supply chain management. Suppliers, retailers and consumers are all in this functional network structure. To make the entire supply chain develop better, it is necessary to consider the common profits of all parties in the supply chain, so that each enterprise in the supply chain can

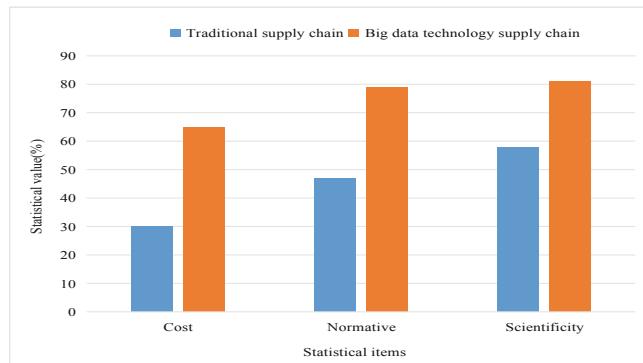
support and cooperate with each other to maximize the overall benefits. This can accelerate the flow of products or services and information, reduce the production cycle, reduce inventory, and improve the sensitivity of the company to the market, so that the company can win fierce market competition, so that the company can develop sustainably.

Figure 1 shows that optimizing supply chain capacity control can significantly improve the management status and business results of the company. Based on the comparative analysis of the turnover of an automobile company from 2017 to 2019 based on mega data analysis technique, it can be found that the turnover of the company is growing at a rate of 10% every year, which brings unprecedented opportunities to the company.



**Fig. 1.** Survey and analysis of turnover and profit in 2017–2019

In order to further analyze the scope and depth of mega data analysis technique in the supply chain capacity administration and control of automobile enterprises, this paper conducted a survey. Figure 2 shows the outcomes. Figure 2 shows that the influence of conventional supply chain control on auto companies is far less profound than that of mega data technique supply chain control. The conventional model is costly, its information update lags behind, and the results are not satisfactory. After the mega data analysis technique was introduced the automobile industry, it has improved the scientific nature of enterprise management and control, improved the standardization of the system, and the efficiency of automobile enterprises has also been significantly improved. Therefore, the benefits of mega data analysis technique in the automotive industry outweigh the harms, and it is very important to spread mega data analysis technique.



**Fig. 2.** Comparative analysis of cost, scientificity and standardization between traditional supply chain and mega data technique supply chain

## 4.2 Supply Chain Value Innovation Under Mega Data Analysis

Mega data analysis technique has transformed the functioning mode of the supply chain of traditional auto companies. From the perspective of the upstream of the supply chain, mega data analysis technique can perform a visual analysis of raw material requirements, so as to supply powerful technical support for purchasing decision. From the perspective of the intermediate links of the supply chain, mega data analysis technique can nicely optimize the manufacturing process of products. From the perspective of the downstream of the supply chain, mega data analysis technique can be used to profile user needs, thereby accurately positioning user groups, thereby helping auto companies to develop better sales strategies. Therefore, the value innovation process of the supply chain of auto companies under mega data analysis technique can be considered from the following aspects:

- (1) The value-added innovation of mega data to supply chain member companies. If you want to know the consumer's recognition of the company's products, as well as the company's service costs and the efficiency of the company's operations, you can learn from the company's profits. Mega data analysis technique has changed the operation mode of enterprises. The mega data system collects the massive data generated during the operation of the enterprise. These data make different enterprises and different manufacturing links within the same enterprise trust each other more. Auto companies use mega data technique to increase the efficiency of message interaction and reduce the cost of message interaction, so that they can get a larger amount of supplier information, reduce manufacturing costs and ultimately help auto companies realize the value-added under the mega data analysis technique.
- (2) The value-added innovation of mega data to consumers at the end of the supply chain. The end of the supply chain sells products directly to consumers. Continuous development and increasingly mature mega data technique can enable companies to accurately predict user needs and apply them to the initial design of products. The communication and exchange between supply chain member

companies and end users through mega data technique can closely integrate the individual needs of end users with the company's product positioning and development process. At the same time, through this communication and exchange channel, the middlemen between the end user and the enterprise are reduced, so that the transaction expense is tremendously cut down.

- (3) The value-added innovation of mega data to the manufacturing course of automobile enterprises. In the manufacturing process of automobiles, the method of integrating mega data analysis technique with the production management system of automobile enterprises can be adopted, and advanced sensors can be used to aggregate the mega data continuously generated in the manufacturing process in real time, so as to monitor the quality of materials and reduce product defect rate. Generally speaking, the better the quality of the product, the higher the market's recognition of it, and the higher the price. In this way, mega data analysis technique can achieve value added to the manufacturing process.

## 5 Conclusions

In the course of researching mega data analysis technique, this article focuses on the study on the supply chain capacity administration and control of an automobile company that introduces mega data analysis technique. After study, this article thinks that mega data analysis technique is an extremely significant part of the development of supply chain administration and control of auto companies. And in this paper, 160 employees of an automobile company in my country are surveyed and analyzed to get their views of mega data analysis technique. Mega data analysis technique gives full play to its scientific and standard advantages and has been extensively applied in every realm in our country. Through investigation and analysis, it is concluded that the supply chain capacity control of auto companies under mega data analysis technique is effective of increasing the economic efficiency of enterprises, standardizing the construction of corporate systems, and increasing the competitiveness of auto companies. For the supply chain capacity administration and control of auto companies, if you want to make the best of mega data analysis technique, you must effectively integrate mega data analysis technique with the actual situation of auto company supply chain administration and control. It is necessary to focus on the actual situation, attach importance to mega data analysis technique, and effectively formulate development strategies in combination with the supply chain administration and control of auto companies to guarantee the good progress of the company. This study has got ideal outcomes and has contributed to the study on the role of mega data analysis technique in the production capacity control of the automotive supply chain.

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# Optimization Strategy of Cross-Border E-commerce Logistics Chain from the Perspective of Supply Chain

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**Abstract.** With the rapid development of social economy, cross-border e-commerce also ushered in new development opportunities. From the perspective of supply chain, how to optimize the cross-border e-commerce logistics chain is also an important issue at present. Based on the perspective of supply chain, combined with the current relevant research results, this paper studies how to promote the collaborative development of cross-border e-commerce logistics chain based on Collaborative cross-border e-commerce and other species as well as cross-border logistics and other supporting species.

**Keywords:** Supply chain · Cross-border e-commerce logistics · Optimization

## 1 Introduction

The development of e-commerce technology has brought a lot of new industries, and cross-border e-commerce (in the text referred to as CBE) has gradually attracted the attention of all walks of life for its high efficiency and convenience. In the current international trade environment, CBE occupies a very important position in foreign trade. However, with the continuous development of CBE, there must be logistics matching with CBE to ensure the stable and healthy development of CBE [1]. With the continuous progress of CBE technology in modern society, there are new requirements for cross-border logistics (in the text referred to as CBL) technology, which requires the development of CBE to be more information-based and intelligent. Therefore, the traditional logistics mode such as human transportation has been unable to meet the development of modern cross-border e-commerce logistics (in the text referred to as CBEL). In the development process of CBEL, it is also necessary to coordinate the development between CBE and CBL, so that the two can form a complete chain, so that the whole industry can achieve good operation [2].

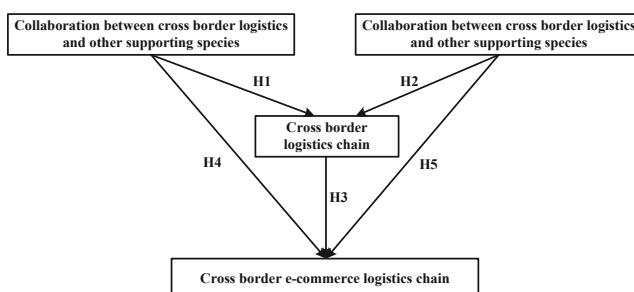
## 2 Coordinate the Development Between CBE and CBL

From the perspective of modern supply chain, CBEL can be regarded as a complete chain line [3]. The whole chain line includes commodities, suppliers, CBE platforms and consumers, which runs through the whole consumption process. If consumers are

not satisfied or have quality problems after receiving goods, they need to return to suppliers through CBE platform to realize two-way circulation, Let the whole logistics system become more complete and closed, but also let the core enterprises in the chain drive the development of other related industries. In the whole process of e-commerce development, the value of core enterprises affects the value of CBEL system to a large extent. Whether the core enterprises have a high competitiveness also affects the competitiveness of the whole logistics system [4]. Only by effectively connecting the flow nodes of commodities, funds and logistics in the whole system can the whole chain run efficiently and make the CBE physical chain operate more smoothly [5].

### 3 Construct the Hypothesis Model

According to the relevant theories of CBE and CBL, this paper puts forward the hypothesis and makes an in-depth study on the impact of the coordinated development of the two [6]. In the process of collaborative development of CBE and CBL, the collaborative development of other supporting species and the two will also affect the CBEL chain. Therefore, it is necessary to introduce the collaborative development of other supporting species and CBEL in the hypothetical conditions, and actively take the CBL chain as the intermediary in the whole system, and further put forward the hypothesis conditions that CBE cooperates with other supporting species and CBL cooperates with other supporting species to affect the CBEL chain. It is assumed that the positive impact of CBL and other supporting species on CBL chain is H1; the positive impact of CBE and other supporting species on CBL chain system is H2; the positive impact of CBL chain on CBEL chain is H3; the positive impact of CBL and other supporting species on CBEL chain is H4; CBE cooperation has positive impact on CBEL chain the positive impact of the synergy of e-commerce and other supporting species on CBEL is H5. According to the above assumptions, a theoretical model can be constructed (see Fig. 1).



**Fig. 1.** CBEL chain

## 4 Empirical Analysis and Research

### 4.1 Relevant Data Collection and Scale Design

In the above assumptions, variables include the coordination between CBE and other species, CBL and other species, CBE and CBL, and CBL chain system [7]. On the basis of the above assumptions, the corresponding measurement scale was designed by using the methods of literature search and expert interview (see Table 1).

**Table 1.** The values of time in the mill drum first section

Variable	Measurement items	Item content	Coefficient $\alpha$ after deleting option	$\alpha$ coefficient
Cooperation between CBL and other species (Q1)	WQ1	Close cooperation with suppliers in logistics	0.761	0.801
	WQ2	Meet the needs of consumers for logistics services	0.785	
	WQ3	Pay attention to the impact of payment system on Logistics	0.765	
Collaboration between CBE and other species (Q2)	DQ1	Cooperation with suppliers	0.821	0.821
	DQ2	Customer relationship maintenance	0.811	
	DQ3	Cooperation with payment institutions	0.815	
	DQ4	Cooperation with customs and quality inspection departments	0.812	
CBL chain system (Q3)	WL1	Logistics cooperation in exporting and importing countries	0.715	0.814
	WL2	Influence of customs and quality inspection department of exporting country on CBL	0.762	
	WL3	International transportation smoothness	0.719	
CBE and CBL collaboration (Q4)	DL1	CBE and CBL information sharing	0.795	0.827
	DL2	CBE and CBL strategic alliance and assistance	0.785	
	DL3	CBE and CBL planning and operation	0.793	

Likert's 5-level measurement method is mainly used to measure each variable item, which is divided into five levels: One represents very much opposition, two represents opposition, three represents no comment, four represents agreement, and five represents strong agreement. The survey method is electronic questionnaire survey, mainly to Beijing, Hangzhou and Shanghai CBE enterprises, a total of 500 e-questionnaires, of which 482 were recovered, excluding some incomplete information questionnaires, a total of 465 valuable questionnaires, the recovery rate is consistent with the requirements of the study.

## 4.2 Test Reliability and Validity

In order to verify the scientific and accuracy of the measurement table, the relevant software is used for inspection. Firstly, Cronbach's  $\alpha$  test in spss21.0 software was used to analyze the reliability of the scale. According to the data in Table 1,  $\alpha$  coefficient is all greater than 0.8, indicating that the reliability of the scale is good. Secondly, KMO was used to test the validity of the scale. The results showed that KMO values were all  $>0.7$ , indicating that the validity of the scale was good.

# 5 Optimization Strategy of CBEL Chain from the Perspective of Supply Chain

## 5.1 Optimize the Convenient Conditions for Customs Clearance

In the development process of CBE, commodities will go through various links, including the logistics of exporting countries, international freight transport and logistics of importing countries, which, to a certain extent, increases the time of CBEL and seriously hinders the development of the whole CBE. Therefore, actively optimizing the conditions of CBE customs clearance, using modern network information technology to build a scientific CBEL network is conducive to promoting the development of CBE ecosystem. In the whole development process, the government should play a leading role in guiding the customs to build a customs channel for CBE products, so as to effectively reduce the clearance time of cross-border goods, simplify the custody, customs clearance and other processes, and constantly promote the coordinated development of CBEL. In addition, CBE enterprises should actively cooperate with the customs and prepare relevant materials to be submitted to the local customs in advance, so as to improve the green channel of CBEL, realize further development, and continuously improve the operation efficiency of CBE ecosystem [8].

## 5.2 Actively Use Big Data Technology

Cross border logistics and CBE are important components of CBE system. Therefore, in the development process of CBEL, big data technology can be actively used to effectively improve the efficiency of CBL operation. Relevant enterprises can actively apply big data technology in all aspects of commodity packaging, coding and transportation, and track the whole process, so as to find out the problems in the circulation

of cross-border goods in time, formulate effective measures to solve the problems, minimize the loss, and continuously improve the quality of CBE services. Relevant enterprises can also use big data technology to analyze CBL transportation routes, select the optimal transportation routes, shorten the logistics transportation time, and effectively improve the efficiency of CBL operation. In addition, big data technology can accurately locate consumers of CBE, timely understand the needs of various consumers, provide different services, fully meet the cross-border shopping needs of consumers, and promote the further development of CBE [9].

### 5.3 Optimize Allocation Mechanism

In the development process of CBEL, interest issues will certainly be involved. Therefore, we should constantly improve the mechanism of benefit distribution and establish the interest distribution system, so as to realize the further development of CBE and cross-border current. First of all, the government needs the support to play a leading role, and formulate a more perfect and scientific cooperation and benefit distribution system, build a sound and solid mutual trust system between the two sides to ensure the development of both sides; secondly, we can introduce a third-party platform to maintain and trust the flow of funds and interests, so that the interests of both sides can be more transparent and fair, and the interests of both sides can be more transparent and fair Cooperation can be smoother [10].

### 5.4 Improve the Infrastructure of CBL

In order to realize the coordinated development of CBE and CBL, we need to constantly improve the infrastructure of CBL. First of all, an overseas warehouse of CBEL can be constructed to uniformly store and manage the cross-border goods to be delivered, so as to realize the integrated development of CBE and CBL. For example, in Russia, Chinese CBL enterprises can build an overseas warehouse for CBL, integrate the resources of CBL, and make the e-commerce logistics channel of China and Russia more convenient. Secondly, in different regions, CBL enterprises should also build corresponding border warehouses, store CBE products in the border warehouses, and effectively shorten the logistics transportation cycle of CBE products according to the number of orders. Finally, the functions of overseas warehouses and border warehouses should be actively utilized to avoid losses due to currency devaluation to a certain extent, so that the ecosystem of CBE can get healthy development.

## 6 Conclusions

At present, the social and economic development is very rapid, it can be said that the people's living standards have been improved along with it, and the happiness of people's life is also rising. Especially, the trend of globalization is irreversible. The emergence of CBE and logistics is also the inevitable trend of social development. Relevant enterprises should keep pace with the times, constantly optimize the CBEL chain from the perspective of supply chain, improve the level of CBL, realize

harmonious and stable development, create more economic value for related enterprises, and promote the further development of social economy.

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# Research on Business Administration Information Under the Background of Big Data Technology

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**Abstract.** With the development of information analysis and processing technology to the application of unstructured data mining, big data has been paid more and more attention. The analysis and extraction of rare and extremely useful information from massive information has been widely used at home and abroad, and shows “amazing” effect and charm. This paper analyzes the current situation and common problems of information of industrial and commercial organs in China, and puts forward countermeasures and suggestions for the layout of big data technology application in the information construction of the 12th Five Year Plan.

**Keywords:** Information · Big data · Business management information · E-government

## 1 Introduction

In the field of information technology, with the application of cloud technology more and more widely, big data technology has also received more and more attention. The so-called big data usually refers to a large number of unstructured and semi-structured data created by an organization, such as network logs, videos, voice, pictures, geographic location information, etc., the number of which often reaches hundreds of billions of bytes (PB), about one billion books of one million words. These data are different from structured data such as registration, case investigation and so on. They are also very useful resources for in-depth data mining. They will spend a lot of time, manpower and money when they are used for relational database analysis. Big data technology [1]. It is a technology that uses information technology to quickly obtain valuable information from various types of big data. Its characteristics can be expressed by four “V”: one is the huge volume, the data volume jumps from TB level (billion bytes) to Pb level (billion bytes) or even EB level (billion bytes); the other is the very many types of data (variety), Internet, Internet of things, cloud computing, Internet of vehicles, computers, mobile phones, tablet computers, video devices, audio devices, as well as information generated by various sensors are the sources of data; third, the value is sparse, and it is difficult to search. For example, in a few hours long recording, the useful data may only be a few seconds, a dozen seconds, or even need to be

deciphered; fourth, the requirements The processing speed is fast, that is to say, in the process of data mining and analysis of cross regional online processing, it is required to get results in a few seconds, and even some people in the industry put forward the “one second law”.

## 2 The Current Situation of the Information of Industrial and Commercial Administration

From the existing work mode, data retrieval and various experience exchange materials, it is not difficult to find that the current situation of industrial and commercial administration information presents the following characteristics.

### 2.1 Traditional Structured Data Still Dominates

The current management mechanism and management mode are still the traditional operation mode under the framework of the traditional administrative laws and regulations, which determines that the information application is still based on the production of structured data (tabular data), such as registration forms, case investigation forms, market inspection forms, etc., and the data production still follows the old path of filling, entering, storing, querying (Statistics) - analyzing Son. Before the laws and regulations, supervision mechanism and supervision mode have not changed significantly, this feature will still occupy a dominant position, and provide a basis for the analysis and utilization of the general significance of information resources [2].

### 2.2 Collection and Application Basis of Unstructured and Semi-structured Data

It is in the blank of unstructured and semi-structured applications and data, such as public security's war and law library, image abstract technology, Internet search and interception technology, image recognition technology, disk recovery and decryption technology, digital authentication technology, etc., which are neither collected nor accumulated in the industrial and commercial system; such as advertising monitoring information, video conference information, audio information, credit classification supervision and other dynamic places The management information is either not collected, analyzed and applied, or transformed into structured data. Due to the lack of data support, industrial and commercial information is still in a relatively simple and small-scale stage, and the deep mining application and dynamic application relying on massive data or big data do not exist for the time being.

### 3 No Scientific, Efficient and Reliable Mechanism and Minimum Data Set Have Been Formed for Data Mining, Analysis and Utilization

Even for the application of structured data, how to scientifically define what data are needed at the level of SAIC, provincial, municipal and county bureaus, and industrial and commercial offices; how to structure the generation, cleaning, aggregation and analysis mechanism of these data, so as to make it operate efficiently and reliably, and on this basis to form flexible data at all levels. It will take time to update the minimum data set maintained. Due to the unclear demand and imperfect mechanism of data at all levels, although the data quality has been greatly improved, the collection is still blind, and the application is mainly query and simple analysis [3]. The application effect of data in information is not obvious, and the role of macro decision-making, micro control and comprehensive guidance of data still needs to be played.

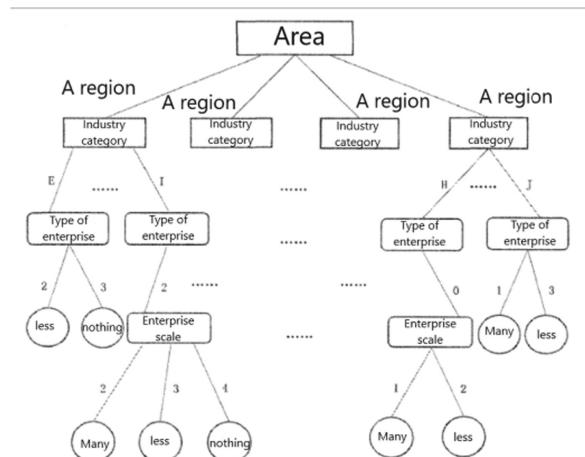
#### 3.1 The Existing Infrastructure Has Not Yet Fully Adapted to the Needs of Massive Data Processing

The existing network bandwidth is difficult to support video conference and data transmission at the same time. The cloud computing capacity, online processing capacity and large user access capacity of hardware equipment need to be improved as soon as possible, and new applications such as video equipment, electronic monitoring equipment, voice equipment, mobile electronic equipment and sensor equipment need to be deepened and popularized. Some application software at all levels are isolated business applications, which are inconsistent with the data standards of the General Administration of China. The application at the provincial level cannot be completely unified. The software that cannot share information and integrate business still has the practice of emphasizing line and integration, department and sharing, construction and safety, convenience and precaution. In information technology, it is urgent to achieve quick results and instant benefits, but not fast, which objectively affects the rapid progress of “integration, integration and integration” of industrial and commercial information, and affects the full play of the overall efficiency of information technology. To sum up, in the competition of new big data technology, the information level of industrial and commercial organs is still in a relatively low and weak position, and the information resources of industrial and commercial organs do not fully have the characteristics and functions of information resources in the era of big data. The essence of “information industry and commerce” is to make digital technology truly integrate with industry and commerce administration, and make it play an irreplaceable role in the reform and development of industry and commerce administration, but there is still a big gap from this goal. The digital divide determines the economic gap and the management gap. Therefore, we must adhere to the continuous development of industrial and commercial information to develop and solve this key problem. In order to narrow the gap and turn passivity into initiative, we should seriously think about what we should focus on and avoid mistakes. We should improve the level of information by focusing on the information construction of the 12th Five Year Plan for

Industry and commerce, and meet the challenge of new comprehensive national strength competition with better situation and higher level information resources.

## 4 Business Management Data Mining Algorithm

Decision tree algorithm is a very important algorithm for classification and prediction in data mining algorithm. The model efficiency of this algorithm is high, the rules are easy to understand and the accuracy is high, so it has great application value. The formal division of decision tree shows the classification rules. From the tuples without order and rules, w tree is inferred as the classification rules. Among the decision tree algorithms, C4.5 is a classical algorithm. Figure 1 shows the decision tree generated by the improved C4.5 algorithm.



**Fig. 1.** Decision tree generated by improved C4.5 algorithm

### (1) Information entropy

Information entropy was proposed by C. E. Shannon, the father of information theory, in his paper “a mathematical theory of communication” published in 1948. He pointed out that any information has redundancy, and the size of redundancy is related to the probability or uncertainty of each symbol (number, letter or word) in the information<sup>152</sup>. The calculation formula is:

$$\begin{aligned}
 H(X) &= [I(X_i)] = E[\log_2(1/P(X_i))] \\
 &= - \sum_i P(X_i) \log_2(P(X_i)) \quad (i = 1, 2, 3, \dots)
 \end{aligned} \tag{1}$$

Where  $H(X)$  represents the information entropy of attribute set  $X$ , and  $P(X_i)$  represents the probability of occurrence of attribute  $X_i$ .

## (2) Information gain rate

Information gain is biased to a large number of value attributes, sometimes it has little effect on classification, so the new classification standard adopts information gain rate. The information gain rate is used to compare the information content of the unit attribute. The information gain is normalized by the information value, rather than simply comparing the total information.

## 5 Build a Public Service System with “One-Stop, Intelligent” Characteristics

Take such a fictitious scene as an example. One morning, Zhang Zong of a company suddenly remembered that in order to make an investment, the company needed to change its registered capital. He immediately opened the vehicle information system, checked the portal website of the Administration for Industry and commerce, and asked for help in handling the change of registered capital through voice. A sweet female voice on the website told him to submit it All kinds of materials and forms that need to be filled in have been sent to Zhang Zong’s on-board information system and the company’s mailbox. He immediately instructs the company secretary to handle it by phone. When Zhang Zong arrives at the company’s office and opens the computer, the Bureau of industry and Commerce informs that the materials have been received, the change registration has been approved [4], and the mail that will send the new license by express delivery has also arrived Yes. The above scenario is the “one-stop, intelligent” strategy in the future, which implies a large number of background information operations such as media information processing, online help, online acceptance, online approval, online capital verification, online identity verification, etc. The “one-stop, intelligent” public service system is the most popular information means for enterprises and the public, which can best show the regulatory service level of administrative organs, and can most promote reform and innovation. At present, there is still a lot of work to be done from the real “online processing”, “Internet approval”, “no leaving home”, “efficient and convenient”. There are two obvious difficulties affecting the progress of this work. One is that the legal norms are lagging behind, which can not effectively guarantee the legitimacy of administrative acts; the other is that the financial guarantee system needs a breakthrough reform, information technology equipment and information technology of the government, whether it is accounting subjects, guarantee methods or the audit of the integration of information projects Yes. In fact, the hidden problem behind the two is still that we can’t keep up with the development of information technology and haven’t formed the concept of adapting to the rapid development of Therefore, at this stage, on the one hand, it is necessary to consolidate the existing portal application, integrate the application resources, and let the staff be familiar with our semi-finished products’ online processing businesses such as “online annual inspection” and “online registration”. In order to use the “one-stop, intelligent” public service system to reserve knowledge and technology, it is necessary to vigorously improve the quality of personnel, and gradually form the concept of building an online government On the other hand, it is

necessary to actively promote online Internet examination and approval on the basis of cross departmental information sharing, accelerate the legal construction to meet the needs of “one-stop, intelligent” public service system, accelerate the reform of financial security system, and boldly explore the investment and construction of cross departmental information projects. With these two legs, we should first take the road of public service system with the characteristics of “one-stop, intelligent”, and then realize the real “one-stop, intelligent” public service.

## 6 Conclusions

In order to seize the opportunity, seize the digital commanding point of big data technology and hold the digital sovereignty of industry and commerce, we must do every work step by step according to the guiding ideology and construction requirements of the 12th Five Year Plan of the State Administration for Industry and commerce, strive to overcome the subjective blindness in our work, focus on the overall effectiveness of the industry and commerce administration, and take credit as our priority Information sharing is the most important, and “integration, integration” is the real communication, coordination and overall promotion, so as to realize the effective use of industrial and commercial administration information resources, effectively improve the quality of industrial and commercial administration team through information, and meet the high-quality challenges with high-quality team.

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# The Development Model of Cloud Computing Economy from the Perspective of Business Ecosystem

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**Abstract.** Cloud computing mode is a new field with the development of the times. The commercialization mode of IT resources under cloud computing not only realizes the effective utilization of IT resources, but also reduces the cost of IT users, so it is welcomed by the market and users. In order to realize the better and faster development of cloud computing, this paper, based on the perspective of business ecology, analyzes the characteristics and problems of cloud computing, and provides optimization ideas for its future development mode and direction.

**Keywords:** Cloud computing · Business ecosystems · Dynamics · Development models

In the Internet, cloud computing and artificial intelligence account for a certain proportion. Mutual promotion of commercial Internet computing changes, and to upgrade to a certain pre-condition, affecting the social and humanistic changes. Thus, cloud computing is quite important throughout the Internet.

## 1 The Scientific Connotation of Cloud Computing

Cloud computing is similar to the CPU, in a computer is the central processor in the whole data calculation, which can parse things by going deep into some data, thus indicating the difference between things. Cloud computing is associated with a variety of information in the Internet, which is called a “cloud”. Cloud computing is the liberalization of these integrated resources through APP management, which does not require too many people. Only the least number of people is needed to maximize the value of the data resources provided.

Computing power on the Internet as a commercial goods, like all kinds of living expenses in our real life, like water, electricity, gas, as long as the requirements can be used at any time, and the price of most families can afford, there will be no too harsh preconditions. And cloud computing can use characteristic algorithms to minimize resource utilization and maximize space savings [1].

Basic functions of cloud computing, including needs-based, measurable, ultra-fast recovery capabilities, several common networks and DB inspection. Cloud computing requires that data retrieved from Internet must be processed continuously through intelligent analysis and distributed to useful data reports. This allows the provision of

quasi-data for social, corporate and other industry reference. We know that if we add aerospace science and technology and try to misprocess some data, the spacecraft will deviate 180,000 miles, making it difficult to achieve its goal. After all, this is the result of data separation. Today, companies are moving their services Cloud phenomena are already common, saving CIO and organizational costs. To be sure, companies can move data from certain jobs into cloud computing if they want to save business money. But this misreading comes from thinking about saving money or, as vice president and chief cloud architect of cloud computing technology partners put it, it would be "magical".

Cloud computing uses the advantage of analyzing data and selecting excellent data from it to bring accurate data detection reports to enterprises to support and control their operations and production. The cost and the value generated are two separate topics, and some people can not succumb to the real cost of cloud computing. Morley feel that most cloud computing APP programs are measured by the value of their services. Business is not cost value and cost is different. It can realize value in low cost model. In short, an enterprise's cloud-computing strategy recognizes that there is only one business and that value can be demonstrated through cost-saving formal approaches Come on. In short, the enterprise's cloud computing strategy has achieved business objectives. The enterprise cloud computing strategy direction and has the special stipulation task goal closely related. Of course, it is virtually impossible to determine whether big data in cloud computing can bring any real benefits in the short term, but through long-term development, this is only antagonistic and the impact is only indirect. Nothing or anyone can die alone. Many of the conclusions are speculation at first, but with the development of the future, they are confirmed one by one.

Ali Yun's Wang Jian can be seen by the Chinese Academy of Engineering, and successfully elected one of the academicians, which also shows his important contribution. In fact, in September 11 years ago, the early computing company was established, called the "Alibaba Cloud". He told hundreds of employees at the time: cloud computing will have a new place in the future, and the status of previous IT devices will decline and become the basis of network computing. "When this came out, most people were skeptical and said Wang Jian was a liar on the platform. The debate over Ali Yun's stupidity It has attracted thousands of people on the subject. Yes, of course, most people criticize Wang Jian, but a few years later, Ali experienced a lot of tribulations and overcome a lot of technical problems, and finally achieved success, and finally people realized that Wang Jian was no longer a traditional "liar". It's the cloud wing engineer, the master of cloud computing teachers and other people who pass on each other. It's not easy, you know, to create an epic of cloud computing and a milestone in the field of cloud computing.

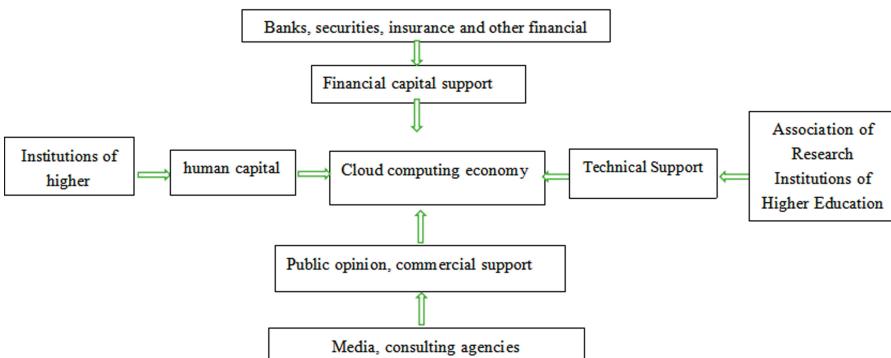
## 2 Cloud Computing Security Risks

In a month more than a decade ago, There was a data loss incident that hit the web, That's right, It was Google's "loss of user information", The personal accounts of tens of thousands of users were reset, March 2011, Google mail again large-scale user data outflow. Every other year, About 140,000 Gmail users found all email and chat records.

The service has been offered several times at Amazon's data center. (between April and December), But most sites don't have access, Many distribution and management sites are inaccessible, This has a significant impact on members' operating income Ring, including cloud storage and many services have problems. A couple of years later, in september, private photos of hollywood stars appeared on the internet, and authorities rushed to investigate whether hackers had attacked multiple accounts, in addition to Apple Cloud security. It was at that time that the backdoor of the security system was discovered, which raised deep doubts about its security, so that companies would use large cloud computing technologies and platforms to pass data to cloud service providers. This will allow easy analysis and resolution of any security Sex problem, this is the core of cloud computing security, is to solve the fundamental problem of cloud security [2].

### 3 Compatibility Subsystem

Currently in the business economy model of cloud computing, the members of the support subsystem involve many fields. The responsibilities and roles of the development industry and government agencies in cloud computing development have changed in many stages. At this stage, cloud computing organizations include CSA, ISO, CJTC1 and so on. These members are open non-profit organizations cloud computing companies, educational institutions, research groups, and government technology and cloud product management departments. To standardize computing from a professional point of view and standardize the service market to establish cloud computing technology and business standards, promote industry development, achieve technological progress, enhance The core and competitiveness of the cloud computing industry, and the rationality with the sector. Related status we propose professional development recommendations financial institutions to provide cloud computing services. In addition, in the development of cloud computing projects, there is a lot of financial support, especially building data. Universities and research institutions are involved in the development of cloud computing products and services through specialized research and development of human resources or directly. In addition, media and consulting institutions play an important role in the development of cloud computing. The details are shown below.



Cloud computing customers include individual users, government agencies and companies. Individual users include general consumers and WebAPP program makers; corporate groups include individual clouds of small, medium and large companies. The consumer subsystem is not only the import of the benefits of the system. At the same time, it is also one of the driving forces of survival and development, as well as the structure and customer demand of cloud computing products and services. And as a product and even work demand development goals guidance [3].

In the business ecosystem, the characters are diverse and complex. The core company of the system is developing dynamically with the help of other companies involved in the system, and the target environment is changing. With the help of people in the system, the system can continue to develop without any external guidance or support, focusing on the overall development of the system. Mutual support among users and subsystems in the environment contribute to the progression of the central ecosystem. Found that the advanced drive upgrade settings are: production element joint setting, strategy joint setting, production line joint setting. Three open resource associations for academic research Set up and company network and support. It is pointed out that this is an important factor facility. Referring to the setting of promoting high-tech development, the nature of business ecosystem and the dynamic principle of system, we put forward a setting for cloud computing to promote the development of business ecosystem.

This paper focuses on many aspects of cloud computing, such as advanced technology, high risk, high investment, cooperation and Internet economy and technology characteristics. As a necessary condition, the technical characteristics are the combination of large companies, small and medium-sized companies and companies with core ecosystem competitiveness based on the system structure theory of cloud computing business ecology. Thus forming cloud computing business ecosystem chain. In addition, according to the components of cloud computing, the structure of cloud computing and business ecosystem is modeled. Finally, the cloud computing business ecosystem based on cloud engine is modeled. For advanced technology development and operational ecosystems The essence puts forward the setting of promoting development.

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# A Model and Algorithm of Logistics Distribution Path in B2C Electronic Commerce Environment Based on Genetic Algorithm

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**Abstract.** The traffic path optimization model can be created by describing the real logistics distribution network of B2C e-commerce companies as an incomplete undirected graph composed of two nodes: distribution center and customer. Distributed logistics integer programming 0–1 this model belongs to the enhancement class. NP hard multi-vehicle routing optimization model can meet the demand of fast and low cost delivery in e-commerce environment.

**Keywords:** B2C · E-commerce

## 1 What is Genetic Algorithm

First, the invention of the first step of the algorithm is biological. Genetic algorithm is a parallel climbing search algorithm. What is looking for rock climbing? Obviously, this is a search algorithm. The most basic search algorithms are depth priority search and width search in chronological order. Therefore, there is no obvious difference between many algorithms and algorithms, and even if the algorithm is different, the principle of solving the problem is the same. What is the algorithm? The most basic knowledge I think can be easily found in search engines. The principle is simple. This is different from the basic width priority search. In the beginning of the problem area Initial node) fixed) random climb will be found in the problem area and start what gap? The artificial intelligence algorithm phase is only in all the states of the current problem. For example, the collection of the shortest path problem is the problem area. Find a random position (node) and climb the mountain. It will extend all possible operations, such as conducting extensive searches first and selecting shear action nodes that produce the best results in the iteration of the step. Until the troubleshooting is successful, if this is the shortest path problem. All possible operations are all nodes that can now be moved. Then I rearranged each node. Obviously The node with the shortest starting distance is the node that wants the most. Therefore, treat this node as the current node in the difficult area and repeat the process until the end point is reached. Each node's sorting process is also called the C cost function (state). In this algorithm, a number will be sent for each state [1].

The smaller the number, the better the current form. Obviously, if the problem area is simple, the cost is a monotone reduction function. At present, mountaineering is a

relatively small search algorithm. However, if the area under discussion becomes more complex, the climb will simply not be possible. In practical use, the problem gap is usually described as “much more complicated.” This difficult category is obviously much easier than practice. Since it is one-dimensional, we must pay attention to what is  $x$  when  $y$  is minimum. But there’s a problem here. But there are only a few problems. However, in the range of possible reverie, there are two false lows. (lowest score) If the algorithm is point-based, then any operation you perform (left or right) increases the cost, so I think the algorithm finds the best solution. But this is clearly not the best solution. One of the simplest and rudest ways to solve this problem is to start at different levels Points run multiple (parallel) mountaineering searches at the same time. Let’s see which method is the lowest cost. The solution in this climbing example is: the best solution to the problem.

This sounds like nonsense. Yeah, that’s bullshit. You may want to use deep search first to solve the problem of finding the lowest cost. Can also be solved using a simpler minimum algorithm. As mentioned in the third compulsory mathematics in traditional secondary schools (estimates). This kind of parallel hiking search was carried out before personal computers were everywhere. However, there are still many applications from teaching school schedules to flight plans. Parallel climbing can be very effective when problematic gaps (such as schedules) become complex. This does not mean that deep search can not solve simple planning problems. But if it’s bad enough, go deep Will solve the problem of six years of eighth grade curriculum. May take weeks on your current personal computer. When multiple dive searches are performed at the same time and the optimal climb search is chosen to deal with the problem, each search algorithm instance generates and tries to move at random in the problem area. Getting to the best position makes many people think of natural alternatives. So I gave a good name to the parallel mountain climbing search algorithm. Genetic algorithm is about genetic algorithm. Reality confirms that this has no relationship with chromosomes, genes, biological neural networks, gene blending or kangaroos.

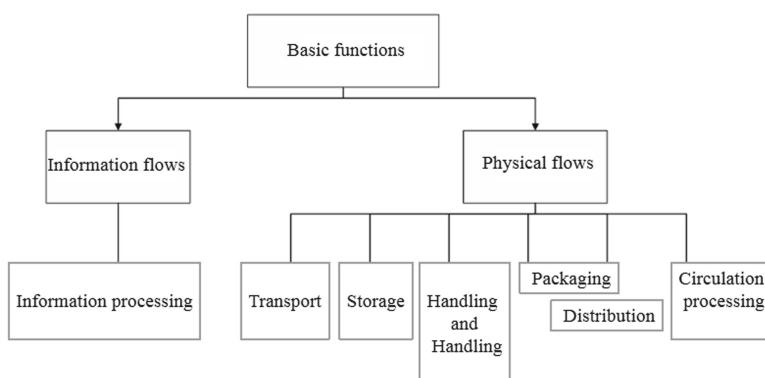
## **2 Research and Development of Electronic Commerce Logistics and Current Situation**

A study of the relationship between e-commerce and logistics has been done outside China, and similar theoretical results have been sorted out by comparing and analyzing data. At first, logistics is not the focus of e-commerce theory research. However, with the development of e-commerce, the unusual role of logistics in e-commerce in the 21st century is becoming stronger and stronger in this relationship. The research shows that the most important part of e-commerce is logistics. In addition, the first definition of the relationship between e-commerce and logistics in the 21st century is introduced. First of all, well-known researchers suggest that e-commerce to traditional commodity sales and traditions The lack of detailed structural research (which provides a direction for the development of the details of the new e-commerce theory) promotes the expansion of the use function. Another expert believes that satisfaction will affect each other, from the two platforms to get a more satisfactory purchase, and provide cross-logistics and model services satisfaction consistency analysis simulation of e-commerce satisfaction

indicators, A prediction model of the process of improving consumer joy and e-commerce platform joy is obtained, and satisfaction is predicted by comparing the author and supplier information of the main document. University e-commerce platform The model method. In order to affect the e-commerce environment, we analyze the logistics and transportation factors below, and propose that the secondary factors affecting e-commerce companies are logistics capital and product allocation, product specialty and logistics distribution selection mode. Through the investigation of the process of e-commerce logistics, aesthetics finds that the high cost of e-commerce logistics is due to the high cost of logistics and distribution, and the concentration of logistics companies. Low by analyzing the available electronic devices, we provide a way to reduce the cost of e-commerce logistics in forward and reverse transportation. Through the study of commercial retail logistics system, it is found that if there is double principle and agency in logistics payment Department, will affect logistics efficiency and results. Directly related to the stability of the entire industry I am studying the optimization of e-commerce logistics [2].

### 3 Logistics Transportation

Logistics transportation is the final product of the rapid development of modern logistics and the final product of market intensive development. As a for-profit organization, under the influence of market dividend and market share, the company can improve the quality of service delivery and reduce the cost of transportation, so as to better grasp the market share and expand its strength. Since you must find it. Through the more in-depth theoretical research on logistics and distribution, it has been concerned and studied. The main new effects of logistics distribution in modern society include reasonable loading, vehicle control, distribution, optimization, vehicle route arrangement, assembly and timely delivery. Other logistics operations and logistics The combination of functional elements has formed modern logistics. The functional elements of logistics include: transportation, storage, package, distribution, transportation, processing. Its basic functions are shown in Fig. 1:



**Fig. 1.** Basic function diagram

## 4 B2C the Relationship Between e-commerce and Logistics Distribution

Along with the rapid development of computer science and technology, e-commerce has strengthened the relationship between consumers and online merchants and Internet, and the products have a “zero delay” transaction success rate. Most of them are processes closely related to data, business information, finance, logistics and other links. In fact, the domestic logistics infrastructure is somewhat lagging, unable to deploy and operate. In order to meet the requirements of the rapid development of e-commerce, do not do nothing. Logistics distribution has become one of the most important restrictive elements in the modernization of e-commerce. In the first few years of e-commerce, people did not realize that logistics as e-commerce is not Possible or missing part of the importance, and do not understand the dynamics of e-commerce logistics. Logistics stereotypes are usually traditional forms of distribution. For most services and products provided by e-commerce, logistics transformation has not been fully studied and released. Logistics ability does not advance the development of e-commerce is not a small impact. Therefore, the integration of e-commerce and logistics, there is a certain demand that e-commerce and logistics can not be separated from the relationship. The close relationship between the two needs to be explained in more detail. First of all, the unified development of data processing speed and electronic resource level can realize the perfect development of electronic commerce In this type of transaction, business processes primarily represent changes in ownership of goods and services. Since a part of logistics will support business flows in the opposite direction, the importance of logistics is crucial in the information flow, business flow and logistics throughout the state [3, 4].

From the above theory, we can get the relationship between logistics and e-commerce. Without the support of logistics equipment, the development of e-commerce is impossible; without the growth of electronic commerce, the rapid development of logistics is also impossible. The development of logistics in the future can not be separated from the evolution and growth of e-commerce environment. With the development of logistics equipment in China, logistics itself has its own problems will promote its growth. There is also a paradox in this, the paradox is that the logistics driven by the e-commerce environment on time and feedback is weak, the e-commerce environment has promoted the development of logistics and ended the role of retrogression, business The bottleneck of development is how to provide services quickly and conveniently where customers need them. This process high degree of cooperation with logistics. Without the support of actual logistics, virtual economy is impossible.

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# Design of Individualized Recommended Algorithm in College Online Platform

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**Abstract.** In order to improve the quality of education, modern colleges and universities generally begin to use information technology to carry out online education, which pays more attention to students' personalized needs and self-learning awareness. Therefore, online education needs to independently recommend courses according to students' needs. In order to achieve this function, this paper will carry out relevant analysis, first of all, build the basic framework of online education platform in Colleges and universities, and then integrate personalized recommendation course algorithm to design the online education platform with this function.

**Keywords:** Universities · Online education · Personalized recommendation courses

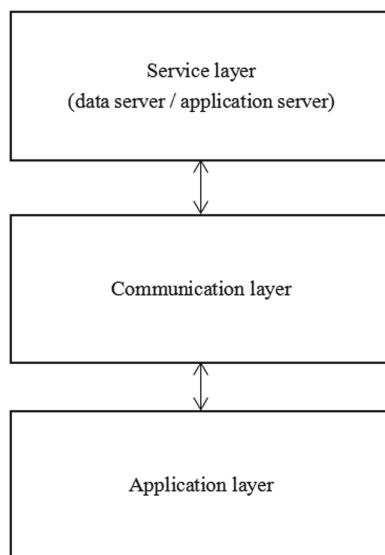
## 1 Introduction

Advanced teaching philosophy attaches great importance to the personalized needs of students, requiring colleges and universities and teachers to provide education services according to the students' personalized needs, and adjust the curriculum system and teaching content. However, the personalized needs of students are very complex, and it is difficult to analyze them by manpower. Therefore, it is necessary to use technical means to solve this problem. At this time, the popularity of online education gives the opportunity for the reform of college education. People think that if the function of personalized recommendation course is designed in the online education platform, the personalized needs of students can be comprehensively analyzed with the help of the algorithm, which can ensure that the recommended courses meet the personalized needs of students, and can also adjust the course recommendation strategy according to the changes of students' personalized needs, so it has high application Value. However, how to realize this function has become a key issue for relevant personnel to think about, and it is necessary to carry out relevant research.

## 2 The Basic Framework Design of Online Education Platform in Colleges and Universities

### 2.1 Overall Framework

The online education platform designed in this paper includes three parts: service layer, communication layer and application layer. See Fig. 1 for details.



**Fig. 1.** The overall framework of online education platform in this paper

Diagram: (1) service layer, which is mainly composed of data server and application server, is also the logic layer of the whole system platform, mainly responsible for providing data and algorithm support, application function support, personalized recommendation course algorithm design is also concentrated in this layer; (2) communication layer, the communication layer is designed with general campus network and Internet After the computer networking, the service layer data can be transmitted to the application layer to realize the data display and function display, and the application layer information can be transferred to the service layer, so that the server can obtain the relevant information of students' personalized needs and recommend courses with the help of algorithms; (3) application layer, the application layer adopts Web page design, which is mainly used to display relevant data and functions Collect some operation information of students on the platform, such as what kind of books students like to read, what time period students like to learn, etc., these information will be transmitted to the service layer to provide support for this layer, and also promote the operation of personalized recommendation course algorithm.

## 2.2 Platform Function Design

The platform function design is concentrated on the application server and displayed in the application layer. The design needs to consider the general needs of students in the learning process and the system operation requirements, so as to ensure the integrity of the application layer functional system. At the same time, when students use relevant functions, they can also collect students' personalized needs. Under the two requirements, the platform should have the following functions.

### (1) The function of students' learning under the general needs

① Data retrieval function: in the initial application of this platform, due to the lack of data support, it can not promote the operation of personalized recommendation course algorithm. Therefore, we must first collect the information related to students' personalized needs, and at the same time meet the needs of students to retrieve textbooks that meet their own needs in learning, so we need to design the data retrieval function. In the function design, the "keyword" retrieval logic is set first. After the system receives the keywords input by the students, all the data containing the keywords can be displayed to the students, and the students can choose again. The selection at this stage is relatively simple and will not cause too much trouble to the students. Secondly, search page design, the page should include search column and search classification options, in order to facilitate students to more accurate information retrieval; ② multimedia function, in order to ensure the quality of teaching, the system has designed a multimedia function, which can centralize the three traditional information display forms of pictures, words and audio frequency into the video information display form, so that it can be direct View of the transmission of information, at the same time, it is convenient for students to judge whether the video content meets their personalized needs, and also allows the platform to collect relevant information; ③ subject association logic, there are some inevitable connections between all majors in Colleges and universities, so not all learning materials are compiled for a certain specialty, and many learning materials are comprehensive, indicating the existence of various disciplines At this time, in order to improve the accuracy of personalized recommendation courses on this platform, it is necessary to design discipline association logic in the platform, and teachers and other professionals define all materials. If a certain material involves two majors, the data needs to be displayed in the boards of the two specialties. No matter which plate the students are searching for, they can find the information, which has a negative effect Low retrieval difficulty, improve the accuracy of course recommendation [1, 2].

### (2) Function under system operation requirement

① Data storage function: the relevant learning behavior or operation behavior of students in the platform is to obtain data support. If students want to retrieve a certain type of learning materials, the data must exist in the platform, otherwise students can not learn. Therefore, the platform must have data storage function to support the operation of similar data retrieval and other application functions, as well as personality The algorithm of recommended course is supported. The data storage function of this platform is mainly realized by the cloud database. The capacity theory of the database

is unlimited, which can meet the needs of a large number of data storage. Therefore, the cloud database is selected in the design. However, if the data storage demand is not large, the traditional large-scale database can be used for design, such as SQL database (Structured Query) In order to collect the personalized needs of students, the platform has designed the data statistics function, which can collect the students' learning time period, learning time, and the materials they often watch when they study, and synchronously obtain the data performance of each information. For example, students have carried out the data statistics function at 8:00 in the day and 21:00 in the evening Learning, but at 21:00 p.m., the learning time is the longest. Therefore, the platform will judge that this time period is the peak of students' learning, and the data will be displayed in the form of histogram, and personalized course recommendation will be made for students in this time period [3].

### 3 Personalized Recommendation Course Algorithm Design and Integration

#### 3.1 Algorithm Introduction

This platform mainly adopts SVDD (support vector data) The algorithm can make the platform have the ability of autonomous learning. With the help of relevant functions, it can detect students' learning performance, so as to obtain data, judge students' current personalized needs through calculation, and even play the role of academic warning. It can help students to make clear their learning direction and push them without knowing it Therefore, the algorithm can realize personalized recommendation of courses. In addition, the reasons why this platform chooses the algorithm are as follows: (1) SVDD algorithm has good stability, excellent data compatibility, and can continuously count and calculate learning performance, which has practical value; (2) SVDD algorithm is relatively simple, which can reduce the difficulty of platform design, and also make the function of personalized recommendation course easier to realize [4].

#### 3.2 Design Algorithm

The SVDD algorithm design of this platform is divided into two steps: data preprocessing algorithm design and SVDD algorithm model design.

##### (1) Design of data preprocessing algorithm

Because the learning behavior of students in the platform will produce two types of data: learning behavior and learning effect, and both of them are the data that need to be counted by the platform. Therefore, due to the inconsistent attributes of the two, the data can not be directly analyzed and need to be processed in advance [5]. In this regard, in order to measure the index data of the two dimensions in a unified way, the platform will adopt the normalization method to realize the preprocessing. The normalization method formula is as follows:

$$x_{nor} = \frac{x - Min}{Max - Min} \quad (1)$$

In the formula, Max and min are the data of learning effect and learning behavior respectively, and the max min data group is generated based on the two data sets, where max = 1 and min = 0; XNOR is the normalized result.

## (2) SVDD algorithm model design

The SVDD algorithm model design is divided into two steps:

$$\begin{aligned} Min\ell(R^2, a, \xi) &= R^2 + P \sum_i^N \xi_i \\ s \cdot t \cdot (x_i - a)^T(x_i - a) &\leq R^2 + \xi_i \quad \forall i, \xi_i \geq 0 \end{aligned} \quad (2)$$

Formula (2) is the objective function of SVDD, where  $\{x_i, i = 1, 2, \dots, N\}$  For a given target dataset,  $\xi_i$  As the relaxation variable factor, R and a are the radius and center of data measurement respectively, and P is the penalty parameter, which can control the degree of misclassification samples.

$$K(x, y) = \exp = \left[ -//x - y//^2 / \sigma_1^2 \right] \quad (3)$$

Formula (3) introduces the kernel function K (x, y) on the basis of formula (2), which makes the sample map from the low dimensional space to the high dimensional space, indicating that the original nonlinear logic operation has become a linear logic operation. From this, we can analyze the performance of the student platform and basically realize the function of personalized recommendation courses.

### 3.3 Algorithm Integration

Although the SVDD algorithm model design has been completed above, it does not mean that the algorithm can be used in this platform. If the platform environment does not meet the operation requirements of the model, the algorithm cannot be integrated into. Therefore, in order to integrate the above algorithms into the platform and promote the operation of personalized recommendation course function, relevant strategies should be adopted in the service layer to construct the algorithm environment. The specific strategies are as follows.

#### (1) Index system

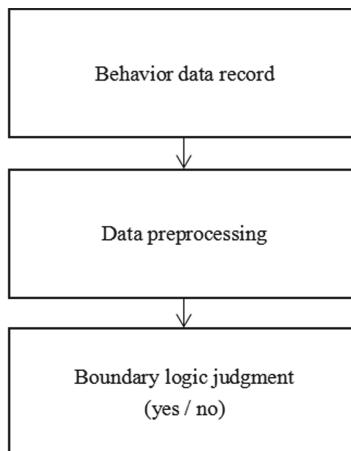
Table 1 shows the index system of the platform, which will be supported by the algorithm as algorithm operation logic in the service layer, and relevant functions will collect students' behaviors according to the logic, and then feed back to the algorithm. The algorithm will calculate the weight of each index according to the weight grade of each index, and the results can be divided into priority, which can make the platform make accurate judgment.

**Table 1.** Platform index system

Index	Dimension	Weight
Learning effect indicators	On-line	50%
Learning behavior indicators	On-line	55%

## (2) Student behavior monitoring model

Because students' learning behavior is a continuously generated data, it is difficult to keep up with the speed of its generation only by relying on the statistical function of data, which may lead to the inaccurate function of personalized recommendation courses. Therefore, it is necessary to design a student behavior monitoring model to make up for this defect. At the same time, the model can also provide good environment support for SVDD algorithm. The model of student behavior monitoring is shown in Fig. 2.

**Fig. 2.** Student behavior monitoring model

It is worth mentioning that the so-called convenient logical judgment in Fig. 2 is to classify various behaviors of students, and then manually set the standard values of each behavior. For example, if the standard value of the total online learning time of students is 1H, the boundary is generated in the algorithm logic. If the actual total learning time of a certain day does not reach the boundary, the system will judge that the students' learning behavior is improper. After analyzing what course the misconduct appeared in, the final judgment is made, that is, "you do not meet the requirements of XX course today, it is recommended to continue to study xxmin".

## 4 Conclusion

To sum up, this paper designs and studies the algorithm of personalized recommendation course in online education in Colleges and universities. Firstly, it constructs a basic online teaching platform as the basic framework. Secondly, it designs the algorithm model, and puts forward the method of integrating the algorithm into the basic framework. Through the analysis, we can see that the SVDD algorithm selected in this paper can judge students' behavior and learning effect. With the help of the data statistics function in the basic framework, we can understand the personalized needs of students and even their academic development. Then, according to the judgment results, the platform will push relevant courses to students, and students can also search according to their own needs, and the algorithm will search students' behavior Record, the next time you do not need to retrieve students can personalized recommendation.

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# The Evaluation of Maximum Return of Human Resource Allocation Based on Decision Tree Algorithm

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**Abstract.** In the past, human resource management mainly relies on the subjective experience of managers, which is extremely tolerant of mistakes. Therefore, this paper will analyze and discuss the application and research of decision tree algorithm based on data mining in human resource management. This paper analyzes the application of decision tree based on data mining in human resource management, the algorithm of decision tree and the construction of decision tree, so as to promote the integration and effective allocation of human resources, and provide data basis for human resource management. The maximum return assessment is used for analysis and research.

**Keywords:** Decision tree · Human resource management · Application · Maximum return evaluation analysis

## 1 Introduction

Using the decision tree theory to screen the human resource data, a more reasonable and effective database is obtained, and the relevant examples are verified, which not only objectively processes the data, but also makes full use of the rich practical experience of relevant workers. Therefore, the results of the model are of certain practicality, This model gives full play to its unique advantages in human resource management.

## 2 Application of Decision Tree in Human Resource Management

Under the background of global economy entering the era of knowledge, information and network, human resources play a more important role in economic development. The application of database and computer technology makes the amount of data increase dramatically. In these data information, some of them are related to the success or failure of the enterprise reward. The application of decision tree based on mining data can quickly and efficiently analyze and process these data information, discover the rules and obtain the relevant information to provide the basis for enterprise managers to make decisions. And this decision tree based on data mining is developing and

maturing in the huge market demand, which brings considerable economic benefits to enterprises[1]. The application of decision tree in all aspects of human resources and staff management: database (data mining during the period) → prediction model (making decision during the period) → classifying employees (making decisions during the period) → allocating human resources.

### 3 How to Introduce Decision Tree Method

#### 3.1 Decision Tree Method

Decision tree is a kind of knowledge representation method which can express decision set intuitively by tree structure, and can classify information efficiently. Decision tree classification method has been widely used in customer analysis, market research and sales decision-making [2]. The following four advantages are derived from the decision tree: first, the decision tree can intuitively present the relevant data information, and it is easy to extract and query; secondly, the operation efficiency of the decision tree is high, which is more suitable for the training set with large amount of information; then, the decision tree can also process the information outside the training set; finally, the decision tree has higher accuracy. Because the prediction results include both on-the-job employees and the resigned employees, the decision tree classification can achieve good results, but the decision tree can not deal with the continuous attribute data well, so ID3 learning algorithm is needed in the core part of the model.

#### 3.2 Principle of ID3 Decision Tree Algorithm

ID3 algorithm is used for classification prediction, and the results need to be predicted are obtained by constructing decision tree. The key of ID3 decision tree algorithm is to calculate information gain and entropy according to recursion. "Information entropy" is the core. The greater the uncertainty of training set is, the greater the value of corresponding information entropy is. The test attribute standard of the node is determined by selecting the attribute with the highest information gain. The training sample subset classifies the amount of information through the attribute and establishes branches at the same time. Then, the branches of each node are established by recursive method, and finally the decision tree is generated.

Suppose that the dataset  $D$  of  $S$  is the tuple training set of class label, suppose that the attributes of class label have  $n$  different values, define  $n$  different classes  $C_i, j \in (1, 2, n)$ , and let  $C_i$  have sample number  $C_iD$ , then the expected information required for a given sample classification is shown in formula (1)

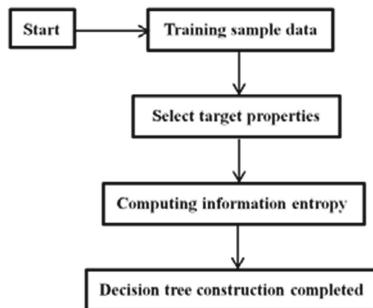
$$Ent(D) = - \sum_{i=1}^n P_i \ln P_i \quad (1)$$

Where  $D$  is the class label of the tuple;  $P_i$  is the non-zero probability that any tuple in  $D$  belongs to a class,  $P_i = C_iD / |D|$  selects the attribute with the highest information gain in the attribute as the test attribute of the given set  $s$  to calculate the different information gain of each attribute. Then, a node is created and each value of the tag

attribute is given to create a branch, and samples are divided according to these branches. This algorithm is not only clear in theory, but also simple and convenient in calculation. It can generate a decision tree with scientific basis in a short time, and is widely used in practice.

### 3.3 Construction of ID3 Decision Tree

By calling the abnormal or fault data stored in the database, C+ is used to write the program, and ID3 decision tree algorithm is used to construct the decision, as shown in Fig. 1.



**Fig. 1.** ID3 decision tree algorithm programming flow chart

### 3.4 Further Improvement of ID3 Algorithm

Although ID3 algorithm has been widely used in enterprises, it has some difficulties in incremental learning tasks, and also has the above shortcomings. Therefore, ID3 algorithm is further improved to C4.5 algorithm. The decision tree based on C4.5 algorithm can be updated in real time according to the increase of data information. Each link of tree species can calculate the E value, so as to judge the attribute of information and classify it. C4.5 algorithm has a method suitable for small amount of data: To evaluate the attributes of training cases, and the conservative evaluation method can effectively overcome the calculation deviation[3]. In addition, C4.5 algorithm uses information gain to select the attribute standard, which makes up for the biased value of attribute in ID3 algorithm. Therefore, the decision tree constructed in this paper is based on the improved C4.5 algorithm with ID3.

## 4 Model and Method Analysis of Human Resource Evaluation

### 4.1 Principle of Design Evaluation Index

There are five smart principles for designing evaluation indicators.

S (specific): the performance evaluation index should be detailed to the specific content, that is to say, the performance target led by the team should be focused, and it will change with the change of the situation.

M (measurable): performance evaluation indicators should be designed as indicators that employees can operate through labor, and the results can be quantified.

A (attachable): performance evaluation indicators should be designed as the goals that can be achieved through the efforts of employees and should be completed within a certain period of time.

R (realistic): performance evaluation indicators should be designed/observable, which can prove that there is no objective in reality.

R (time) bound: performance evaluation indicators should be time limited and focus on efficiency indicators. It is necessary to determine the appropriate data evaluation index system for performance evaluation.

## 4.2 Construction of Evaluation Index System

- (1) Quality indicators. The quality index is an index to evaluate the actual individual behavior of employees, including 2 secondary indicators and 10 tertiary indicators. The second level indicators are work potential and psychological quality. Work potential refers to the ability and quality that can only be shown in the actual work, including five three level indicators: professional ability, adaptability, organizational ability, persuasive ability and creativity; psychological quality refers to people's psychological activity or temperament [4]. It includes five three-level indexes, such as people's ideological quality, personality, sense of responsibility, interpersonal coordination ability and emotional quotient.
- (2) Job indicators. Job indicators are mainly used to evaluate the requirements of each job for employees, including 3 secondary indicators and 8 tertiary indicators. The second level indicators are skills, conditions and intensity, and skill indicators mainly reflect the degree of intelligence requirements of the post on workers, including three three indicators, including work experience, education background and professional knowledge; the condition indicators mainly include two third level indicators: working environment and job risk. Intensity index is a comprehensive reflection of physical consumption, physiological and psychological stress, including three three levels of indicators: physical workload, mental workload and job complexity.
- (3) Performance indicators. Performance indicators refer to the quantitative indicators to evaluate the results of internal employees' workload or job performance, including three secondary indicators: work efficiency, work quality and work achievements. Then the weight of each index is determined by analytic hierarchy process (AHP), and the score of each index can be calculated by weighted summation. Then the grade of a certain achievement of each person is determined according to the four pre-set grade standards of excellent, good, medium and poor.

### 4.3 Model and Method Analysis of Evaluation

Considering the intuitionistic and operable effect, a new evaluation model is proposed. Taking the comprehensive score of qualitative indicators such as post quality indicators as the abscissa, and the evaluation scores of quantitative indicators such as performance indicators as vertical coordinates, the square matrix is divided according to different score intervals. Through the vertical and horizontal coordinates, we can combine a person's work situation at a certain time and a post with his basic quality to make a comprehensive analysis. This is not a simple conclusion of the next comprehensive evaluation, but an intuitive analysis of the relationship between qualitative and quantitative indicators of personnel, specific job analysis and macro analysis.

## 5 Conclusion

This paper constructs a new model and method to evaluate the maximum return of human resources in the team, which can intuitively analyze the relationship between qualitative and quantitative indicators of personnel, as well as specific job analysis and macro analysis. In the specific position analysis, we can find its position in the square chart, and then we can judge whether the person and the position are suitable, that is, whether the ability of human resources is compatible with the performance; in the macro analysis, the performance evaluation matrix is divided into four areas, each area represents the relationship between the overall quality of human resources and its performance, It can determine whether there are problems in the allocation and management of human resources. According to this evaluation model, we can better evaluate whether the ability and quality of human resources are compatible with the performance, and can improve the allocation of human resources, so that it can reach the optimal state of human resources allocation.

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# Study on the Economic Analysis of China's Bamboo Industry Based on Cloud Computing

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**Abstract.** In order to accelerate the development of China's bamboo industry and further clarify the importance and necessity of cultivating and developing cloud computing, starting from the economic attribute of cloud computing, this paper focuses on the analysis of the impact of cloud computing on China's bamboo industry economy, studies and analyzes the development of bamboo industry economy with cloud computing, so as to further promote the demonstration application of cloud computing; Accelerate the research and development of independent and controllable cloud computing technologies and products.

**Keywords:** Cloud computing · Bamboo industry · Economy

## 1 Introduction

Cloud computing is a new technology rising rapidly in recent years, which has become the focus of attention from all walks of life. At present, cloud computing has been applied to all aspects of people's production and life, which will have a huge impact on national economic and social development. The research and analysis of bamboo industry based on cloud computing can let us know all kinds of economic benefits of bamboo industry [1].

## 2 Economic Attributes and Characteristics of Cloud Computing

From the perspective of economics, cloud computing is a new computing mode that uses the network to manage and schedule the original distributed computer software and hardware resources, and provides users with computing services on demand and in real time. Just as the "power station" provides centralized power supply services, it provides users with centralized computing services. At present, the rapid development of Cloud Computing mainly presents the following three characteristics.

Many technologies and wide application fields.

From the perspective of cloud computing technology, it integrates many computing framework paradigms such as distributed computing, parallel computing, grid computing, etc., draws on the concept of service-oriented architecture (SOA), and is supported by the rapid development of computing and storage technology, integrating virtualization and load A set of new technical concepts and implementation mechanisms have been formed by various technical methods such as equalization, which has typical technical integration attributes. The integrated innovation of these technologies is conducive to the optimization of the use of computing resources, the flexible use of external computing resources, and the acquisition of flexible computing resources according to the changes in business needs. It can manage and apply the massive data generated and required by business in a more efficient, flexible and low-cost way, and support the massive users. At the same time, breaking the boundaries between organizations and realizing efficient collaboration, resource sharing and decentralized co creation within and with external parties will help to make the process connection between enterprises and partners and customers in the business ecological environment simpler and more efficient. It can be seen that cloud computing is widely used in many fields, such as e-government, transportation, energy system, financial system, education system and public health, which are closely related to people's production and life. It is likely to become the foundation and platform for a new round of scientific and technological revolution and industrial revolution Sex technology has the characteristics of significantly reducing the cost of information technology and promoting the continuous improvement of productivity [2].

## 2.1 High Industrial Connection and Strong Driving Effect

The cloud computing industry covers a wide range. According to the classification of economic activities, the activities of cloud computing sector (industry) can be divided into cloud computing manufacturing industry and cloud computing service industry, or refer to the expression of standard three industries, which are called cloud computing secondary industry and cloud computing tertiary industry [1]. Cloud service industry is the core of cloud computing industry system, which mainly refers to the service format formed by using SaaS, PAAS and IAAs service modes, and includes software development, system integration derived from cloud computing The products of value-added services such as data analysis, data storage and processing mainly include resource management software, storage software, computing software, big data platform software and cloud computing solutions. Cloud manufacturing industry mainly includes cloud computing related hardware manufacturing industry, and its products mainly include customized servers, cloud storage, network equipment, terminal equipment, etc. For example, cloud computing service industry belongs to information technology service industry; cloud hardware industry belongs to electronic information product manufacturing industry; cloud software industry belongs to software industry (also included in information technology service industry). It can be seen that cloud computing belongs to a collection of multi industries and multi businesses, including information technology services such as software development, information system integration services, and electronic information manufacturing such as computer manufacturing. It has been included in various classifications of national economic

industries, but it is not reflected separately. Therefore, the extensive industrial relevance of cloud computing not only forms a new industrial sector, expands the investment scale and stimulates the relevant demand.

### 3 Development Status of Bamboo Industry in China

Bamboo resources, as a kind of forest resources with special aesthetic feeling, are deeply loved by Chinese people because of their special landscape value, sustainable use of ecological and economic value and unique human characteristics [3]. In 1976, the total area of bamboo forest in China was 3.04 million Hm<sup>2</sup>, and in 1988, the total area of bamboo forest in China reached 3.5463 million Hm<sup>2</sup>, and in 1998, it reached 4.2108 million Hm<sup>2</sup>. Especially in the past decade, the annual growth rate is 100000 hm<sup>2</sup>. By 2008, the national bamboo forest area reached 5.3810 million Hm<sup>2</sup>, including 3.8683 million Hm<sup>2</sup> of Moso bamboo forest, 1.5127 million Hm<sup>2</sup> of miscellaneous bamboo forest, and 82.900 billion of bamboo forest, including 9.157 billion of Moso bamboo and 73.743 billion of miscellaneous bamboo. China's bamboo forest resources are mainly distributed in the Yangtze River Basin, South China and southwest China, among which, the area of bamboo forest in Fujian, Jiangxi, Zhejiang, Hunan, Sichuan, Guangdong and Anhui provinces is over 300000 Hm<sup>2</sup>, and the total area of bamboo forest in these seven provinces is 4.472 million Hm<sup>2</sup> (see Table 2 for details), accounting for 83.1% of the total area of bamboo forest in China; while the total area of bamboo forest in Fujian, Jiangxi and Zhejiang provinces is up to 2.6276 million Hm<sup>2</sup>, accounting for 48.8% of the total area of bamboo forest (Table 1).

**Table 1.** Increasing status of bamboo forest area in China

Statistical years	1976	1981	1988	1993	1998	2003	2008
Area of bamboo forests	304.00	319.96	354.63	379.08	421.08	484.26	538.10

**Table 2.** Bamboo forest area in major bamboo producing provinces of China

Statistical provinces	Fujian	Jiangxi	Zhejiang	Hunan	Sichuan	Guangdong	Anhui	Total
Area of bamboo forests	99.31	85.16	78.29	62.78	48.60	40.78	32.28	447.20

#### 3.1 Current Situation of Bamboo Processing Industry in China

In recent years, the area of bamboo forest resources and the amount of bamboo in China have increased rapidly, the scale of bamboo industry has gradually expanded, the management, processing and comprehensive utilization of bamboo have made great progress, the process of bamboo industrialization has been significantly accelerated, a number of emerging enterprises led by bamboo industry are rising, the national bamboo industry has made rapid development, and the utilization of bamboo has broken

through the traditional utilization. It is used in agriculture, food, environmental protection, light industry, construction, paper making, home furnishing, packaging, transportation, tourism, textile, medical treatment, electronics, national defense, aerospace and other industries. In the research and development of bamboo processing technology and innovation of bamboo products, China as a whole is at the advanced level in the world. With the continuous improvement of processing technology, bamboo products with bamboo as raw material emerge in an endless stream. Bamboo products involve more than 1000 varieties in ten series. As of 2009, China's bamboo output has reached 1.356 billion pieces, the dry output of bamboo shoots has reached 465300 tons, and there are more than 6500 enterprises engaged in processing bamboo shoots and bamboos, including 29 enterprises with an annual output value of more than 100 million yuan, the total output value of the national bamboo industry has reached 71 billion yuan, the export earnings of foreign exchange has reached 1.36 billion US dollars, and the number of employees has reached more than 45 million [4]. Bamboo industry has become an advantageous industry in developing green economy and a rich industry in poor mountainous areas.

## 4 Problems in the Development of Bamboo Industry in China

In general, the development of China's bamboo industry shows the following trends: the eastern coastal provinces have strong economic strength, and the development level of bamboo industry is relatively high; the central and western provinces have rich bamboo resources, but due to their relatively weak economic strength, the development of bamboo industry is backward, and the advantages and potential of bamboo resources are far from being realized.

## 5 Countermeasures and Suggestions on the Development of Bamboo Industry in China

To establish and improve the financial subsidy system of bamboo industry, it is necessary to gradually establish a GSP subsidy policy for bamboo industry, increase support for bamboo forest cultivation, and increase support for high-yield cultivation of bamboo, fertilization, fine varieties, and new technology for processing bamboo products. We will gradually expand the scope of central government subsidies for bamboo forest tending and raise the standard of subsidies. Establish a subsidy system for improved bamboo varieties, give subsidies to the base and cultivation of improved bamboo varieties, and focus on supporting the research, development, demonstration and promotion of new varieties and technologies of bamboo seedlings. We will subsidize the purchase of machines and tools for the bamboo industry, and speed up the mechanization and modernization of the bamboo industry. Research and formulate financial policies to promote the development of bamboo industry, and further increase the support for the development of bamboo industry.

We should improve the financial and tax support policies for bamboo industry, further strive for financial institutions to increase investment in bamboo industry

construction loans, strive for financial departments at all levels to increase loan discount efforts, and improve the discount policy. We should establish and improve the bamboo forest insurance mechanism with financial support, further expand the scale and scope of the central government's subsidy for bamboo forest insurance, and improve the bamboo forest insurance system and working mechanism for grass-roots services. We should actively encourage financial institutions to develop financial products suitable for various functions of bamboo industry, establish small loan support mechanism for bamboo farmers and small and medium-sized enterprises in bamboo industry, moderately relax loan conditions, reduce loan interest rate, simplify loan procedures, improve financing efficiency, and actively carry out a variety of credit financing businesses in line with the characteristics of bamboo industry, including forest property mortgage loan. We should improve the supporting policy of bamboo industry tax and fee, and reduce the burden of farmers and enterprises. We will implement preferential tax policies for comprehensive utilization of bamboo products, strive to improve the export tax rebate standards for labor-intensive and high value-added bamboo products, and promote the development of low-carbon economy and labor-intensive enterprises.

**Funding.** Guizhou University of Finance and Economics Foundation Project: Guizhou Forest Carbon Sink Estimation and Evaluation, No. 2017XZC03.

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# Application of Big Data Analysis Technology in E-commerce Data Analysis

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**Abstract.** Big data analysis technology is a universal technology, which can be applied in many fields to provide data analysis services for related business work, including e-commerce data analysis. It can be used to analyze the data structure, analyze the data structure, and display the data structure. It is difficult to do this in artificial data analysis. In order to understand how big data analysis technology should be applied in e-commerce data analysis, this paper will carry out research, first define the relevant concepts, then carry out system design, and finally apply the system to an e-commerce enterprise to analyze its supply and demand data, and verify whether the system is effective.

**Keywords:** Big data analysis technology · E-commerce · Data analysis

## 1 Introduction

E-commerce is an online transaction mode of interest in recent years. It takes the network as a transit station, and connects consumers and merchants. Merchants can display goods and communicate with consumers in the network. Consumers can browse goods in the network, complete payment, and transfer commodities to consumers with the help of logistics. The whole process is very convenient, and consumers can buy merchants at home. Products, so e-commerce has been widely respected, which makes the e-commerce field in a short period of time has become the mainstream of the industry, and now still occupies a leading position. At the same time, e-commerce has been highly praised among the consumer groups, which also makes a large number of practitioners and capital pour into the field, and for a time, e-commerce is in the spotlight [1].

However, the rapid development of e-commerce has also brought some impacts, including the impact of data analysis, that is, in the traditional business model, each merchant has a relatively small number of consumers, so the data generated in the transaction is not much, practitioners can effectively process these data, and in e-commerce, the number of consumers contacted by each merchant has increased dramatically. Different consumers have different needs, so a large number of data are generated, and the types of data are also growing. At this time, practitioners can no longer effectively process these data. This phenomenon will lead to practitioners do not know what needs of consumers, making the operation direction confused, which is not conducive to the development of enterprises. Therefore, e-commerce practitioners have

the demand for data analysis. At the same time, the development of e-commerce has also exposed a problem, that is, the competition among practitioners in the industry is very fierce. Only those who have clear consumer demand and can meet more consumer demand can win the competition. This makes a large number of practitioners have a strong pursuit for the efficiency and depth of consumer data analysis, not only to complete the consumer demand data faster We need to know more about the potential demand of consumers, but we can't achieve this by manpower, which makes the development of e-commerce encounter a bottleneck [2, 3].

Under this condition, the emergence of big data analysis technology provides an opportunity for e-commerce to break through the bottleneck. Practitioners generally believe that the use of big data analysis technology can effectively process a large number of complex consumer demand data, and also can guarantee the processing efficiency and depth. The performance of technology in data analysis is even better than that of manual work, so big data analysis technology has caused e-commerce practitioners [4]. It is worth noting that it is not a simple job to use big data analysis technology to analyze consumer demand data. This technology can only be operated in a certain environment, and it needs to be supervised manually to ensure its operation logic is correct. Therefore, it is necessary to carry out research on how to apply big data analysis technology to e-commerce data analysis. It has a certain practical significance.

## 2 Definition of Relevant Concepts

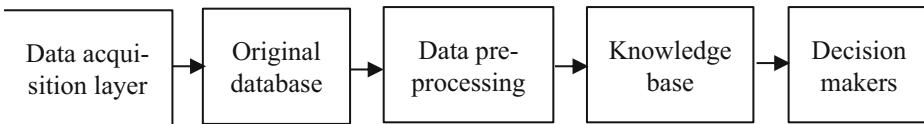
Big data analysis technology can be defined as a kind of technical tool based on big data and with the help of relevant technical means to analyze the big data volume, simplify the data body, comprehensively and deeply show the events represented by big data, and have the function of self-learning, which can help people to work out accurate judgment and decision-making. Its application value does not need to be repeated It was mentioned.

E-commerce big data is a category of big data, which only contains the data related to e-commerce. However, e-commerce big data still has the characteristics of big data in data magnitude and data category, that is, in the category, e-commerce big data includes consumer browsing records, consumer shopping records, consumer consultation records and consumer shopping records. The characteristics of goods, the service characteristics of various practitioners, and these data categories reach the mass level in the huge consumer group, and will be constantly updated. If the e-commerce practitioners can't analyze these data quickly and well, it will lead to the operation lagging behind and lose in the competition, which is what practitioners should try to avoid. However, if practitioners can complete data analysis quickly and well, on the one hand, it can reduce the probability of their own competition failure, on the other hand, they can also establish the direction of operation and provide impetus for their own development. Therefore, practitioners should attach importance to the value of e-commerce big data and reasonably use relevant data analysis technology for analysis, which is the pursuit of modern e-commerce practitioners [5, 6].

### 3 Design of Big Data Analysis Technology System Under E-commerce Data

#### 3.1 Overall Framework

The overall framework of big data analysis technology system under E-commerce data is shown in Fig. 1.



**Fig. 1.** Overall framework of big data analysis technology system

Illustration: (1) Data acquisition layer is mainly responsible for collecting original data, data source is e-commerce big data, data items need to be designed and collection scheme should be established, then the layer will continuously collect relevant data from e-commerce big data according to the scheme, and send all the collected data to the original database; (2) The database is mainly responsible for receiving the original data transmitted from the data acquisition layer, and classifying the representation of all the original data, such as the keywords contained in the data, the data items to which the data belongs (i.e. the data items designed in advance in the data acquisition), and then the classified original data are transmitted to the data preprocessing subsystem; (3) To be responsible for the in-depth analysis of the original data under each classification and to distinguish the valuable data from the worthless data, it is necessary to set up the definition of valuable and valueless data before operation. For example, any one of the two completely repeated data is worthless data, and the other is valuable data. After the differentiation, the valuable data will be sent to the knowledge base; (4) The knowledge base is mainly responsible for receiving the preprocessed data. After receiving, the data will be deeply mined according to the preset logic. Here, analysis technology is involved. Through mining and analysis, we can know the definition and characteristics of all data, and arrange the relevant data in order to form a simplified data model. The model represents the development process of an event in e-commerce, which can be clear It shows the cause of the event, the development route and the correlation between the data in the model. If there is a strong direct correlation between data a and data B, and data a is the cause of data B, it shows that data a has a great influence on data B, so that the relevant events can be understood through the operation of the knowledge base; (5) The decision-making level is mainly based on the analysis results of the knowledge base, according to the artificial preset logic puts forward a decision-making suggestion that can solve the existing problems or make the event develop in the most favorable direction. At the same time, the decision-making suggestion will be displayed to the manual together with the data model after the analysis of the knowledge base. According to the operation of the decision-making suggestion in the data model, the artificial can judge the effectiveness and feasibility of

the decision-making level, and adjust the decision-making if there are doubts, Finally, we can find the optimal solution after the adjustment of the model.

### 3.2 System Design

Around Fig. 1, the following will analyze the design of each layer in the overall framework, and elaborate the system implementation method.

**Data Acquisition Layer.** The data acquisition layer of the system mainly adopts three kinds of data acquisition methods, namely log collection, network data acquisition and data interface acquisition. Among them, log collection and network data collection are mainly realized by network worm technology. This technology can retrieve the continuous production of log and network data, and obtain relevant data with the retrieval scheme, while data interface acquisition belongs to the manual acquisition mode requires manual data acquisition according to the collection requirements, and then USB is used to access the computer where the data acquisition layer is located, and then the original data can be imported into it through this wired connection. In addition, the data items included in the data acquisition layer are shown in Table 1.

**Table 1.** Data items included in data acquisition layer of the system

Project	Brief introduction
Consumer browsing history	When consumers browse the records generated on the e-commerce platform, we can know which products consumers have browsed
Consumer shopping records	The records generated by consumers after shopping on the e-commerce platform show which goods consumers have purchased
Consumer consultation record	The records generated by consumers' consultation on e-commerce platform show what consumers have consulted
Commodity characteristics	What are the main products that consumers buy and what are the characteristics of these products
Service characteristics	What kind of services do consumers receive in shopping and what are the characteristics of services

**Original Database.** Because there is no need to store data permanently in the original database, all the data will be transferred to the next layer after preliminary classification, so the original database does not have too high data capacity requirements, and can be realized directly by using a more conventional database. SQL database is selected in this system. After the implementation of the original database, it is connected with the data acquisition layer by wireless communication, so that the preliminary classification can be completed according to the original data representation, project and other items.

**Data Preprocessing.** Data preprocessing needs to distinguish valuable and worthless data. In addition to defining the two types of data, we also need to implement the algorithm. There are many such algorithms. However, considering the effect of pre-processing, this system uses K-means clustering algorithm (K-means clustering

algorithm). K-means algorithm is an iterative clustering analysis algorithm. In operation, we need to divide all the data into k groups and randomly select k objects as the cluster center. Then, around the cluster center, we can calculate the distance between other data and the cluster center. According to the standard value of the distance, we can know the cluster center of each data. In this process, if we find no valuable data, such as a certain number According to a certain clustering method, the data center will be distinguished through the iteration.

**Knowledge Base.** Knowledge base needs to save data permanently or for a long time, so it has a large requirement of data storage space, which can not be realized by conventional database. This paper chooses cloud database to design. Cloud database is a kind of database with unlimited capacity in theory. It can save data to the network environment to meet the storage requirements of knowledge base. However, if the cloud database is directly used for storage, it may lead to data leakage, so further design is needed. In order to solve this problem, the system divides a part of the cloud database storage resources in advance, and then closes this part of resources to store the knowledge base data. If the resources do not meet the storage requirements in the later application, the external resources can be imported into the closed environment again to realize the database capacity expansion. This processing method can make the knowledge base have good performance Expansibility, on the premise of ensuring data security, can always meet the data storage needs. The processing scheme of knowledge base is shown in Fig. 2.

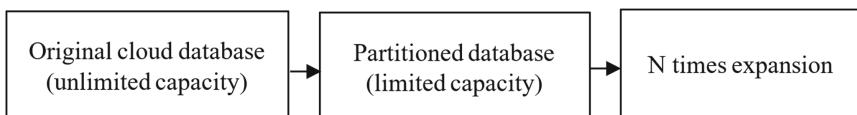


Fig. 2. Knowledge base processing scheme

**Decision Makers.** The decision-making layer contains intelligent logic, which is mainly constructed by artificial intelligence neural network technology in this system. Artificial intelligence neural network technology is a common big data analysis technology. In this system, the technology is shared by the knowledge base and the decision-making layer (the technology can produce data models in the knowledge base, and output decisions through the decision-making layer, because the purpose of technology application is to output decisions, so it belongs to the decision-making level). In the application, artificial intelligence neural network technology will obtain all the data of an event from the knowledge base, and then analyze it with each data as the initial node. According to the characteristics and definitions of all the data, the data will be combined together. If data a is consumer consultation data, and the definition is consumer demand, then data B will be generated under data a, and data B is defined as consumer purchase Therefore, the first mock exam of A data is to record B data. The two models are combined to form a data model. After representing consumers, they buy the goods that can meet the needs of the consultant, and the output of the relevant commodities should be based on the model.

## 4 System Application Test

### 4.1 Test Plan

In order to test the application effectiveness of the system in E-commerce completely, a test scheme is proposed below, which is composed of two parts: function/performance test and data analysis test. The specific content of the scheme is as follows.

**Function/Performance Test.** The function of the system in e-commerce is tested. The test target is the analysis function of supply and demand data. If the system can analyze the data, it shows that the system has this function. At the same time, it is not enough to simply have functions, and the performance of its operation is also very important. Therefore, in the performance test scheme, a basic function operation environment is designed, that is, the system is required to analyze 600000 pieces of supply and demand data, and count the integrity, accuracy and efficiency of the analysis. If the system can analyze all the supply and demand data completely and correctly within the specified time, it will be explained Its function and performance are complete.

**Data Analysis Test.** Data analysis and testing is mainly carried out with the help of an e-commerce platform. The system is required to be applied in the platform for 30 days. The actual application value is verified according to the function/performance test index, and the test results are reliable.

### 4.2 System Application Method in Data Analysis and Test

Because the data analysis and testing involves actual cases, we need to adjust the system according to the cases, and the main work is to build the data model of supply-demand relationship. In the construction of supply-demand relationship data model, it is necessary to obtain the relevant original data, and name and define the original data. Here, a commodity in the platform is selected and named as item\_ID represents the commodity number. According to the number, we can know the classification of the commodity. Then we collect and classify other original data around the commodity to get all the consumers who have purchased the product. According to the browsing records, shopping records and consultation records of all consumers, we classify the consumers into groups. Under this condition, the system can be analyzed and tested.

The test results show that the supply and demand data analysis function is complete, the data analysis integrity reaches 100%, the data analysis accuracy is more than 90%, and the data analysis efficiency is high.

## 5 Conclusion

To sum up, this paper studies and analyzes the application of big data analysis technology in e-commerce data analysis. Through the analysis and understanding of the relevant concepts, this paper puts forward the design scheme of e-commerce big data analysis system, and realizes the big data analysis system through the scheme design. In order to verify whether the application of the system is effective, the paper also

carried out relevant testing work. According to the test results, the system is effective, which can help e-commerce practitioners to analyze massive data in a short time, and ensure that the data analysis is complete and correct, so that practitioners can make certain decisions according to the system analysis results.

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## **Technical Tracks 7: Cyber Intelligence for Education Course and Applications**



# The Application of “Online to Offline” Interactive Teaching Mode to College English Teaching in the Era of “Internet+”

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**Abstract.** Influenced by traditional English teaching mode, many teachers neglect the cultivation of students’ English practical skills. So it is particularly important to change the traditional teaching mode and apply “online to offline” interactive teaching mode in the era of “Internet+”. This paper mainly discusses how to apply the method to English class, stimulating students’ interest and improving English teaching efficiency. The author hopes this study can be useful for the teachers who adopt “online to offline” interactive teaching mode in the era of “Internet+”.

**Keywords:** Online to offline · Interactive teaching mode · Application

## 1 Introduction

Nowadays English is taught as foreign language in most non-English-speaking countries around the world, which raises many problems. The majority of students are lack of interest in English learning. Sometimes they may feel the class is very boring. So it’s necessary to stimulate students’ learning interest. A vivid class which applies appropriate teaching aids will be beneficial. With the development of science and technology, the Internet technology has progressed rapidly, which becomes assistance for English teaching and learning [1]. By applying “online to offline” interactive teaching mode in the era of Internet, the teaching quality and teaching outcome will be greatly improved [2]. Thanks to the advantages of “online to offline” interactive teaching mode and Internet technology, the teaching efficiency has been improved a lot, which is really a need for English teaching in college. Meanwhile, with the gradual implementation of New Standard of English Curriculum, it has been paid more and more attention to English classroom teaching which advocates interactive teaching mode. The aim of interactive teaching is to break the traditional teaching model which centers on teaching and to motivate students’ subjective will to learn and use English in real context. This thesis aims at exploring the application of “online to offline” interactive teaching mode to college English teaching in the era of “Internet+”. Through this article, the writer hopes it can improve the current situation about students’ passive study and the efficiency of college English classroom teaching.

## 2 The Elementary Concepts of “Online to Offline” Interactive Teaching Mode in the Era of “Internet+”

### 2.1 The Characteristics of “Online to Offline” Interactive Teaching Mode

In “online to offline” interactive teaching mode, English teaching does not only impart knowledge, but also a process that teachers and students interactively teach and learn together. It has the following characteristics. The main goal of interactive teaching mode is to cultivate and develop students’ subjectivity [3]. Hence students play the most important role in teaching and learning. “Online to offline” Interactive teaching mode emphasizes the heuristic education and students’ all-round development, which can largely stimulate students’ motivation by guiding their inner spiritual needs so that they learn how to study, think and research. The purpose is to make students become independent, active and creative social subjects by training. In the teaching process, students continuously get improved through interaction, which at the same time promotes teachers’ personality and professional quality [4]. “Online to Offline” interactive teaching mode can also enable all learners to have equal opportunities to receive education. Only the equal teaching and learning environment can make the interactive learning to be full of harmonious, democratic and free atmosphere. Under this situation, students have the freedom to think, explore, ask questions and express their views, and bravely and happily solve the problem. “Online to offline” Interactive teaching is in pursuit of the harmonious teacher-student interaction and student-student interaction.

### 2.2 The Teaching Characteristics of “Internet+”

“Internet+” can provide comprehensive resources of words, sounds, graphic images, animations, and so on [5]. So we can apply “Internet+” technology to teaching. Teaching content can be conveyed by visual and auditory medium. All the teaching materials can be shown for students by “Internet+” technology. Teachers can apply various visual and auditory courseware to make boring text book vivid and colorful.

“Internet+” technology can provide abundant expressions, so the teaching content cannot be limited by objective factors. “Internet+” technology can apply lights, sounds, colors and shapes of optical features, which can change the appearance of things: from big to small, quick to slow, near to far and even from virtual to real[6]. By applying this technology, teachers can have more time to ask students to look at the things carefully. On the Internet, it can display many things. “Internet+” technology could create the atmosphere of the learning of foreign culture. After viewing, students can not only exercise speaking but also can know the real life of the people in English-speaking countries and understand the cultural differences among other countries. It can cultivate the spirit of patriotism and cultural communicative awareness, expand the horizons of students and provide the foundation for their lifelong development. The traditional teaching aids usually include textbooks, tapes and some pictures. Under this condition, students don’t have visual insight into some knowledge, but “Internet+” technology can broaden teachers’ knowledge and teachers can collect and apply many excellent teaching materials. “Internet+” technology can provide teachers with many ideas and

experiences and online resources to improve their opinions, which can facilitate English teaching and learning [7].

### 2.3 The Current Situation of Applying “Online to Offline” Interactive Teaching Mode in the Era of “Internet+”

**Table 1.** Students’ favorite teaching modes

Interactive teaching mode	Teachers’ lecturing	“Internet+” technology	Others
79.22%	7.66%	10.08%	3.04%

From the chart (see Table 1), 79.22% of the students like interactive teaching mode; meanwhile 10.08% of the students like applying “Internet+” technology. In English teaching, teachers should make good use of “Internet+” technology, and adopt different methods to teach different subjects. “Internet+” technology can help students feel relaxed and stimulate their desire to study. Multimedia is very popular in modern times and it would be a necessary means in English teaching. The application of “online to offline” interactive teaching mode in the era of “Internet+” can enrich the teaching content in English teaching and learning. Connecting the network with “Internet+” technology can effectively increase the capacity of classroom teaching. When teachers present pictures, they can apply “Internet+” technology to show many pictures to make the teaching contents more vivid, which can enhance student’ understanding and memory of text content and extend their knowledge. The application of “online to offline” interactive teaching mode in the era of “Internet+” can also create an effective learning atmosphere and improve teaching efficiency. Teachers can prepare lessons by applying “Internet+” technology, which can help teachers present all the teaching materials clearly and reasonably. So it can also accelerate the classroom teaching rhythm. Meanwhile, teachers can present the teaching contents to students clearly and logically, and students will have enough time to think and answer questions raised by teachers [8]. The application of “online to offline” interactive teaching mode in the era of “Internet+” can also provide students with substantial image and vivid language. New pictures, animation and interesting topics can be used to greatly inspire students’ enthusiasm to learn. During the process, teachers should be able to guide students to think, discuss, and answer questions. Teachers can also conduct debates, conversation, role-playing and other activities to encourage students to communicate in English, which can build up students’ confidence. So, the proper teaching approaches and new technology should be put together to change this situation.

### 3 The Application of “Online to Offline” Interactive Teaching Mode in the Era of “Internet+”.

#### 3.1 Transmitting More Knowledge

In traditional English classes, we usually teach students with textbooks. Teachers meant to give students more knowledge which is connected with books, but it's a great pity they can't do it well. Firstly they don't know where to look for information. In addition, looking for information will cost a lot of labor and time when they do it. Thirdly, teachers have to spend a lot of time doing a lot of explanation to make students entirely understand the knowledge in the limited class time. On the contrary, “Internet +” technology can provide a large amount of information for teachers to select [9]. It's also very convenient for them to choose from. They just press some buttons lightly, then they can get the things they want. In addition, the electronic board can be connected with Internet. People from all over the world can share the common information with other people. Students can learn more things than just from traditional English class. They can get some extra knowledge which can't be found in text books. For example, when they're studying a text about foreign countries, teachers can show some general knowledge by short videos or movies. In that case, students can be greatly impressed. When students watch the videos or movies, teachers can put forward some questions so that students can discuss with each other. In this process, teachers function as the director to give some necessary guidance. According to the discussion, students can learn from each other and they can also anticipate what will happen to practice their thinking ability. Therefore, they can learn more by interactive teaching in the era of “Internet+”.

#### 3.2 Arousing Students' Interest

Students may get lost and feel puzzled if teachers don't explain very carefully or apply some teaching aids to organize some practical activities in traditional English classes. In traditional classrooms, teachers often have some simple tools to teach such as chalks, a piece of blackboard or something else. Therefore, it is very difficult to draw the attention of students by just looking at the books or blackboard and listening to the teacher. When the explanation is going on and on, students would get tired in a very short time, which makes students difficult to concentrate. The application of “online to offline” interactive teaching mode in the era of “Internet+” can show vivid pictures and videos so that students can have their attention concentrate on what teachers say and what they want to express in class [10]. They would show great interests, which is very useful English teaching and learning. When they are interested in the learning materials, they are willing to try their best to overcome any difficulties they meet on the way to success. It is said that interest is the best teacher which can provide enough courage when students meet troubles. When we do things for the first time, the interest is the key point. So teachers should try their best to make classes interesting and acceptable.

### 3.3 Inspiring Students’ Creativity

The overall teaching condition is not optimistic in college. Thus the time-consuming and inefficient English listening teaching is almost universal. Over years, English teaching is under the influence of traditional values. Traditional teaching methods cannot effectively create teaching situations and limit the development of students’ creative thinking. Flexibility and diverse forms of “Internet+” technology will extend students’ thinking. For example, teachers can apply “online to offline” interactive teaching mode in the era of “Internet+” to enable students to use a variety of ways to sum up the rule of grammar and learn the culture of other countries. Then students’ ability of logical thinking and creative thinking will be greatly improved. Teachers apply “online to offline” interactive teaching mode to encourage students to think, to explore, to exercise their imagination and to develop their creative thinking. The use of “Internet+” technology can make a new and interesting class so that students are full of curiosity, freshness and thirst for the learning of new knowledge [11]. For example, teachers may ask students to preview ahead of time. Students are required to surf on the Internet to look up some references in order to have some understanding on the learning material. Meanwhile, students are required to give presentations on what they have done in class. By this way, students will try their best to collect the materials and their creativity can be cultivated effectively.

### 3.4 Creating the Scene for English Learning

In English classes, teachers can apply the “online to offline” interactive teaching mode to college English teaching in the era of “Internet+”. For some abstract or key points, teachers can show them on the screen by video or audio, which can better attract their attention and help them understand the knowledge easily and quickly. Besides the knowledge points on the textbook, teachers can also add some extra knowledge points out of the books when necessary. Of course, the knowledge originates from many fields. But our brain cannot recall too much knowledge that we have stored in our brain. It’s too short to tell in a limited time. If we apply “Internet+” technology to show, which would be more convenient. It can store lots of information that the brain cannot. So, when we talk about a point and want to expand it, just press some buttons and the information would present on the screen immediately. What’s more, we can apply “online to offline” interactive teaching mode with “Internet+” technology. With the assistance of the “online to offline” interactive teaching mode, the class activities could be more interesting and meaningful for students to take part in. We can apply some short wonderful movies or some vivid teaching materials. These things will not make students boring but interesting. They would whole-heartedly throw themselves into the study.

## 4 Conclusion

All in all, with the development of new curriculum reform, English teaching in college is becoming more and more important. College students should not be passive to learn language skills. On the contrary, they must be active participants in the teaching activities. “Online to offline” interactive teaching mode takes full account of college students’ psychological characteristics. In this period, students have intense curiosity and desire to behave themselves. It can also greatly arouse students’ enthusiasm, stimulate students’ interest in learning, develop students’ personality and improve their quality in an all-round way. The ultimate goal of college English teaching is to cultivate the comprehensive competence. The application of “online to offline” interactive teaching in college is an effective method to achieve goals in the new era. Teachers can stimulate students’ learning enthusiasm by “online to offline” interactive teaching in college classroom [12]. It will lay a good foundation for college students to learn English well in the future. The application of “online to offline” interactive teaching mode to college English teaching in the era of “Internet+” of multimedia is a trend. With the involvement of “Internet+” technology in English teaching, students’ motivation is uplifted and students’ interest is aroused. As for teachers, they should correctly apply “Internet+” technology in optimizing English teaching. They should lay great emphasis on the relationship between English teaching and “Internet+” technology. Only by applying “online to offline” interactive teaching mode to college English teaching with “Internet+” technology together can the teaching efficiency be largely improved.

**Acknowledgement.** Research project: One of the research achievements of “Teaching and Research Reform Project” in Undergraduate Teaching Quality and Teaching Reform in Mianyang Teachers’ College in 2020: Strategies Research for Improving the Educational and Research Ability of English Teachers in Primary and Secondary Schools.

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# Training Mechanism Reform of “Programming +” Higher Engineering Education

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**Abstract.** With the rapid development of new engineering, today, it is particularly important for higher engineering education to develop healthily and orderly. As one of the basic skills that should be mastered by students of many new engineering majors, the programming ability is helpful for the majority of students to study new majors more effectively, and can make students better adapt to their work in the future. Based on the demand of programming ability in the development of new engineering, this paper discusses some problems that restrict the promotion of programming education in higher engineering colleges, and puts forward corresponding solutions. It is expected that suggestions in this paper can play a certain role in improving students’ computer abilities and promoting the healthy and orderly development of new engineering.

**Keywords:** New engineering · Programming + · Engineering education · Teaching reform

## 1 Introduction

In August 2018, the task of teaching reform to develop “new engineering” was proposed [1]. As an important link in developing “new technologies, new industries, new business forms and new modes”, new engineering is the “catalyst” to cultivate engineering science and technology talents and improve the quality of higher engineering education under the new economic form. In order to promote the construction of new engineering courses, on the basis of their own advantages and social needs, colleges and universities in various regions make every effort to explore the Chinese model and Chinese experience leading the global engineering education, so as to help the construction of a powerful country in higher education. Some pioneer explorations such as “Tianda Scheme”, “F Plan” and “Chengdian Scheme” have emerged in succession [2]. Since the “new engineering” was put forward, it has received rapid response from universities and strong support from the industry.

“New engineering” can divided into new type engineering specialties, emerging engineering specialties and newly born engineering specialties. They emphasize the

transformation and upgrading of traditional majors, the popularization and application of new technologies and the cross integration of different disciplines [3, 4]. Their development process is largely dependent on computers, artificial intelligence and big data technology. As the basis of computing technology, the popularization of programming thinking and programming technology has become an important task in the information reform of modern higher engineering education and the development of new engineering specialties [5].

At present, teachers in different fields have carried out preliminary attempts to combine programming with professional teaching. For example, in engineering majors, relevant courses have been set up based on *Numerical Methods for Engineers and Scientists Using MATLAB*, [6] *Linear Algebra and its MATLAB Application* [7] and other teaching materials, so as to carry out the education of courses and software programming simultaneously. However, due to the limitations of teachers, infrastructure and teaching resources, programming methods have not been fully popularized in undergraduate education. A large number of teachers have also made some efforts. For example, Xinjie Sun and Shuifan Pan combine mainstream Python to propose a personalized service mode, which needs students to practice their professional knowledge through programming methods, so as to improve students’ ability to apply what they have learned [8]. However, there is still a certain gap between the practice of these courses and the requirements of new engineering majors.

In this context, it is particularly important to understand the core role of programming technology in higher engineering education and the training of outstanding engineers, to analyze key problems which hinder the organic combination of industrial technology theory and computer programming thinking, and to explore the training mode which integrates traditional engineering teaching and the training of students’ programming abilities.

## 2 Analysis of the Demand of “Programming +” in New Engineering Construction

### 2.1 The Necessity of Cultivating Programming Thinking in Time Scale

In terms of time dimension, engineering education in the past paid attention to the popularization of basic knowledge and the application of general technology. With the popularization of national higher education and the improvement of basic abilities, Internet technology has a subtle impact on the traditional engineering field. In different professional fields of engineering, great changes have taken place in industrial production technology. For example, structural engineering has shifted its focus from structural mechanical analysis to structural parametric modeling; civil engineering has developed from focusing on architectural structural design to using Building Information Modeling (BIM) technology to carry out the building of design, construction and management systems which cover the whole life cycle of buildings. In addition, new materials, new tools and new methods are also used more frequently in above fields, forming the new engineering. From the technological changes in the field of engineering in the past ten years, it is not difficult to find out that, due to the practical needs of technology in China’s industrial development, the traditional engineering

education can rely on basic programming abilities to develop. Today, the traditional higher engineering education is unable to meet the technical requirements of the complex, intelligent and high-end development faced by new engineering majors. Therefore, it is necessary to cultivate students' programming abilities in the construction of new engineering.

## 2.2 Differentiated Needs of Audiences and Research Objects of the Teaching Reform

With the development of higher education and the concept of new engineering, teachers and students are two important elements in the process of reform. Teachers are the preachers of new engineering construction in university education; the practice and promotion of programming thinking in curriculum reform requires teachers to have solid knowledge on professional curriculum and the ability to integrate new technologies and methods used in scientific research into university classroom teaching. Programming skills are highly consistent with the "intelligence" and "information" elements in new engineering courses. Therefore, in the process of teaching technical knowledge, the key element of "programming +" should be integrated to improve students' ability to solve practical problems and realize the synchronous teaching of theory and practice. It is urgent to add "programming +" to the construction of teachers' teams in modern universities. On the other hand, as the backbone of the future new engineering industry, college students have more demands for programming ability. The new generation of college students grow up in the information age; they have a natural sense of intimacy to computers, data, network and other words. The new engineering courses also have universal requirements in these aspects. Therefore, "programming +" has become a necessary element in acquiring professional knowledge, especially in learning practical courses in the later stage of university.

## 2.3 Requirements of Constructing the Computer Curriculum System for New Engineering

From above analysis, it is found that both the development background of engineering specialties and the main body of teaching participants have put forward certain requirements for the cultivation of students' programming abilities in higher engineering education. The professional curriculum system, as another essential component in the development of new engineering, also puts forward specific requirements for the cultivation of programming ability. At present, the construction of new engineering courses advocates interdisciplinary, new technology promotion and traditional professional transformation, but corresponding professional education cannot match the development of industrial technology; the syllabus of non-computer engineering majors also fails to keep pace with the times. At present, the basic computer courses in university only have a general framework; the cultivation of specific programming ability do not receive enough attention. Taking the training scheme of robot engineering specialty as an example, for this major robot programming and operation courses are added on the basis of mechanical engineering. However, computer language courses and basic program application courses, which are the basis of motion

analysis, the simulation application, the programming control and other professional courses, have not received enough attention in the early stage. As the result, students only know how to operate, but do not know the deep meaning and logic. This is a big obstacle for engineering graduates to think and work independently after employment.

### **3 Key Issues in Training the “Programming +” Ability in Higher Engineering Education**

#### **3.1 The Training Mode of “Programming +” in Higher Engineering Education**

Since various majors of new engineering have demands for programming ability, it is particularly important to strengthen the teaching of computer programming language and integrate the training of programming and application with daily professional courses. However, in the existing mode, it usually follows the sequence of mathematics courses, basic computer courses, programming language design courses, professional courses, as well as professional application and practice courses combined with software and program. Although the professional courses are added with the training of programming ability, each stage is independent with each other, so it is difficult for students to understand. Therefore, how to combine the training of programming ability with the teaching of professional knowledge in limited class hours is the primary problem that the current teaching reform needs to solve.

#### **3.2 The Allocation of Teachers for New Engineering Majors**

The cultivation of programming ability requires the full understanding of computer language and logic. At the same time, we need to have application programming thinking to solve practical engineering problems. This determines that the training of programming ability of new engineering majors cannot simply rely on the teachers of public computer courses and professional teachers of original courses; it needs a new team of teachers with the comprehensive ability of the two. Currently, colleges and universities usually allocate the teaching resources of new engineering majors as follows. They usually combine teachers of computer majors and traditional engineering specialties to serve as the teachers of new majors. Part-time teachers only have limited energy in these courses and cannot match with the professional knowledge very well. With the advancement of the construction of new engineering courses, the development of new majors will be restricted. Therefore, the teaching team which adapts to the rapid development of new engineering is the main problem restricting the construction of disciplines.

#### **3.3 The Contradiction Between University Performance Evaluation System and New Engineering Promotion**

In colleges and universities, the double evaluation system of teaching and scientific research is widely used [9]. However, in the process of constructing and promoting

new engineering specialties, the scientific research ability in the original performance evaluation system should be highly combined with the course teaching; the two elements can no longer be evaluated and assessed independently. For example, in the above-mentioned Robot Programming and Practice course, under the premise that students do not have a solid foundation of programming ability, teachers need to undertake a series of work, such as popularizing computer languages, sorting program logic, carry out mathematical modeling of practical problems, and operate robot programming. From the perspective of scientific research evaluation, the above process is the teaching process of teachers' scientific research skills, which is difficult to generate contributions that meet performance evaluation criteria. From the perspective of teaching evaluation, the above process is still in the initial stage of the new curriculum construction. With the novelty and creativity of new engineering specialties, it will take some time to produce a good teaching evaluation. However, it is difficult to adjust the assessment pressure and performance evaluation methods of relevant professional teachers.

## 4 Solution to the Promotion of Programming + in New Engineering

### 4.1 The Multi-stage Teaching Mode

The reasonable teaching mode is an important link to ensure the synchronous development of programming ability training and professional knowledge study. According to the features of different courses, basic knowledge and programming ability should be integrated in different degrees in the course teaching. In this paper, we propose three different teaching forms: auxiliary teaching, synchronous teaching and extended teaching. They are suitable for course modules with different requirements for programming ability. For example, in professional basic courses, teachers can use the visual results of computer programs and numerical simulation to show students the professional application of knowledge points vividly; “programming +” is an auxiliary method. In professional skills courses, the programming thinking training and professional skills training are synchronously developed for specific engineering cases. Students can understand the evolution from book formulas to model results through the case analysis and program model disassembling. In practice courses, focusing on expanding students' engineering thinking and professional vision, professional knowledge plays a role of catalyst in classroom teaching. Teachers can design teaching plans and auxiliary materials independently, and use flipped classroom, research-based topics and other open teaching modes to mobilize students' subjective initiative. Teachers can encourage students to write their own programs and build their own models, and experience the process of solving engineering problems by using basic knowledge in the early stage [10].

## 4.2 Teacher Resources and Teachers’ Team

Under the background of new engineering, the core demand for strengthening the training of programming thinking and ability is still the demand for teachers. Only with a perfect and professional teachers’ team can we train selected students efficiently, and use teaching resources provided by schools and departments effectively. The core of constructing the teachers’ team is to form an independent, high-quality and comprehensive teachers’ team through reasonable selection and collocation. The team should have senior teachers in the professional field; they can be responsible for the training of necessary professional knowledge in the teaching plan and the coordination of teaching resources. Young teachers are also indispensable. Combining with the advantages and characteristics of young teachers in scientific research, they can give full play to the characteristics of leading-edge technology and new methods in scientific research, and bring basic professional knowledge, as well as new methods and technologies into the classroom. At the same time, young teachers are also the new force of specialty curriculum teaching, and the backbone of compiling special textbooks and handouts. In addition, we should train high-quality engineering talents who are in line with the times and can combine professional basic knowledge and programming ability with the needs of modern engineering. At present, higher education institutions do not have enough teachers suitable for the construction of new curriculum, which is the key task of constructing the teachers’ team. It is suggested that universities can arrange engineering technicians and researchers of scientific research institutes to teach professional application knowledge through concurrent employment and invitation reports, so that college students can understand methods and technologies that are widely used in the current working environment. At the same time, advanced software, technologies and engineering parties in the industry can be brought into undergraduate teaching in advance, which plays the foundation for students to enter the society.

## 4.3 The Teacher Evaluation System

After the above-mentioned systems of teaching mode, teacher resources and teaching management are built, a reasonable assessment system is an important guarantee to ensure the sustainable teaching reform. No matter teachers or students, the process of “programming +” engineering teaching integration is undoubtedly a great change. New textbooks, new teaching methods, new knowledge and new systems require a lot of time and energy of first-line teachers. In the whole teaching process, teachers are more involved in it, instead of cramming teaching. The traditional single assessment system for teachers can not completely cover teachers’ intentional labor. Therefore, the construction of new teaching materials, the achievements of students’ practice projects, discipline competitions, student scientific research and academic achievements and the comprehensive evaluation of students on teachers should all be included in teachers’ assessment system. When teachers are liberated from the traditional evaluation system and return the essence of teaching to ability training, they can follow the pace of new engineering construction and cultivate the high engineering and technical talents with practical engineering abilities [11].

## 5 Conclusion

With the continuous innovation of science and technology in the field of modern engineering, automation and intelligent means are gradually popularized and applied in all walks of life in society. Under this background, new engineering reform came into being. Programming thinking runs through the whole process of new majors' emerging and traditional specialties' transformation. Starting from the fundamental contradiction between the ever-increasing demand for programming ability in course learning, employment and further study and the lagging teaching of computer (programming) ability in engineering majors, this paper summarizes curriculum requirements, analyzes factors hinder the combination of programming teaching and professional courses as well as their reasons, and gives reasonable suggestions for related problems. With the construction of new engineering courses, colleges and universities are encouraged to further integrate the training of computer programming abilities in the higher engineering education process. By innovating teaching modes, offering experimental classes for outstanding engineers, building characteristic teaching teams and providing supported evaluation system, the integration can be carried out smoothly. Finally, the first-line teaching feedback and teaching mode re optimization can cooperate with the construction of new engineering; the new engineering can drive the development of new agriculture, new medical sciences and new social sciences. It can help for the four new constructions of China in education science.

### Acknowledgments

1. This paper is the outcome of the study, Reform and Practice of the “Programming +” Teaching Mode for Biological Majors under the Background of “New Agriculture”, which is supported by the Foundation of the Education Department of Zhejiang Province. The project number is jg20190121.
2. This paper is the outcome of the study, The Multi-objective and Adaptive Teaching Reform of the Course “Hydraulic and Pneumatic Transmission” Facing College Students of the New Era, which is supported by the Foundation of NingboTech University. The project number is 20200545844.

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# Research on Ancient Chinese Learning Mode Under the Mobile Internet Environment

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**Abstract.** Mobile learning is an emerging product of the rapid development of the Internet. It is a learning behavior that uses the concept of “Internet +”, and relies on mobile terminals such as smartphones and tablets to perform online self-learning through wireless networks. The ancient Chinese mobile learning model can break the time and space limitations of the traditional Chinese classroom-teaching model, making the ancient Chinese teaching model more flexible, convenient and efficient, which helps to stimulate students’ curiosity and interest in learning, guide students to learn independently, and solve problems by themselves. Cultivate students’ comprehensive ability to use Chinese.

**Keywords:** Mobile · Internet · Ancient · Chinese · Learning mode

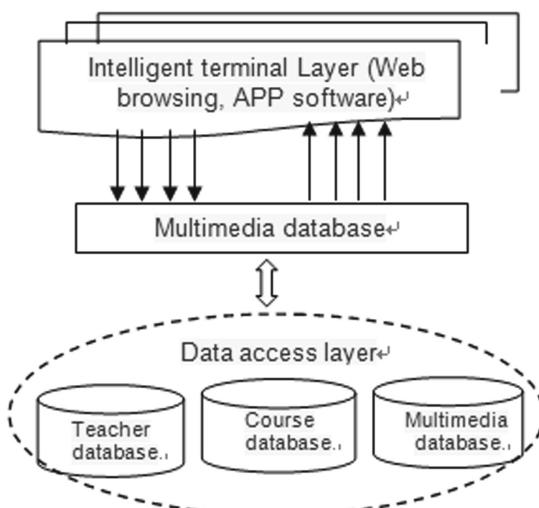
## 1 Introduction

At present, with the rapid development of Internet technology and wireless communication technology, smart phones, tablet computers and other mobile terminals are rapidly popularized. The Internet has become an indispensable source of information and communication medium for people, thus affecting people’s work, study, and life. The emergence of mobile learning is inseparable from the development of network information technology. The popularization of cloud computing and the concept of “Internet +” are prompting mobile learning to lift the veil and gradually enter the classroom [1, 2]. Mobile learning has a strong affinity and can be used as an auxiliary teaching method to integrate with a variety of mainstream teaching models. This article combines “Internet +” technology with mobile learning models to construct a new ancient Chinese mobile learning model [2].

## 2 Ancient Chinese Mobile Learning Model Based on “Internet +”

“Internet +” is an overall concept. It relies on the Internet as a platform to deeply integrate Internet technology and traditional industries, making traditional industries a highly integrated and unified whole online and offline, which means that the Internet will be open, efficient, and Features such as interaction and strong affinity are used in

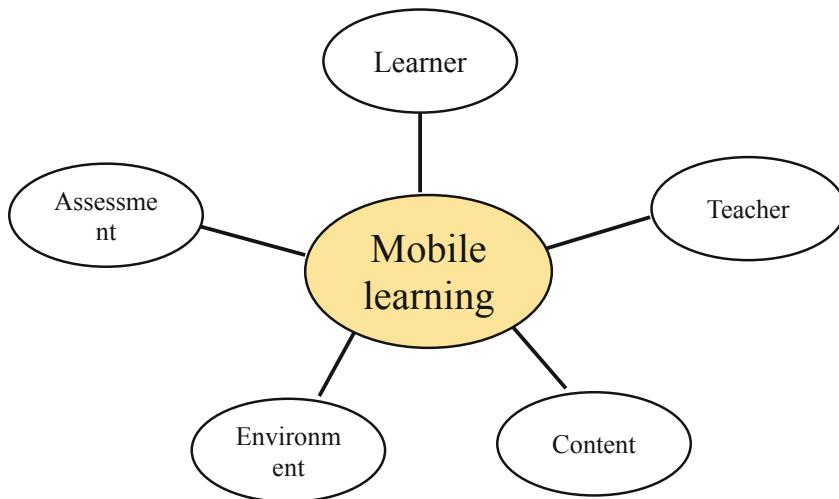
traditional industries to optimize resource allocation in traditional industries, reduce work processes in traditional industries, save costs, improve work efficiency, and provide the public with a convenient, efficient, and comprehensive solution to personal needs. In order to promote the new ecology and new development of traditional industries, this is the advantage brought by “Internet +” [2]. Therefore, in the “Internet +” era, traditional education informatization is bound to face reforms. The “Internet + education” model is the main form of the future development of education informatization [2], as shown in Fig. 1.



**Fig. 1.** Internet + education model

Mobile learning is a specific form of “Internet + education”. It has not yet a clear and unified definition. In the traditional sense, mobile learning refers to the use of mobile terminals such as smartphones, tablets, laptops, and wireless networks. Online learning platform, mobile storage or cloud storage and other teaching resource carriers, constitute learning behaviors that are not limited by time and space, using the network offline or online methods. According to traditional understanding, mobile learning of ancient Chinese can be divided into online offline learning and online learning. Online offline mobile learning course teaching resources, such as course videos, English literature, English speeches, video open classes, etc., are stored in the storage devices of mobile terminals, such as the internal memory of smartphones and tablets, and the hard disk of laptops. Although the learning process of students is not limited by time and space, the interaction is poor. Students encounter problems in the learning process and cannot ask questions, discuss and solve them in time [2]. The course learning process is relatively cumbersome when the method is imported into the mobile terminal; while the online mobile learning is an extension of the “Internet +” concept. Like the offline mobile learning, the learning process is not limited by time and space, and the advantage is that teaching resources are generally stored in the cloud platform, students

use mobile learning platforms and wireless networks for on-demand learning. Students can access the Internet at any time to find documents for auxiliary learning during the learning process [3]. When they encounter problems, they can use wireless networks and instant messaging software such as WeChat to establish discussion groups, discussion groups, for learning exchanges and sharing of learning resources between students or between teachers and students, can accept teachers' guidance, and can also open up ideas through discussions between students, so as to solve problems and accelerate students' internal absorption of new knowledge [3], as shown in Fig. 2.



**Fig. 2.** The learning mode of the mobile Internet

The ancient Chinese mobile learning mode generally does not adopt the form of webcast in specific practical teaching, because the webcast mode has a fixed teaching time, students need to cooperate with the teacher's teaching time for online learning, and it is not convenient to communicate with students in real time during the teacher's teaching process. Interaction, which is contrary to the concept of mobile learning, so mobile learning often adopts a network video-on-demand form that combines a variety of teaching methods [4]. The ancient Chinese mobile learning model constructed in this article is a multiple mixed mobile learning model of "Internet + micro-class + flipped classroom + MOOC" with the help of mobile terminals such as smart phones. This mobile learning model is based on flipped classrooms, integrating micro-class and MOOC teaching, and carrying out the entire teaching process with the help of mobile terminals such as smartphones, WeChat and the Internet [4].

Before class, the teacher recorded a micro-class video reflecting the key and difficult points of this Chinese class based on the teaching content of this class. The video content can use multi-modal teaching ideas through video, audio, posture, gestures, teaching aids, etc. The form reflects the main teaching content and key difficulties of the course [4]. The course micro-video time is generally about ten minutes, and the

longest is no more than fifteen minutes. This can stimulate students' senses such as vision and hearing to improve students' attention and inspire the purpose of students' interest in learning will not cause students to concentrate for a long time and high concentration due to excessively long teaching time, resulting in a sense of fatigue, thereby affecting the effect of autonomous learning. At the end of the video, the teacher can give some learning resources such as literature materials, English lectures and speeches that assist students in learning and accelerate students' understanding of the course content for students to consult and refer to. Mobile terminals such as mobile phones can watch course micro-videos online and conduct independent learning [5, 6]. Students can pause at any time while watching the micro-video of the course to think deeply about the difficulties of the course. They can also read materials through the Internet to assist their understanding at any time. They can also communicate with students and share learning resources through instant messaging software such as WeChat [7].

In class, teachers no longer have to repeat the content of the course too much. Instead, they will fully return the class time to the students so that students can have group discussions in Chinese to solve the problems encountered in the course of autonomous learning. The role of time is to coordinate students to discuss and answer questions that students cannot solve by themselves. At the same time, in order to activate the classroom atmosphere and fully mobilize students' enthusiasm for learning Chinese, teachers can ask students in groups to perform scene reproduction, role play, impromptu speech and other links in Chinese through the course content after the students' discussion [8].

After class, students use their smartphones to download homework in the cloud, and upload them to the cloud for correction by teachers [8]. Teachers can send the corrected assignments to students' mobile phones in real time via WeChat, so that students can keep abreast of the corrections and completion quality of their assignments. If students still have some knowledge points they have not understood after class, they can communicate with teachers in real time through instant messaging software such as WeChat to answer questions [9]. Students can also connect to the cloud platform via smartphones after class, watch the MOOC video of the whole course online, and deepen their understanding and memory of the course content by repeatedly watching, understanding and trying to figure out the whole course of the course [10].

### 3 The Learning Model of the Ancient Chinese Mobile Internet

#### 3.1 You Can Freely Control the Place and Time of Study

With the help of mobile terminals such as smart phones and campus wireless networks, mobile learning locations can be free from the limitations of traditional classrooms. Through campus wireless network coverage, students can study independently in playgrounds, bedrooms, classrooms, canteens, libraries, etc., Students' study time is relatively loose [10]. You can use a wide time specified by the teacher before class to reasonably arrange the study time you want to conduct self-on-demand learning of

course micro-videos. By repeatedly playing and watching the course videos, students can deepen their in-depth understanding of the key points and difficulties of the course, find out their own problems in the learning process, and can check the content related to the course through the Internet or the school network while learning. The supplementary learning resources and reference materials for self-inquiry and self-answering of questions can also be used to conduct real-time discussion of problems with students or teachers through WeChat groups and other methods, so as to find entry points and new ideas for solving problems [11].

### 3.2 Abundant Learning Aid Resources

Chinese learning resources on the Internet are very rich, such as English literature, newspapers, videos, lectures, MOOCs, micro-classes, video open classes and other resources. Through mobile terminals such as smart phones, you can easily access, download or download through the wireless campus network. Watching the above resources online can enable students to solve the problems encountered in the Chinese learning process through independent learning and independent access to materials during the mobile learning process, and to deepen their understanding, digest and absorb the key points and difficulties of the course and other important knowledge points, Improve the efficiency of internalization and absorption of knowledge [12]. At the same time, students can store useful Chinese learning materials in the cloud space. Through cloud storage and cloud computing technology, they can easily share and share Chinese learning resources among students. Teachers can also share Chinese language related to the course content [12]. The learning reference materials are classified and stored in the cloud space and shared through the cloud to facilitate students to download and learn, thereby narrowing the scope of students' search for course-related materials, saving search time, and transforming students' independent learning from independent learning to clustering, thereby improving.

### 3.3 Virtualization of Learning Space

Compared with the traditional classroom-teaching model, the mobile learning model is often a virtual space based on network technology, and now it is mostly a cloud platform. Through the cloud platform between teachers and students, and between students and students, although it is not possible to teach, listen and learn face-to-face between teachers and students like the traditional classroom teaching mode, but online learning in the cloud platform also has traditional classroom teaching Unmatched advantages. For example, students can watch online micro-videos taught by teachers for autonomous learning, students can communicate in real time with students, and they can discuss and solve problems in a timely manner [13]. They can also exchange learning experiences, share learning experiences and learning materials. Through the above methods, they can promote each other in the process of independent learning and jointly improve the effect of Chinese learning. Teachers can also assign and correct homework through the cloud platform, share Chinese learning reference materials, upload course videos for students to repeat learning in the future, and so on [11]. Therefore, the virtualized learning space can effectively make up for the lack of

traditional Chinese classroom teaching that only teachers teach alone. It can enable students to fully integrate into the teaching, through continuous discussion, solve problems independently, and stimulate students' interest in learning Chinese.

### 3.4 Help Improve Students' Comprehensive Ability to Use Chinese

The mobile learning model advocates that students study independently by watching micro-videos of the courses before class and consulting relevant course materials on the Internet. In the process of autonomous learning, students continuously stimulate their own senses such as vision and hearing by reading English literature, newspapers, and watching English lectures, speeches, public classes, etc., so that their senses and thinking are active, and they exercise their Chinese reading, Translation ability and Chinese listening ability [13]. At the same time, students can communicate and interact with classmates and teachers online in real time in the process of autonomous learning, constantly asking questions and answering questions raised by other classmates, deepening their understanding of Chinese knowledge and improving their ability to learn Chinese. In class, the students conducted group discussions in Chinese, which exercised their Chinese reading and communication skills [12].

### 3.5 Enhance the Affinity Between Teachers and Students

Mobile learning advocates independent learning through the Internet with the help of mobile terminals such as smart phones, which has changed the teacher-centered teaching style in traditional classrooms. During the learning process, students can interact with the teacher online in real time and accept the teacher is learning guidance. Because they are not directly communicating with the teacher in the classroom, some students who are not good at communicating with the teacher face-to-face can boldly ask questions and boldly communicate with the teacher. The teacher discusses the problem to solve the problem [13]. Therefore, some students who are not good at questioning and affect Chinese learning can gradually change their Chinese learning methods. At the same time, because of continuous communication with teachers, they can gradually narrow the distance between teachers and students and gradually cultivate the relationship between teachers and students. The affinity between teachers and students promotes and learns from each other, which plays a role in teaching and learning.

### 3.6 Strong Integration

Mobile learning is a very inclusive learning method, which contains the epitome of a variety of learning methods. It can be said that mobile learning is a framework and freely expandable learning method [14]. On the basis of the "Internet +" framework composed of mobile phones and other smart terminals, cloud platforms, and wireless Internet, mobile learning can integrate multiple novel teaching methods, such as multi-modal teaching methods, micro-teaching methods, flipped classroom teaching methods, and MOOC teaching methods. One or more methods in the teaching method, as its sub-

teaching method modules, can be freely combined and integrated with the main framework of “Internet +” [14].

## 4 Conclusion

This article is based on the “Internet +” ancient Chinese mobile learning model, which can change the drawbacks of the traditional ancient Chinese classroom teaching model. It is a combination of flipped classroom teaching, micro-class teaching, multi-modal teaching, MOOC teaching and other modes. Diversified teaching mode system. The ancient Chinese mobile teaching model, which encourages students to use smart phones and other mobile terminals to watch course micro-videos before class, and use the Internet to check materials online for autonomous learning, can generally be accepted by young college students, stimulate their interest in learning, and change the class. The traditional classroom teaching organization form of ancient Chinese returned the classroom to students. Through group discussion, scene reproduction, role playing and other curriculum practice, students’ initiative and enthusiasm in learning were improved, and the comprehensive quality of students’ Teaching is not only limited to classroom lectures, it is more important to cultivate students’ autonomous learning ability and the ability to ask questions and solve problems, and ultimately enable students to apply what they have learned in ancient Chinese.

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# The Relationship Between Social Adaptability and Slow Employment of College Students - Based on Amos Data Model

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**Abstract.** Through AMOS and SPSS data analysis software, an intermediary model of social adaptability, personality and slow employment of college students was established. In this paper, with the help of advanced scales at home and abroad, college students from all over China ( $N = 500$ ) were investigated. The effective rate was 89%, and the Alpha was 0.835. Therefore, the sample is reliable. In addition, through correlation analysis, it is found that college students' social adaptability has an impact on slow employment. The Bootstrap and AMOS mediating path models were used to find that personality has mediating effect between social adaptability and slow employment. To be specific, extraversion is the only mediator between learning and continuance. Emotionality is the only mediator between interpersonal and dispersion.

**Keywords:** Data model · Bootstrap · Mediation effect · Slow employment

## 1 Introduction

Recently the outbreak of COVID-19 has affected the global economy, the employment environment is increasingly fierce and severe, and the college students are facing unprecedented employment pressure. Some slow employment phenomenon begins to appear. According to the survey, among the 93,420 graduates surveyed, 9.8% chose “slow employment”, higher than those who chose “continue to study in China” or “continue to study abroad”. The employment of college students plays an important role in social and economic development and stability. Thus, it is of great significance to study the phenomenon of slow employment.

At present, domestic scholars still have little research on the phenomenon of slow employment of college students, and there is a lack of empirical research on the slow employment phenomenon. It mainly focuses on the factors affecting the slow employment of college students, including their employment values, family environment and employment environment. There are few studies on social adaptability (including learning adaptability, interpersonal adaptability and frustration adaptability) and personality of college students. Wenzhi Bian pointed out that many graduates think that it is better to wait for their first job than to settle for it [1]. They hope that they can get their first job in one step. It can be divided into the following three types: continuance, search and dispersion [2]. Social adaptability is a harmonious state that

college students achieve by interacting with the social environment [3], including learning, interpersonal and frustration adaptability [4, 5]. Therefore, the social adaptability of college students may affect the choice of slow employment. In addition, American psychologist Allport believes that personality determines the uniqueness of individual adaptation and can trigger people's behaviors and actively guide people's behaviors. Meanwhile Juan Wang also found a significant correlation between personality and employment [6]. Therefore, there may be a certain relationship between social adaptability, personality and slow employment [7, 8].

To sum up, this paper deeply analyzes the relationship between social adaptability and slow employment of college students through empirical research, and discusses whether there is a personality-mediated effect between them. We verify the relationship between variables by exploring the relationship between the dimensions of each variable. From the perspective of human resource management, this paper provides references for enterprises and government departments, hoping to put forward more constructive suggestions on college students' self-personality cognition, improvement of social adaptability and employment.

## 2 Method

### 2.1 Participants

This survey adopts Likert five-point scale to conduct questionnaire survey, including basic information collection and subjective questions. The subjects were mainly college students from all over China. A total of 500 questionnaires were issued and 450 valid questionnaires were collected, with an effective rate of 89%. Demographic information consisting of age, sex, living arrangement (with family, dormitory, rented flat with other). Questionnaires ( $N = 445$ ) was used for the final overall analysis.

### 2.2 Measures

#### 2.2.1 Social Adaptability Diagnostic Scale

According to the diagnostic scale of social adaptability ability[9] compiled by Richang Zhang and based on the research content of this paper, the questionnaire consists of 10 items and divides the social adaptation ability of college students into three dimensions: learning and interpersonal and frustration.

#### 2.2.2 The Lesser Five Personality Scale

Based on the questionnaire of big five personality factors [10] compiled by Hui Zhou and revised by Hong Zhou, it is mainly used to measure the personality tendency of Chinese teenagers. Based on the research in this paper, the small Five Personality Scale for college students is compiled. The questionnaire consists of 16 items, including 4 personality dimensions: extraversion, agreeableness, emotionality, prudence.

### 2.2.3 Slow Employment Scale

In this paper, the slow employment of college students is divided into three types: continuance, dispersion and search. Three items are set, and the score is set the same as the above two scales.

## 2.3 Results

### 2.3.1 Reliability

SPSS23.0 was used for the reliability analysis of the scale, and the results were shown in Table 1, with an Alpha value of 0.835. It indicates that this scale has good reliability and validity.

**Table 1.** Questionnaire reliability test

Alpha	Alpha (standard)	Items
0.835	0.847	29

### 2.3.2 Correlation Analysis

In order to understand the relationship among social adaptability, slow employment tendency and personality of college students, the correlation analysis of each dimension is carried out. Its correlation coefficient is as follows:

**Table 2.** Correlation analysis of all dimensions

	1	2	3	4	5	6	7	8	9	10
1	1									
2	-0.24*	1								
3	-0.167*	0.223**	1							
4	0.286**	0.037*	-0.122*	1						
5	0.297**	0.160**	-0.102*	0.575**	1					
6	0.154**	-0.222*	-0.151*	0.035*	-0.117*	1				
7	0.169*	0.028*	-0.093*	0.427**	0.526**	-0.80*	1			
8	0.235*	0.217**	0.245**	0.530*	0.460**	0.344*	0.535**	1		
9	0.265**	-0.001**	-0.123*	0.337**	0.119*	0.240**	0.119*	0.280*	1	
10	0.257**	0.044**	-0.150*	0.650**	0.471**	0.028*	0.154*	0.387**	0.447**	1

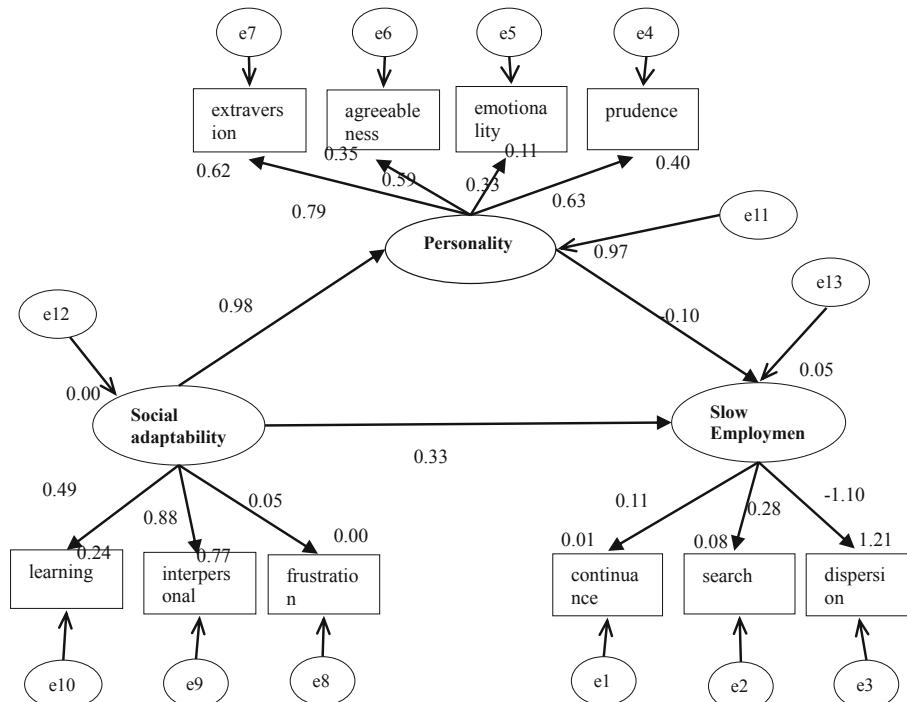
Note-(1 = continuance; 2- = search; 3 = dispersion; 4 = extraversion; 5 = agreeableness

6 = emotionality; 7 = prudence; 8 = frustration; 9 = learning; 10 = interpersonal)

The correlation analysis in Table 2 shows that there is significant correlation among all dimensions. This indicates that the social adaptability, personality and slow employment of college students are correlated. It provides support for further data validation.

### 2.3.3 The Mediating Role of Personality

In order to further study the internal relationship among personality, slow employment and social adaptability. In this study, the mediating test is carried out on the basis of correlation of all dimensions and the mediation effect test program proposed by Wen Zhonglin is adopted, and based upon the Bootstrap method proposed by Preacher and Hayer. According to the above mediation test method, the items with relevant relationships were tested successively, that is, whether  $A * B$  was significant [11, 12], and the following results were finally obtained (Fig. 1).



**Fig. 1.** The mediating effect path model of personality traits on slow employment and social adaptability

We can see that social adaptation plays a part of mediating role in slow employment through personality traits. There was a direct correlation between social adaptability and slow employment, with a direct effect value of 0.33. At the same time, social adaptability can also produce mediating effect through the mediating effect of personality traits and slow employment, and its mediating effect value is -0.098. The total effect value was 0.428, and the ratio of mediating effect to total effect was -0.228. In addition, the dimension of personality has the only mediating effect in social adaptability and slow employment (Table 2 and Table 3).

**Table 3.** The mediating role of extraversion on learning and continuance

Y X coefficient	Intermediate coefficient			BootLLCI	BootULCI		
	M a	b	c'	LLCI	ULCI		
	0.5305	0.2419	0.1548	-0.1646	0.4742	0.0219	0.2982

Note-(Y = continuance; X- = learning; M = extraversion)

It can be seen from the above table, Firstly, the mediating effect of extraversion is significant ( $LLCI = 0.0219$   $ULCI = 0.2982$ ). It is not containing 0. Besides, the mediation test ( $a * b$ ) is 0.0067. Secondly, the direct impact of independent variable on dependent variable is seen, that is, whether  $C'$  is significant. The interval is ( $LLCI = -0.1646$   $ULCI = 0.4742$ ) containing 0, indicating that  $C'$  is not significant. Therefore, the intermediary is established (Table 4).

**Table 4.** The mediating role of emotionality on interpersonal and continuance

Y X coefficient	Intermediate coefficient			BootLLCI	BootULCI		
	M a	b	c'	LLCI	ULCI		
	0.3334	-0.3053	-0.2716	-0.5737	0.0305	-0.2278	-0.163

Note-(Y = continuance; X- = learning; M = extraversion)

It can be seen from the above table; First, the mediating effect of extraversion was significant, with the interval ( $LLCI = -0.2278$   $ULCI = -0.163$ ). It is excluding 0. Besides, the mediation test ( $a * b$ ) is 0.0037. Secondly, the direct impact of independent variable on dependent variable is seen, that is, whether  $C'$  is significant. The interval is ( $LLCI = -0.5737$   $ULCI = 0.0305$ ) containing 0, indicating that  $C'$  is not significant. Therefore, the intermediary is established.

### 3 Conclusion

On the basis of previous relevant studies, this paper conducts research on Chinese college students in the form of questionnaire. Statistical methods such as single factor ANOVA analysis, correlation analysis, mediating factor analysis and path model analysis were used to discuss the relationship among personality, social adaptability and slow employment. The conclusion is as follows.

- (1) the social adaptability, personality and slow employment of college students are correlated
- (2) social adaptability of college students has a positive effect on slow employment.
- (3) personality played a mediating role in this relationship. The concrete mediating effect is as follows. Firstly, extraversion is the only mediator between learning and continuance. It shows that learning can directly affect the continuance, and it can

also affect the continuance through extroversion. Secondly, emotionality is the only mediator between interpersonal and dispersion. It shows that interpersonal can directly affect dispersion and can also affect dispersion through emotional personality.

## 4 Recommendation

According to the above researches, the social adaptability, personality and slow employment of college students are correlated. The social adaptability of college students can directly influence their choice of “slow employment”, and can also influence them through their own personality. Therefore, in view of the above research results, this paper will put forward relevant Suggestions from college students and school departments.

In the first place, suggestions for slow employment of college students. College students with high extroversion enjoy contact with people and often feel positive emotions, but low extroversion tend to be quiet, cautious and don't like to contact with the outside world [13, 14]. Therefore, if a college student with high extroversion also has high learning adaptability, he can try different choices according to the personality characteristics of extraversion, such as study Tours, entrepreneurial investigation and so on. Students with these characteristics can try to learn more useful knowledge or skills, get in touch with more things to enrich themselves, and have a clearer understanding of their employment goals, so as to provide references for their final employment choice. Besides, College students with high interpersonal adaptability generally have high social skills. They are good at dealing with all kinds of people, dealing with complex interpersonal relationships, and controlling their emotions reasonably and effectively. They may hold a position in the class or community organizations in general. But people with relatively weak interpersonal may be introverted, easily emotional, and have unclear goals when making employment decisions, so they are more likely to become a group with slow employment. Therefore, college students with unclear employment goals should pay more attention to their emotions, learn to control their emotions, and be cautious before making decisions.

Besides, For schools, we should pay attention to the differences of personality traits of college students and teach them in accordance with their aptitude [15]. It can be confirmed that attention should be paid to the cultivation of students' social adaptability. Therefore, schools should pay attention to the combination of generalists and specialists when arranging courses and carrying out teaching quality assessment, and the combination of basic and applied disciplines, and the combination of learning and social skills. Especially in the face of the sudden COVID-19 epidemic, schools should build a comprehensive employment guidance service system through the combination of “online and offline”. At the same time, psychological health education should be embedded in employment guidance, so that students can timely adjust their bad psychology in the employment process, so as to improve their psychological ability to work under pressure, with a good attitude to choose employment.

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# Research on the Role of Self-media to the Brand of Private Universities

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**Abstract.** The competition among private universities in terms of talent introduction and school resources is becoming increasingly fierce. Improving competitiveness through brand building has become a problem that private universities must face. In the management of private colleges and universities, brand operation and management is an important content, and it is even more important in the self-media era. In today's era of deep influence from the media, marketing has become a necessary measure for all occupations, and competition between universities will naturally evolve into brand competition for private universities. Private colleges and universities must establish correct brand management concepts based on their own characteristics and the external environment, formulate brand marketing strategies to promote their own development, and create a more distinctive brand image of private colleges and universities. This article puts forward specific strategies by analyzing the status quo of brand marketing management of private colleges in the self-media era.

**Keywords:** Self-media · Private universities · University brand · Brand strategy

## 1 Introduction

China's higher education has become popular. The types and levels of private colleges and universities are diversified. Only famous universities can win the recognition of higher education consumers. Although public, private and private colleges and universities have state support and subsidies, the resources that schools rely on for survival and development cannot do without the market. Since the media has become the fastest growing and most widely spread new media after websites, forums and other network media [1]. Its uniqueness, convenience, interactivity, and diversity make itself a trend and play in all occupations. Plays an important role. Facing such opportunities and challenges, colleges and universities must seize the opportunity to attach importance to and strengthen the role of We-media in the brand marketing management of private universities [2]. This is the demand for the development of higher education itself, and it is a part of the management of private universities. The shortcomings of traditional university Chinese classroom teaching mode.

## 2 The Basic Idea of Brand Communication

### 2.1 The Most Unique and Valuable Part of a Brand is Usually Manifested in Its Core Values

Regarding the brand's core value recognition, it is possible to try a variety of different means for brand promotion [2]. For example, newspapers, television and other media can also be modern Internet media. Each has its own merits, and they can all learn from each other, shown as Fig. 1.



Fig. 1. Brand promotion

### 2.2 Brands at Different Levels Have Their Own Brand Promotion Strategies in Line with Their Own Development Stages

Brands at different levels are in different stages and core brand building. In fact, the brand is selling culture and spreading its own cultural characteristics, such as the free culture of NIKE, the personality culture of Apple mobile phones, and so on [2]. Therefore, brands at different levels, after recognizing their own stage and the core of brand building, should gradually transition from product promotion to brand communication stage.

## 3 The Importance of Brand Building of Private Universities

### 3.1 The Important Role of Private Colleges' Brand Building in the Construction of Talent Team

In recent years, private colleges and universities across the country have been offering higher and higher prices to recruit talents. In particular, the competition for high-end talents and scientific research teams has gradually intensified. Various private colleges

and universities have not only repeatedly set new highs in the salary and treatment of introduced talents, but also have given generous policies in terms of teaching and scientific research resources. The purpose of the competition for talents by private universities is to provide impetus for the development of the school, strive to occupy a place in the new round of “double first-class” construction, and strive for more policy and resource support [3]. According to the “Double First Class” selection rules, the Ministry of Education will refer to influential third-party evaluations to evaluate the effectiveness of the “Double First Class” construction of private universities [4].

### **3.2 The Important Role of Private Colleges’ Brand Building in Enrollment**

With the reform of the college entrance examination and postgraduate training system, outstanding high school, undergraduate and master graduates have more choices when applying for the exam. In recent years, many private colleges and universities have adopted various forms such as independent enrollment, summer (winter) camp, and summer school, hoping to lock in the source of excellent students in advance [3]. In the registration stage of college entrance examination and postgraduate examination, candidates and parents are increasingly relying on popularity, university rankings and subject rankings to choose schools and majors.

### **3.3 The Important Role of Private Colleges’ Brand Building for Student Employment**

Today is the era of the popularization of higher education. The number of college students graduating each year continues to grow, and the employment competition among college students is becoming increasingly fierce. Under normal circumstances, when an employer faces a large number of job seekers, the fastest way to select outstanding job seekers is to judge by the popularity and influence of the school and the profession. In this case, private universities can build a good reputation through brand building, which can improve the employment competitiveness of students to a certain extent [4].

## **4 The Status Quo and Problems of Brand Building of Private Universities**

### **4.1 Lack of Awareness of Brand Building and Lack of Unified Planning**

Many private colleges and universities are still using the traditional “propaganda + enrollment + employment + group study + other” segmented thinking, and do not consider brand building from an overall perspective. Brand building-related work is often scattered in multiple departments, and there is no unified planning at the school level, which has caused a waste of resources, talents and opportunities to a certain extent [4].

## 4.2 The Brand Image is Too Serious and Keep the Audience Away

With the gradual intensification of competition among private colleges and universities, the traditional serious image of private colleges no longer meets the needs of brand building of private colleges [5]. Regardless of whether it is a job search for talents or a student's study, in addition to considering the "hard conditions" such as salary, geographical location, teaching facilities, and campus environment, they all hope to work in a university that pays attention to the appeals of teachers and students and considers the interests of teachers and students [5].

## 4.3 Inappropriate Media Communication Strategy Cannot Continue to Produce Positive Influence

First, the traditional brand image construction of private colleges and universities has the problem of focusing on traditional media and ignoring self-media. The annual publicity funds of private colleges and universities are invested in traditional media such as newspapers, TV and websites, but insufficient investment in We-media such as WeChat, Weibo, Douyin, etc., which forms a huge contrast with the actual reading contribution of We-media [6].

Secondly, the publicity departments of some private universities do not have a good communication mechanism with functional departments and secondary colleges, which leads to the neglect or delay of pushing news materials with brand building value, and missed opportunities to build brand image [6].

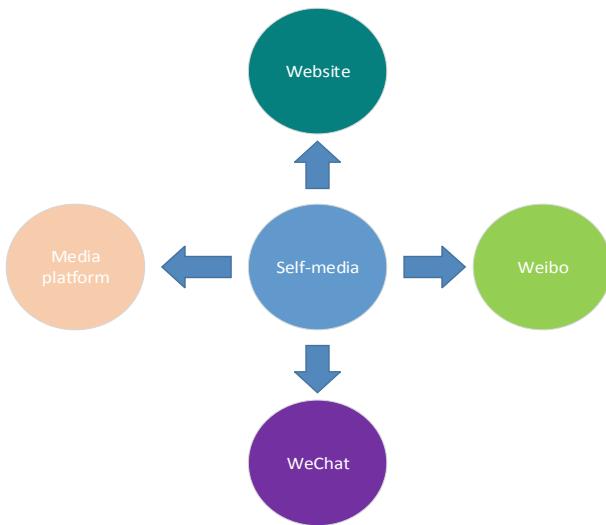
# 5 Strategies for Brand Building of Private Universities in the Self-media Environment

Brand strategy includes two aspects: one is to determine one's own comparative advantages or characteristics through strategic positioning; the other is to allocate all resources in the organization and conduct operation management based on the "feature" as the guide. The same goes for private colleges and universities. The self-media platform represented by Weibo and WeChat, as a new type of information dissemination tool, is favored by teachers and students on university campuses, and plays a significant role in brand marketing and management of private universities [7]. Self-media plays a value-oriented function of spreading ideas and constructing concepts on and off campus. Schools should increase their application awareness and form a systematic plan for the application of We-media in school brand marketing [7].

## 5.1 Enhance School Brand Marketing

Established brand management department, branched out from media marketing. Schools should make a scientific and reasonable plan for school brand marketing and management. Basically, privately-run universities have their own self-media, but there are not many self-media with significant effects. This is because the school lacks attention and professional teams. Private colleges and universities have advantages in

scientific research and talents [8]. We must make full use of this advantage and form a professional self-media team in the school to make better use of self-media to promote the development of the school brand, as shown in Fig. 2.



**Fig. 2.** Self-media platform promotion

## 5.2 Take Advantage of the Self-media Approach

One is the efficient use of WeChat official accounts. The school should form a professional WeChat public account team, and publicize the achievements of well-known alumni and the achievements of special professions. The second is to promote micro-courses. Although micro-courses now seem to be widely used, the actual utilization rate is not high. Schools should carefully develop micro-courses that can be used by students, create professional characteristics, and show special educational methods and concepts [8]. The third is to play the role of well-known professors. The academicians and well-known alumni who teach are all school brands. The school can invite these celebrities to hold some lectures and pre-warm up on the self-media platform, allowing people inside and outside the school to listen. The fourth is to form a group of well-known alumni [9].

## 5.3 Combine Traditional Methods with Self-media

We media's advantages must be based on traditional methods. Education should not have the slightest ambiguity. It needs long-term accumulation, not short-term prosperity. School leaders should not rush for quick success, but should focus on long-term effectiveness, and create a good academic and cultural atmosphere with solid historical accumulation [9]. At the same time, it is necessary to focus on the development of its own characteristics, clarify its advantages, and promote the overall improvement of the strength of private universities.

## 5.4 Prevent Micro-degradation and Reduce Negative Effects

The school must give full play to the role of professional departments and keep abreast of the latest developments of the incident so that the incident can be handled in a timely and proper manner [10]. At the same time, schools must unblock and integrate, not only use administrative means, but also unblock and guide, cultivate college students' self-media literacy, and minimize negative effects. In addition, the school should establish a harmonious relationship with the government, parents and other interested parties, and maintain the brand [10].

## 5.5 Media Communication Strategy

To maximize the effect of brand building publicity activities, the characteristics of media communication and the law of information communication must be considered. We-media, represented by WeChat, Weibo, live broadcast, and video clients, has obvious advantages in fast content distribution, user interaction, precise push, and fission communication, as shown in Fig. 3. Traditional media such as newspapers, television, radio, news websites, etc. still have a great advantage in the field of one-way information transmission, and are regarded by the public as an authoritative source of information [11]. The content dissemination of traditional media and self-media has an interactive effect, traditional media can be used as an authoritative source of information, and self-media is suitable for rapid distribution or secondary transmission. In each brand communication planning, it is necessary to fully consider the characteristics of various media communication rules and make appropriate designs. When designing a media communication plan, it is necessary to fully consider what needs to be distributed on the platform according to the communication characteristics of different platforms, the sequence of distribution, time interval, and interaction methods, etc., and if necessary, design multi-stage communication and regular review and summary [11].



**Fig. 3.** Advantages of a good brand

## 6 Conclusion

Under the conditions of a market economy, efficient brand marketing is the inevitable development of education, and it is the need of China's development in education innovation and competition. Of course, the core value of the school brand comes from the concept of educating people. While brand marketing, we must not forget the fundamentals, and we must still put education first. The traditional way of brand marketing and self-media complement each other, which will bring huge results to brand marketing and school management. Private colleges and universities must use both traditional methods and self-media methods in a reasonable manner in order to participate in the competition in the higher education market, improve quality and efficiency, keep pace with the times, and continuously promote the construction and development of schools.

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# Research on Blended Learning Methods of College Chinese Under the Background of “Internet+”

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**Abstract.** In the context of the “Internet+” education revolution, the hybrid teaching model has been gradually introduced into the education and teaching process of schools. School education staff independently meet the test of this teaching model, gradually change their thinking in teaching activities, optimize their own teaching ability, and create a relatively high-quality learning environment for students, which has become an inevitable requirement of education in the new era. As a general education subject of the school, college Chinese can enrich students’ humanistic literacy and comprehensive Chinese culture, which requires professional teachers to pay special attention to it and construct a mixed teaching classroom under the positive influence of Internet technology.

**Keywords:** “Internet+” · College Chinese · Mixed style · Learning style

## 1 Introduction

The college Chinese course is a public course in higher education. Since it is a public course offered, it is necessary to pay attention to the depth and breadth of teaching in the actual college Chinese teaching. Under the macro background of education reform and development, the previous rigid language teaching model with multimedia PPT as the core gradually showed some drawbacks, and gradually failed to keep up with the rapid development of the times, catered to students’ preferences, and failed to stimulate students’ learning [1]. In the Internet+ environment, based on the combination of online and offline, to build a blended teaching, this is a new way for college Chinese teaching.

## 2 The Shortcomings of Traditional University Chinese Classroom Teaching Mode

### 2.1 Teachers Dominate, Students Lack Initiative

College Chinese is a public basic course in universities, which is extremely practical and requires the active participation of students. However, in some undergraduate colleges and universities, teachers often occupy a dominant position in the classroom.

The status of teachers is too enlarged. The teachers [1] often determine the content and methods of teaching. The teachers themselves also determine the content and how to teach. Students are completely in a passive position in college Chinese classes, lacking initiative, insufficient participation in the classroom, lack of learning consciousness and enthusiasm, and the subject status of college students in college Chinese classes is seriously ignored [1].

## 2.2 Teaching Aims at Mastering the Language and Lacks Ability Training

Traditional university Chinese is mainly aimed at teaching language and learning language knowledge, and all the teaching arrangements of teachers are for this purpose. Various language exercises and communication activities in the classroom are also carried out around the knowledge points in the teaching plan, all for mastering the knowledge points. Therefore, the various exercises in the class lack practicality and have no practical meaning. In addition, students also need to take the college Chinese proficiency test. The main task of students is to deal with the university language test by practicing and memorizing in and out of class [2]. At present, the teaching of a large amount of language knowledge in college Chinese classes is not conducive to the improvement of students' application ability.

## 2.3 Teaching Methods Are Rigid and Backward, and Language Learning Lacks Flexibility

The traditional university Chinese teaching model is rigid and backward, overemphasizing the teaching of language knowledge, especially the explanation of grammar and vocabulary, which takes up a lot of classroom time. Most teachers still focus on the teaching of language knowledge in classroom teaching, with mechanical language exercises. In this way, students see the university Chinese class as a process of learning Chinese knowledge, memorizing grammar and vocabulary. Students' learning methods are also mainly mechanical memory and mechanical exercises, which lack the necessary communication and application [2]. The single backwardness of teachers' teaching methods leads to students' lack of flexibility in language learning, and they are rigidly applied.

## 3 The Practical Significance of “Mixed Teaching Mode” in College Chinese Class

“Hybrid teaching mode” is derived from the background of the Internet information age, and is proposed for online teaching. It has been committed to a new teaching mode that combines online virtual teaching with traditional physical classroom teaching. It is widely used in the current college Chinese classroom teaching process.

### 3.1 The Mixed Teaching Mode Adds More Real and Rich Teaching Resources to the Chinese Classroom

The emergence of numerous online data information and teaching videos has provided college students with more ways to directly access real and effective learning resources. In this learning process, students can directly perceive the impact of the Chinese environment, breaking the time and space restrictions of Chinese professional teachers' classroom teaching, and providing students with another learning platform with rich resources and not limited by time and space. Therefore, in the context of the Internet era, students can receive the latest news and richer and more professional knowledge on the Internet, the diversity of online information can flood the students' minds, and it is based on videos, animations, music and pictures [3]. Ways to spread, which brings many convenient conditions for students to learn Chinese.

### 3.2 Promote Efficient Interaction Between Students and Teachers

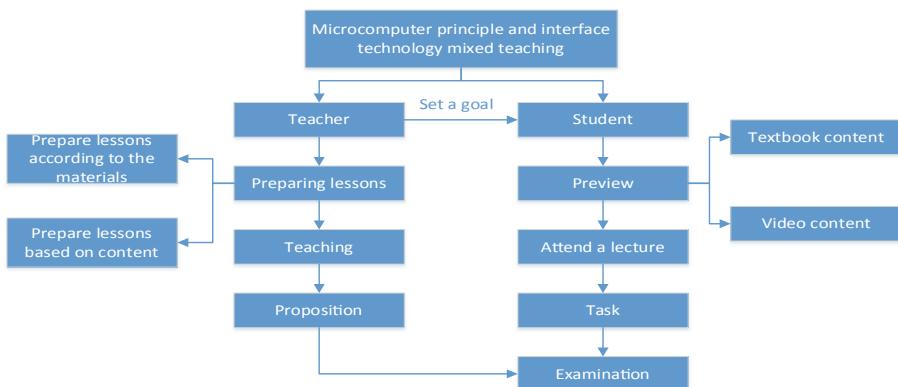
The ultimate goal of college Chinese teaching is to play to the students' maximum learning potential and strengthen the students' comprehensive Chinese and humanistic qualities. However, due to the obvious differences in students' individualization, the educational environment, economic conditions and professional teachers' teaching levels experienced are uneven [3]. Under such circumstances, it is more difficult to achieve various teaching goals through unified teaching or a limited three-foot podium. However, Internet technology efficiently handles this problem. College students can select interesting learning modules online according to their own learning foundation and ability to make up for their shortcomings, improve their abilities, and develop their individuality. In addition, Chinese teachers can also post independent homework, including online homework, to exercise students' independent learning ability and independent personality development, so that college students can use online learning tools to actively complete learning tasks and achieve learning goals [4].

### 3.3 Comply the Development Requirements of the Information Learning Ecology

Under the Internet age background, students almost grew up in a data based environment. They are familiar with network skills, and the learning ecology has strong modern development characteristics and information-based learning characteristics. If the professional teachers in the school's internal Chinese classroom still use the old teaching model, then students will think that the teacher lacks modern teaching characteristics and advanced teaching thinking, and cannot actively cooperate with the teacher to complete the teaching task, which will achieve the teaching goal for university Chinese teachers. It is very unfavorable [4]. Therefore, under the reference of the mixed teaching model, college Chinese teachers can flexibly use advanced and scientific teaching methods and tools in the education market to improve students' learning enthusiasm and enhance their comprehensive Chinese literacy.

## 4 The Idea of Constructing Mixed Language Learning Under “Internet+” Background

The traditional teaching mode of college Chinese pays attention to listening, speaking, reading and writing, which helps to cultivate students' basic abilities. The new mixed teaching model also starts from these four aspects. Teachers should formulate teaching methods according to the actual situation in order to achieve better results [5]. The main body of the mixed teaching model is the students. First of all, by analyzing the actual situation of the students to determine the teaching goals, can we formulate a reasonable teaching plan and achieve good teaching results [5]. Secondly, according to the actual situation of the students, practical technical means are adopted to ensure that students of different levels can learn good knowledge. After teaching the course, teachers can interact with students in various forms, such as PPT display, WeChat video, Douyin, Weibo and other interactive methods, which can not only effectively improve students' interest in learning, but also increase students' learning enthusiasm. Finally, when designing a teaching plan, teachers should consider from the perspective of students. The teacher's teaching design should adapt to the age and psychological characteristics of the students, and should give full play to their abilities in the learning process, as shown in Fig. 1. Blended teaching can not only help students improve their learning ability and comprehensive literacy, but also promote their learning. Cultivate students to become the applied technical talents needed for the future development of enterprises [6].



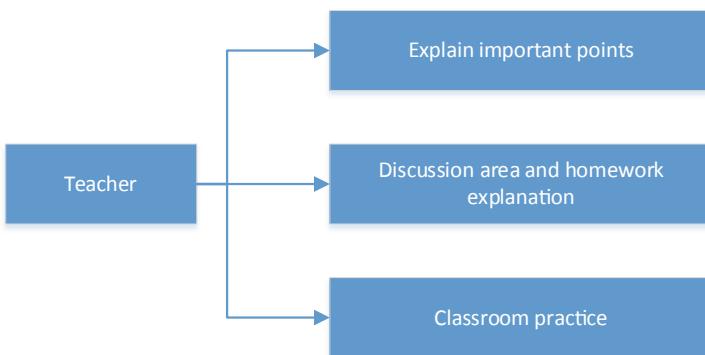
**Fig. 1.** The overall design block diagram

## 5 Internet+ Hybrid Chinese Teaching Mode

### 5.1 Update the Original Teaching Concept

Traditional college Chinese teaching, most teachers are the main body. Teachers, as knowledge imparters, occupy the main part of the classroom. Students can only

passively accept the knowledge instilled by the teacher during the learning process [6]. In teaching process in the mixed mode of college Chinese, the students are the main body, and the teacher acts as the organizer and participant of the teaching classroom to assist students in completing various classroom tasks, so that students become the real subject of classroom learning, and teachers are helping students adapt to themselves. In the process of new roles, we should also focus on cultivating students' subjective consciousness, as shown in Fig. 2. For example, in the process of students learning words, students can take the method of reading, and teachers can correct and listen to the side. This learning method can make students remember the words more deeply, and can make students better adapt to new roles [7].



**Fig. 2.** The part of the classroom teaching design

## 5.2 Change the Single Teaching Method

In traditional university Chinese teaching, teachers mostly use a single teaching method to teach. Under the background of “Internet+”, the application of the mixed teaching mode of university Chinese mainly focuses on two Chinese courses: audio-visual courses and comprehensive Chinese courses to teach students [7]. The audio-visual class mainly exercises students' listening and speaking abilities. Teachers display the corresponding language teaching materials in various forms such as watching teaching videos, listening exercises, and exchanges and discussions, ask relevant questions about the materials, and ask students to learn through thinking and communication answer. Explain the key and difficult points of language knowledge and cultural knowledge, and cultivate students' basic abilities in listening, speaking, reading, writing, and translation [8]. Teachers focus on textbooks to explain comprehensive training of language and cultural knowledge, and students' basic abilities in five areas.

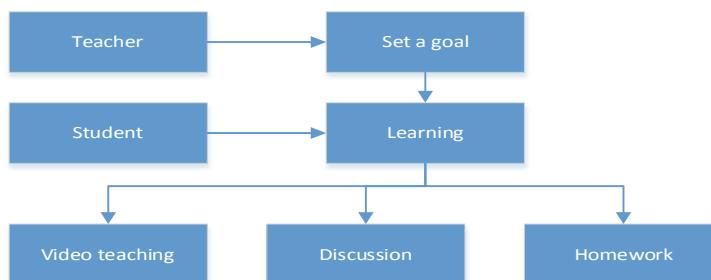
## 5.3 System Training Teachers

Under the background of “Internet+”, in the application process of the university Chinese mixed teaching model, the school should provide professional training for teachers, focusing on three aspects of teaching concept, education method and

professional quality, and focus on improving the comprehensive quality of teachers to adapt to the times development [8]. Therefore, schools can train university language teachers in batches, communicate and discuss with teachers from other schools or departments, and choose the best. Schools can also regularly invite professionals to give lectures to provide teachers with teaching experience.

#### 5.4 Auxiliary Chinese Classroom Teaching

Compared with traditional teaching classrooms, multimedia classrooms occupies many advantages. With the popularization of “Internet+”, multimedia equipment is gradually being used in teaching [9]. Multimedia equipment assists Chinese classroom teaching and transforms a single traditional classroom mode into a diversified teaching mode. With the help of multimedia equipment, the display of language is more vivid and the focus is more prominent, thereby promoting students’ learning of Chinese knowledge. For example, when learning Chinese articles, teachers can download some good music in the multimedia equipment, so that students can appreciate the music while studying the text, and deepen the memory of the text. Although multimedia equipment has been popularized in every classroom, teachers do not pay attention to the production of multimedia courseware, resulting in poor quality of courseware and unsatisfactory teaching effects, which affects the learning efficiency of students to a certain extent. Therefore, college Chinese teachers should pay full attention to multimedia-assisted Chinese classroom teaching, earnestly do a good job of multimedia teaching courseware, and improve teaching effects [9]. Only by improving the quality of courseware can the effect of multimedia-assisted Chinese classroom teaching be better reflected, as shown in Fig. 3.



**Fig. 3.** The teaching part design

#### 5.5 Gradually Strengthen the Teaching Ability of Chinese Teachers and Increase the Interaction Between Teachers and Students

In the actual college Chinese classroom teaching, if Chinese teachers want to use the blended teaching model to optimize the Chinese teaching classroom, the first thing they must do is to use advanced online teaching tools to strengthen their professional teaching qualities and create a strong online line for students with a literary atmosphere.

Under the combined learning environment [10]. A good learning atmosphere can enhance students' learning motivation, and the use of blended teaching methods in ordinary college Chinese classroom teaching can strengthen students' learning mentality and enrich students' language knowledge. Chinese teachers should also lower their teaching attitude, communicate with students in a cordial and kind manner, and become listeners and guides of students [10].

## 6 Conclusion

Overall, in the context of the development of the Internet era, various advanced and scientific teaching tools have poured into college Chinese teaching classes, directly affecting the traditional teaching mode of Chinese teachers, and bringing new development opportunities to college Chinese teaching classes. However, the old teaching model cannot be completely replaced. This requires Chinese teachers to use a blended teaching model to efficiently integrate the advantages of traditional teaching and Internet teaching to create a relatively high-quality learning platform for students.

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# New Ideas for College Physical Education Development Under the Background of “Internet+ Education”

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**Abstract.** In the new era, China's economy is developing very rapidly. Under such circumstances, science and technology have also been well developed. In the continuous development process and progress, the big data era has made education respond to the development of the times to a certain extent. From the current overall situation, under “Internet+” background, physical education and related teaching in Chinese colleges also need to actively respond to the development of the times and make a certain degree of change. In the continuous change process, reform, and progress, we must first realize. The relevant background and relevant models have positive promotion value and significance for education, and then carry out relevant teaching reforms in line with the actual situation, and propose targeted strategies and measures to improve the final effect.

**Keywords:** Internet+ · Education · College sports · Physical education

## 1 Introduction

“Internet+” is an emerging industry with current China's information technology development background. As an emerging technology, “Internet+” integrates traditional industries and the level of informatization, and promotes the sustainable and healthy development of many industries in China. “Internet+” background the impact of the physical education reform in colleges is very positive and obvious [1]. This can not only effectively improve the efficiency of physical education in Chinese colleges, but also provide a reference for the college physical education reform.

The information technology application driving modern education level is the main feature of “Internet+” education, and it is also the main development direction of China's current strategic goals in the education field. It is of great benefit to achieving the leapfrog development of education. Over the years, after vicissitudes of change, the physical education reform in Chinese colleges still cannot be separated from the traditional teaching concepts [1]. The physical education model based on skills exercise and training is still deeply rooted. The ideology of college physical education is lagging behind, teaching content and related teaching methods, and teaching system of evaluation, Unable to follow the pace of development of the times. This not only violates the related purpose physical education reform of college, but also is not conducive to

the needs of current college physical education teaching goals, violates the learning connotation of students, and it is not conducive to the formation and development of students' lifelong sports awareness [2]. Therefore, the physical education reform in Chinese colleges needs to effectively learn from the background of "Internet+", analyze the construction of college sports information teaching platform, build diversified teaching evaluation system content, and use network resources to build efficient classrooms, and continue to promote Internet technology effectively used in the physical education of Chinese colleges, to provide innovative skills and new development concepts and methods for promoting the reform of Chinese college physical education [2].

## 2 Importance of Innovation in College Physical Education

Innovation is a new proposition in current college education. Teachers can directly involve students in teaching through guidance and enlightenment, providing more possibilities for teaching. However, judging the current situation of Chinese college education, there are still many shortcomings in innovative education, especially in physical education, many of which still maintain the previous traditional teaching methods. Physical education is a key course for improving students' physical fitness, exercising their will, and promoting students' all-round development. Therefore, timely changes and innovations are needed [3]. Under the current "Internet+" background, it is a great opportunity for physical education to innovate. This not only can effectively break through the traditional teaching space constraints, and give students more autonomy, but also allows teachers teach students in accordance with their aptitude and adopt different teaching methods for different students, so as students' learning efficiency can be greatly improved, as shown in Fig. 1.



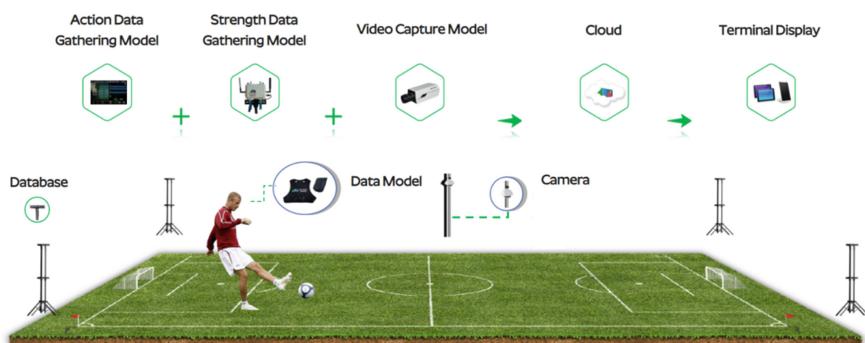
**Fig. 1.** Internet monitoring of student physical education

Furthermore, the innovation of physical education under the “Internet+” background requires changes in teaching methods, concepts, etc., so that students become the main teaching, and increase the interaction between students and teachers, so that students can become the new university physical education in the new era [4]. Physical education innovation should not only innovate physical teaching methods and physical teaching knowledge points, but also attention the cultivation of students’ innovative abilities, encourage students in the curriculum, so that students can get all-round development. It can be seen that “Internet+”. The importance of innovation in college physical education, colleges should strengthen the emphasis on innovation, and actively adopt means and strategies to implement innovation [4].

### 3 The Significance of “Internet+” in Promoting Physical Education in Chinese Universities

#### 3.1 Change in Physical Education Model Promoted the Flexible Teaching Development

In traditional Chinese physical education classroom teaching, physical education needs to be based on physical space such as physical education teaching locations and classrooms. It can only be carried out face-to-face with students at a specified time and place to teach physical skills and knowledge. Students are affected by the space and venue. The limitations of sports development and learning have greatly decreased [5]. The physical education model under the “Internet+” background has effectively transformed this traditional physical education model, as shown in Fig. 2. For example, teachers can use physical education online courses to realize co-teaching with different students, which not only breaks the time and geographical limitations of traditional physical education teaching, but also effectively improves students’ learning flexibility and timeliness, greatly improving students [5]. Therefore, in colleges physical education under the “Internet+” background will no longer be limited to traditional closed classroom teaching locations.



**Fig. 2.** Internet teaching example

### 3.2 Change the Form of Physical Education and Promote the Improvement of Teaching Diversity

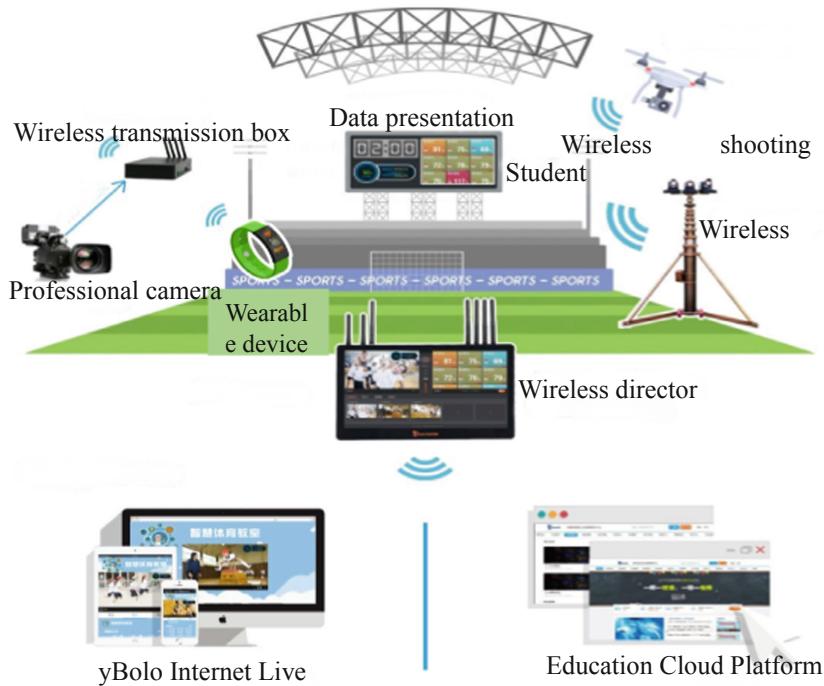
In traditional Chinese physical education classroom teaching, the communication between students and teachers are limited to classroom teaching. However, due to the large quantity of students considered by physical education teachers and the limitation of classroom teaching time, teachers need to complete the explanation of the teaching content within a limited time [6]. This leads to fewer opportunities for close contact and knowledge exchange between students and teachers, which greatly reduces the good emotional communication between students and teachers, and fails to promote effective communication between students and teachers. Physical education in colleges under the “Internet+” background directly changed this way of communication and learning between students and teachers, thus enabling a more humane communication and dialogue between students and teachers, and greatly strengthening the emotional interaction between students and teachers [6].

## 4 New Thinking for College Physical Education Development Under “Internet+ Education”

### 4.1 Innovative Teaching Concepts, Reflecting the Main Status of Students

Physical education in Chinese colleges has long maintained a model, which is to insist on oral teaching by teachers. In the classroom or on the playground, the teachers first explain the movements. Students passively learn the basics of sports theory and imitate the technical movements given by the teachers. Then practice. Although this teaching method can improve teaching efficiency to a certain extent, the main status of students in the classroom is not reflected. Students lack interest and enthusiasm for learning sports knowledge, and they are not serious when practicing and imitating [7]. Cannot reach the goal of physical education. In the context of “Internet+”, physical education teachers can use information equipment to teach, and use micro-class videos to upload videos to the physical education curriculum resource network platform, allowing students to learn on the network platform by themselves [7]. Online Q&A can be conducted online, or offline tutoring can be conducted based on the questions asked by online students, thereby effectively improving teaching efficiency, while making full use of students’ fragmented time to stimulate students’ interest in learning, as shown in Fig. 3. For example, in track and field hurdle teaching, teachers can use software to make hurdle movements, or edit basketball movements in basketball teaching, so that students can watch them actively, and encourage students to make videos of their practice results and upload them to the network platform, which is convenient teachers guide online [8].

In the context of the Internet, the learning environment of students is not limited to the classroom, but more dependent on the Internet. Students’ learning environment has moved from offline to online, and the teaching environment has undergone earth-shaking changes [8].



**Fig. 3.** Internet+ physical education system

#### 4.2 Hierarchical Teaching, Focusing on the Cultivation of Individual Differences

In traditional physical education, the teacher's movements are imitated and practiced uniformly by the students [9]. In this way, it is difficult for teachers to provide comprehensive guidance to each student. This will make outstanding students have nothing to do after completing the movements, and often will after the practice, go to other exercises, and the poor students cannot complete the action in the limited classroom time, which directly affects the development of all students [9]. Physical education teachers can implement hierarchical teaching according to the specific situation of the class [9]. For example, when teaching dance, teachers can record single, double and group dance videos, and then add the teacher's explanation content. Students first find their own dancing partners to practice before class, and they can directly show the exercises in class.

#### 4.3 Innovate Teaching Resources to Realize Independent Inquiry Learning

The country has always attached great importance to the physical fitness of students. Additionally to teaching students professional knowledge, college teaching must also cultivate students to develop good habits of lifelong learning and exercise [10]. In the context of

“Internet+”, physical education in colleges can develop more teaching resources, such as open physical education courses, high-quality sports courses, etc. Students can use their own terminals, such as computers, smartphones, etc. Study, study and exercise in daily leisure time, to develop a good habit of daily exercise [10]. For example, a physical education teacher can make a video of Taijiquan into a micro-class video, which is convenient for students who love Taijiquan to learn and exercise.

## 5 Conclusion

In short, physical education workers must work hard to adapt to the new changes in physical education classroom teaching in the mobile Internet era. College education must not only adapt to the development of the society, but also lead the development of the society. As the leader of college physical education, college physical education workers cannot stick to the original teaching model. They must continue to try new models to enhance the physical health of students.

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# English Teaching Ability Evaluation Algorithm Based on Big Data Fuzzy K-means Clustering

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**Abstract.** Since entering the new era, with the rapid development of science and technology, the daily data generated by all walks of life is an astronomical number. The amount of data generated now has explosive growth compared to before. Under such a development environment, if there is a simple, convenient, and effective way to find the corresponding information you want to find from the massive amount of miscellaneous data, then through this way you can be ahead of others and provide a very important solid foundation for your own development. Based on the traditional English teaching ability assessment method, there are a series of data processing problems, and the accuracy rate is insufficient. This paper proposes a new fuzzy K-means clustering algorithm combined with big data. This algorithm is combined with information. New English teaching ability assessment algorithm. Realize a new English teaching ability assessment algorithm. This article mainly analyzes the clustering algorithm under the current big data background, discusses the current situation of English teaching ability assessment, and puts forward a series of suggestions on how to optimize and enhance the English teaching ability assessment algorithm. And try to find a new way out of the English teaching ability assessment algorithm in the current era based on the results of these studies. According to the experimental results, the new algorithm proposed in this paper for English teaching ability assessment has better information fusion analysis ability than the traditional English teaching ability algorithm, which greatly improves the accuracy of teaching ability assessment and the application of teaching resources the efficiency has also been greatly improved.

**Keywords:** Big data · Fuzzy K-means clustering algorithm · English teaching · Ability assessment

## 1 Introduction

In order to search the current massive data quickly and conveniently, more and more tools are being invented and utilized. In the context of big data, there are many tools that can use various time and data processing. Using these tools is very convenient for capturing and processing massive data [1]. With the continuous development of Internet technology and information technology, Internet technology has brought new development opportunities to all walks of life, and people have a new understanding of the Internet. In the environment of explosive growth of information, people no longer only passively receive information, but also generate massive amounts of data through

a series of online activities, such as shopping and chatting [2]. In addition, in the context of big data, the generation and use of data has also undergone earth-shaking changes. The increase in massive data has led to the emergence of more data prediction tools and data mining tools. These tools have greatly improved the efficiency of data applications and decision-making functions. At the same time, the emergence of big data has also changed the traditional way of thinking, which has greatly promoted the development of thinking in the new era [3, 4].

With the development of big data and the continuous improvement and promotion of related technologies, more and more industries have combined with big data to a certain extent. The combination of English teaching and big data has given a new direction to the development of English teaching [5]. In the era of big data, in this case, the practicality of English teaching has been improved. Students can receive relevant learning information from the Internet, which can be used in practice at any time, and get rid of the previous time and space influences and location restrictions. In English teaching, big data sharing can be used to obtain the required English information resources. In the current era, with the support of big data technology, the communication between teachers and students can make greater progress, and the interaction between teachers and students is more convenient. Through good teacher-student interaction, students can better understand and master language. It is also conducive to teachers for students' personal language level and learning ability, making them more effective in guiding sexual behavior, and helping them to develop personalized learning strategies for English precision teaching [6]. Big data can also count the students' home classroom environment, learning situation and learning trajectory, and form data. The report provides a reference for teachers to improve their teaching level. Teachers can also use big data in classroom teaching to record all aspects of classroom teaching face to face, according to the data reflected in teaching, form corresponding data reports and optimize them [7].

The application of traditional clustering algorithm analysis in the current society has some deviations, and it is impossible to accurately analyze the data [8]. Because the traditional clustering algorithm treats each data as a data object, and classifies them according to the different characteristics of these data objects, divides data with similar or identical characteristic attributes into one category, and finally divides all data objects into different subsets. This partition is also called a hard cluster. But in real life, most things are inseparable. Fuzzy cluster analysis is that each sample belongs to various types to a certain extent, which more truly reflects the actual problem. As a common clustering algorithm, K-means algorithm is easy to use, understand and use. Internet companies use K-means algorithm in many aspects of business [9]. And it has been proved by social tests that the K-means algorithm has good application prospects in all walks of life. But often the problems encountered in real life are quite complex and are related to many aspects. The traditional K-means algorithm can no longer meet the requirements of solving problems in reality. Therefore, the fuzzy idea is introduced into the k-means algorithm by combining the big data method, and the combination of the two can achieve a more consistent clustering effect [10].

## 2 Algorithm Establishment and Optimization

### 2.1 Constraint Parameter Equation

Construct the algorithmic evaluation model of English teaching ability required by this article through differential equation expression:

$$X_n = x(t_0 + n\Delta t) = h[z(t_0 + n\Delta t)] + \omega \quad (1)$$

In this equation,  $h$  is the multivariate function of English teaching ability; it is the error function that appears in the evaluation process, and its magnitude determines the magnitude of the error in the evaluation process. A set of feature training for English proficiency assessment, this vector subset meets the following conditions

$$\sum = \text{diag}(\delta_1, \delta_2, \delta_3 \dots \delta_r), \delta_r = \sqrt{\alpha} \quad (2)$$

Let be a solution of the calculation model, the initial characteristics satisfy

$$\{x_0\} = [x_{01}, x_{02}, \dots, x_{03}]^T, \quad \{I\} = [1 \ 1 \dots 1]^T \quad (3)$$

For the feature analysis of multivariate variables, according to the statistical measurement values, new parameters of the new English teaching ability test can be performed.

$$\{x_0\} = \{\varphi_s\}x_1 \quad (4)$$

Collect and analyze big data for English teaching ability evaluation through recursive analysis, and construct new functions

$$\beta x_1 + \eta x_{ob} + c_{ob}x_{ob} + k_b x_{ob} + p(t) = -\eta x_g \quad (5)$$

$$\eta = \left( \sum_{i=1}^N m_{oi} + m_{ob} \right) \quad \beta = \sum_{i=1}^N m_{oi} \varphi_{si} \quad r = \frac{\{\varphi_s\}^T [M] \{I\}}{\{\varphi_s\}^T [M] \{\varphi_s\}} \quad (6)$$

$$[B]\{z(t)\} + [A]\{z(t)\} = \{f(t)\} \quad (7)$$

Among them:

$$[B] = \begin{pmatrix} 2\xi_1 w_1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}, [A] = \begin{bmatrix} w_1^2 & 0 & 1 \\ 0 & k_b & 0 \\ 0 & 0 & -1 \end{bmatrix} \quad (8)$$

Use big data analysis methods for quantitative analysis:

$$X_n : X \rightarrow \{-1, +1\} \quad (9)$$

Perform classification error calculation:

$$X_n = P(T_m(xi) \neq yi) = \sum_{i=1}^N wmiexp(-a_myiT_m(xi)) \quad (10)$$

Calculated coefficient:

$$X_n = \frac{1}{2} \log \frac{1 - e_m}{e_m} \quad (11)$$

$$x_{ob} = \sum_{j=1}^5 u_{bj} Y_j(t) \quad x_1 = \sum_{j=1}^5 F_{uj} Y_j(t) \quad (12)$$

### 3 English Teaching Ability Assessment Model

Establish a new English teaching ability evaluation and analysis model, and use quantitative recursive analysis on the basis of data information model analysis to carry out accurate English teaching ability evaluation. The establishment and application of this model will promote the improvement of English teaching level. The combination of big data technology and traditional K-means algorithm introduces fuzzy thinking into k-means algorithm. The combination of the two forms a better evaluation effect. English teaching ability assessment is transformed into English teaching ability assessment. K-means clustering objective function is transformed into least squares estimation problem:

$$\{z(t)\} = [U]\{Y(t)\} \quad (13)$$

The response is:

$$\{Y(t)\} = \int_0^t [h(t - \tau)]\{F(\tau)\}d\tau \quad (14)$$

Given the feature vector for teaching ability assessment, the algorithm formula can be listed as follows:

$$Y_j(t) = -m_j^{i-1} \int_0^t e^{\lambda_j(t-\tau)} \{V_j\}^T \{f(\tau)\} d\tau \quad (15)$$

In order to ensure the reasonableness of the weights, the consistency check of the judgment algorithm is compared, and (k) is obtained. The empirical distribution data of the teaching ability evaluation in the k-th category is obtained, and the sub-category set

of the k-th category is obtained according to the above formula. The utilization rate of the distribution of English teaching resources can be expressed as:

$$x_{ob} = \sum_{j=1}^5 u_{bj} Y_j(t) \quad x_1 = \sum_{j=1}^5 F_{uj} Y_j(t) \quad (16)$$

Combining the linear correlation feature fusion method, it realizes the clustering and integration of index parameters of English teaching ability evaluation. Through the clustering and integration of index parameters, the corresponding teaching resource allocation plan is compiled, thus realizing the optimization of English teaching ability evaluation.

## 4 Data Evaluation Results and Research

### 4.1 Evaluation Data

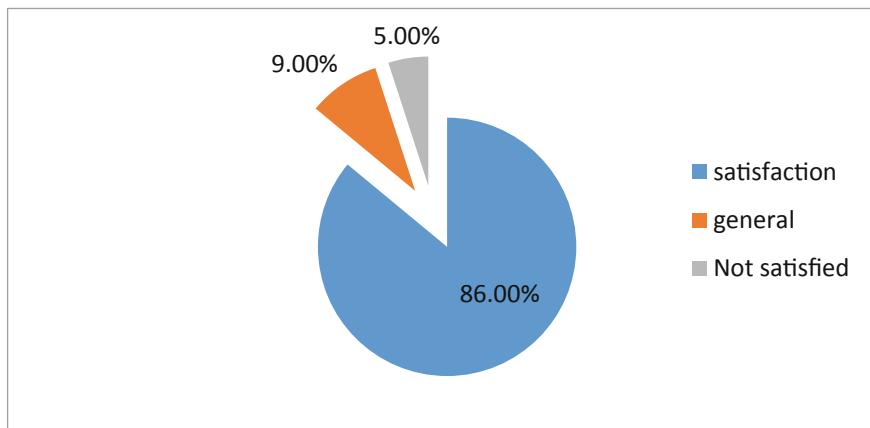
Take the research design of this article as the research object to carry out data clustering and information fusion to realize new teaching ability assessment.

**Table 1.** Performance test comparison

Evaluation cycle	Method of this article		Traditional method	
	Assessment accuracy (%)	Utilization (%)	Assessment accuracy (%)	Utilization (%)
1	96.24	98.74	79.45	72.36
2	95.73	97.65	77.34	74.92
3	96.78	99.31	76.54	66.24

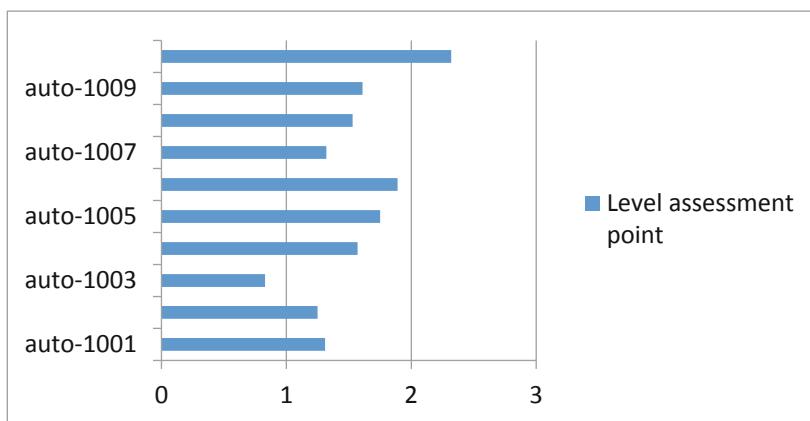
The following data can be obtained from Table 1: In the case of using the big data proposed in this article combined with the traditional K-means algorithm evaluation, the accuracy after three evaluations is basically above 95%, and the utilization rate is also very high and basically maintained at 97%; while the accuracy rate of using traditional methods to assess English teaching ability is relatively low, not reaching 80%, and there is a clear gap between the utilization rate and the evaluation method proposed in this article. It can be seen that the English teaching ability assessment performance of the big data fuzzy K-means clustering proposed in this paper is stronger than the traditional English teaching ability assessment algorithm. The English teaching ability assessment has positive significance for the management planning of the teaching process. By using this algorithm it can greatly improve the accuracy of English teaching ability assessment.

From the survey data in Fig. 1, it can be seen that in the evaluation of English teaching ability using the K-means clustering algorithm, the tester's satisfaction with the new technology is analyzed through the satisfaction data. According to the data, 86% of the testers are satisfied with the K-means clustering algorithm used in the



**Fig. 1.** Satisfaction with the use of K-means clustering algorithm in the evaluation of English teaching ability

assessment of English teaching ability, and 9% of the testers are satisfied with the K-means clustering algorithm used in the assessment of English teaching ability. The results of the evaluation are average. 5% of the evaluators are not satisfied with the K-means clustering algorithm used in the evaluation of English teaching ability. Through the satisfaction survey, it can be seen that the new application of K-means clustering algorithm to the evaluation of English teaching ability can be approved by the assessors. Combining the K-means clustering algorithm does have a unique advantage in the evaluation of teaching ability.



**Fig. 2.** Analysis of the results of the fuzzy K-means clustering algorithm in the English teaching ability assessment system

As shown in Fig. 2, the final test results of the fuzzy K-means clustering algorithm in the evaluation of English teaching ability will give the running time of each stage, and as the frequency of the processor changes, the performance of the evaluation system will also change, and finally it will also affect the running time of the fuzzy K-means clustering algorithm in the English teaching ability evaluation system program. Therefore, when summing up and comparing various parameters, the method of calculating the total energy consumption is uniformly adopted, that is, the real-time power consumption and the product of the total running time. This can also directly reflect the influence of DPA on the final result under different parameters.

## 5 Conclusion

In order to better integrate big data technology and realize reasonable use of current English teaching resources, traditional English teaching ability assessment also needs continuous improvement. Traditional English teaching ability assessment methods are indeed able to make judgments on teaching assessment to a certain extent, but with the development of society, the assessment is becoming more and more diversified, so it is necessary to combine better technology to assess English teaching ability. Make improvements. Based on the background of big data, this paper introduces fuzzy K-means clustering algorithm, and realizes algorithm and information fusion technology to optimize the traditional English teaching ability evaluation method. Use information processing technology and big data information analysis technology to make new assessments of English teaching ability, and make more accurate assessments of teaching assessment from many aspects. An English teaching ability assessment method based on big data fuzzy K-means clustering algorithm is proposed to construct a new teaching assessment model. On this basis, we can realize more reasonable teaching methods and the use of teaching resources to promote the development of English teaching. At the same time, it is still expected that more and deeper innovations and applications can be incorporated to bring new vitality to the assessment of English teaching ability, thereby promoting the progress of my country's English education and making English education better serve the society and the public.

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# Piano Teaching Method Based on Big Data Analysis

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**Abstract.** With the advent of the Internet era, the huge scientific and economic value of big data has gradually emerged. However, its data analysis methods have high technical barriers. In order to discover the value of big data, it is necessary to abandon traditional solutions and adopt new analysis methods. This article aims to study piano teaching methods based on big data analysis technology. This paper adopts research methods such as questionnaire survey method, literature method and interview method, taking two teaching methods as the research object, analyzing and comparing the characteristics of the two teaching methods, and sorting out the results. In addition, this article compares and analyzes the characteristics of big data analysis piano teaching and traditional piano teaching from six aspects. The experimental results of this paper show that the piano teaching method based on big data analysis is of great significance to popularizing piano education, and its teaching efficiency is 20% higher than the traditional teaching method, which shows that the teaching method has an important reference for improving the overall level of piano education in China significance.

**Keywords:** Big data · Big data analysis technology · Piano teaching

## 1 Introduction

Everything in China today is undergoing tremendous changes. The knowledge system may no longer be the only teacher, and students can obtain knowledge through multiple channels [1]. Teachers at this time must establish a sense of responsibility, keep pace with the times, continue to learn and apply modern educational concepts, and improve teachers' academic, subject and vocational education [2]. In addition, teachers should also have the ability to correctly understand music works, have a strong and expensive musical crisis of the works, and have a macro grasp of the prospects of their own teaching practice [3].

Piano teaching is a comprehensive art. Piano teaching methods are methods and skill training, and artistic aesthetics. It is very important to the effect and goals of piano teaching [4]. Finding an effective piano instruction method is an important issue facing piano teachers. Because students' piano schools are different, it is necessary to pay more attention to the particularity of the initial foundation. Only in this way can piano education be carried out through the method of setting goals, and education can be

carried out according to the adaptability of students, and the level of piano teaching can be improved [5, 6].

Yazici T has developed a measuring instrument that can be used to measure the attitude of piano teachers towards piano teaching [7]. A validity and reliability study of this magnitude was conducted in Turkey. In 2015, taught 196 piano teachers in different regions of Turkey [8]. Content validity, principal component analysis and confirmatory factor analysis, as well as structure validity and passing the Cronbach Alpha test, upper and lower 27% t test, 25 positive and 10 negative, a total of 35 items (including Likert-type substitutes Five times) the total relevance of the items created in the piano teaching attitude scale. However, there are some errors in this test, resulting in inaccurate results [9].

The innovation of this article is to analyze the status quo of piano education in university music education, put forward the problems of piano education, analyze and study existing problems and solutions, respect the principles of piano education, and cultivate high-quality professionals who meet the needs of today's society [10].

## 2 Piano Teaching Method Based on Big Data Analysis

### 2.1 Big Data

The term big data was born in 1997 and usually refers to a large and complex data collection. Big data has four special characteristics:

(1) Massive data. Big data contains complete data samples and complex very large data, rather than a small amount of sampled data. (2) The price is moderate. The value contained in a single data is extremely low, and the correlation between the data is poor. (3) Multiple local sources. The data sources are complex and the channels are extensive. Most of them are a mixture of unstructured data and structured data, which is difficult to classify. (4) Fast growth. The amount of data contained in big data will change with the change of output indicators, and the traffic can reach TB.

In order to overcome the characteristic threshold of big data and discover the value of big data information, its basic technology is divided into three parts:

(1) Data platform. The data platform is responsible for big data collection and classified storage management. The collected data needs to be cleaned and re-labeled. The label data is always cleaned and updated. Most of the data contains a large number of survey values. (2) Analysis platform. The analysis platform is responsible for the calculation and analysis of massive data. It is an important way to reflect the value. The conversion process requires the support of a powerful computer platform. Commonly used distributed big data computer frameworks include: MapReduce, parameter servers, etc., in addition, there are analysis methods commonly used for artificial modeling or neural network analysis. (3) Appearance platform. Broadcasting platforms usually use visual channels to promote big data products, including studying big data or studying the rules of value models.

## 2.2 Big Data Analysis

The so-called big data analysis refers to the analysis of huge scale and huge amount of data. There are 4 very noteworthy features: the first is the amount of data, the second is the very fast speed, the third is there are many types, and the last is the reliability. The purpose of big data analysis is to use the analysis and mining of historical data, scientifically summarize and discover the laws and patterns contained therein, and combine the continuous flow of dynamic data to predict the future development trend of things.

## 2.3 Piano Teaching Methods

### (1) Teach students in accordance with their aptitude

For piano students, the important role of teachers is self-evident. According to different music works, different learners will have different ways of learning different music works and the results will be very different. It's a waste of time to be a teacher if it is delayed. As we all know, this is a "lost life" for students. Therefore, "do not mistake people's children" is the bottom line of educators' ethics. It can be seen from this that teachers should proceed from the actual situation of the students, respect the differences in personality and knowledge of students, and fully consider the differences in student acceptance and actual performance in the design of teaching plans.

### (2) Material selection

Among the many categories of music and art education, piano is one of the most popular and most studied majors. According to relevant data, there are tens of millions of students studying piano in universities, middle schools and primary schools across the country. Among them, piano teaching in higher normal schools has been particularly active in recent years, and its overall development trend is unprecedented in the history of our country. The classification of piano learning materials can be considered as rich in types, diverse in types, unique in form, and considerable in publication and circulation. According to the types of works, it can be divided into four categories: etudes, polyphonic works, large-scale musical works and Chinese works. According to the different learning stages, it is divided into four stages: enlightenment, elementary, intermediate and advanced.

### (3) Step by step

Piano teaching is a long-term bilateral teaching activity. Students will continue to face various problems and even obstacles in the learning process, and they will continue to continue again and again. Therefore, teachers should pay more attention to the objectivity and scientificity of teaching content, adopt appropriate teaching methods, and arrange teaching in a planned way, so that students can avoid detours and make piano teaching more effective. In the teaching process, if students are found to be strong in all aspects, they can make appropriate leap in content, make reasonable adjustments to teachers, fully increase some difficult content, speed up teaching and learning progress, etc., so that students can quickly learn from From easy to difficult, from the shallower to the deeper, understand the

steps and content of learning step by step, without having to follow the steps completely.

### 3 Piano Teaching Method System Design

In order to achieve the purpose of piano education and ensure the quality of education, various highly scientific educational methods must be adopted. As a multi-system instruction method, piano education mainly consists of the following elements.

#### (1) Seminar and teaching

The instruction method in the form of a seminar is the instruction method of teaching research and discussion. This kind of guidance method helps teachers and students to be equal and give full play to the initiative, self-discipline and creativity of students in learning. This teaching method is suitable for courses such as “job analysis” and “art evaluation”. Need the opinion of an intermediary, and then deal with it. They should pay attention to students expressing their independent opinions and encourage them to hold different opinions. In particular, students should encourage students to “distance from classics”, advocate innovative ideas, and dare to refute teachers. This also reflects the diversity of three-dimensionality and “three-dimensionality” of piano projects, as well as the diversity of students’ piano performance.

#### (2) Practical teaching

Practicing skills is indispensable for piano students. In simple terms, practice is the process of applying theoretical knowledge to practical actions, and students can exercise autonomy and leadership. Realizing the combination of professional knowledge and self-knowledge is an important method of applying unified educational principles, as well as an important method of theory and practice. Piano teaching methods include students who hold various forms of piano concerts, including recitals, ensemble concerts, class concerts, and departmental concerts. Students participate in school music activities at different levels and hold various Music events and music competitions. Therefore, teachers must have better planning, organization and public relations skills.

#### (3) Simulation teaching

Simulation techniques are widely used in various fields such as physical sciences, social sciences, and art sciences. Especially after the establishment of the government, the “functional simulation technique” was developed based on the traditional simulation technique, and piano education can also use the “simulation instruction technique.” In other words, students act as pianists, singers, musicians, and listeners, and perform “simulation performances” in the classroom. They can be piano solo, ensemble, lead singer, and dance accompaniment, which play an important role in enhancing learning interest.

## 4 Piano Teaching Methods Based on Big Data Analysis

### 4.1 Current Situation of Piano Teaching

(1) Blindness of teaching objectives

Today, universities are huge, and many universities have music graduates. Some students with a zero foundation can just take opportunities. Through the intensive music research a few months before the exam, many music graduates are devoted to the university. Therefore, the students' piano learning level is not uniform after admission, the teacher's goal is not clear, and the students lack the understanding of concentration and cannot teach according to their own adaptability. Therefore, to achieve the overall quality of piano teaching, it is necessary to establish a systematic teaching goal for piano teaching to students of different levels.

(2) The unity of teaching content

Nowadays, in the selection of piano repertoire, most of the students' repertoires stay in classical and romantic classical music works such as Mozart, Beethoven, and Chopin. For example, Chopin's Nocturne and Beethoven's Sonata are well-known repertoires by students, but they rarely analyze and execute different types of repertoire at different times. Therefore, the teaching content is very unique, the music environment is very narrow, and the learning content is very limited.

(3) The teaching method lacks comprehensiveness

In the piano teaching of today's great music, some teachers blindly follow the piano level of students, continue to teach difficult skills too much, and allow students to play music beyond their ability to participate in exams or competitions, but ignore the actual piano for art. Importance Students cannot understand the ideas in the project, cannot use their inner feelings to play, and can only complete the work entrusted to them by the teacher.

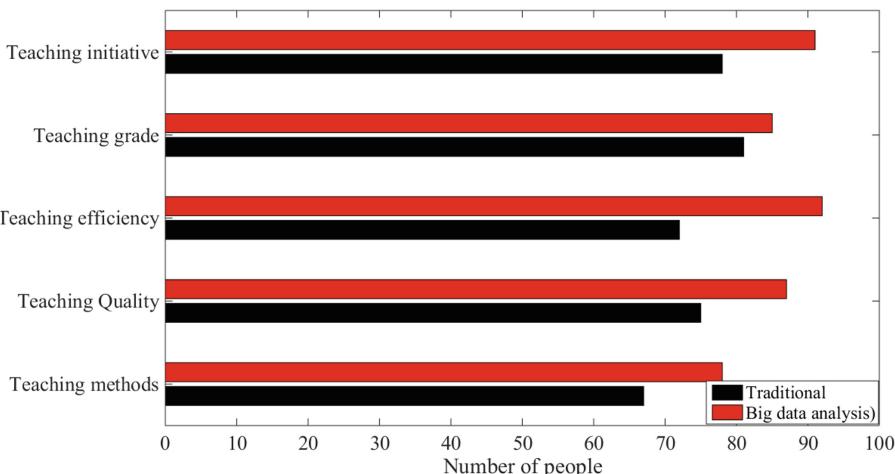
### 4.2 Evaluation and Analysis of Piano Teaching Effect Based on Big Data Analysis

This paper selects 100 students in the piano class for analysis. They evaluated the effects of big data analysis of piano teaching and traditional piano teaching. The evaluation is divided into 5 aspects: teaching method, teaching quality, teaching efficiency, teaching performance and Teaching enthusiasm. The results are shown in Table 1:

**Table 1.** Comparison of piano teaching effects

Teaching effect	Teaching methods	Teaching Quality	Teaching efficiency	Teaching grade	Teaching initiative
Traditional	67	75	72	81	78
Big data analysis	78	87	92	85	91

In order to be more intuitive and clearly observe the comparison of piano teaching effects, arrange the tables into graphics, as shown in Fig. 1:



**Fig. 1.** Comparison of piano teaching effects

It can be seen from the data in the figure that only 67 of 100 people agree with the traditional teaching method, but 78 people agree with the teaching method of big data analysis piano teaching, an increase of 11%. In addition, from the perspective of teaching efficiency, big data analysis piano teaching is 20% higher than traditional teaching, which is the progress of the entire school and even the entire society. Analyzed as a whole, big data analysis piano teaching is more advanced than traditional teaching in any aspect, and some even qualitative changes. This also reflects people's recognition and affirmation of big data analysis piano teaching.

Compared with the traditional teacher evaluation system, the advantages of using big data technology to evaluate teaching results are obvious. The results show that the system can measure and record student development and piano performance without worrying, and can analyze piano performance. By integrating data into real-time, the actual situation and content of teaching should be adjusted. Through the analysis and statistics of the most authentic and reliable data of students' daily learning and life, it can not only reflect the macro-control function of big data, but also give full play to the detailed functions of audience data analysis, so that educators have a comprehensive and detailed ideological and political education. The recognition of this will help improve the efficiency of piano teaching in colleges.

## 5 Conclusions

The main difference between the big data analysis piano teaching method proposed in this article and the traditional piano teaching method is that the results they seek are different in the initial stage. In fact, the technique and sound are the same. In addition,

the piano teaching method of analyzing big data is more philosophical than the traditional teaching method. Its uniqueness is that it can better cultivate children's abilities and enrich their lives with music.

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# The Key and Difficult Points of Database Cloud Technology Based on Physical Resources

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**Abstract.** Nowadays, with the promotion cloud platform, the platform application has achieved initial results. Some business system applications have gradually migrated to the State Grid cloud platform. In the current cloud environment, the deployment of database services based on physical resources has problems such as insufficient support capacity and poor compatibility, which seriously affects the work of business system database migration to cloud services. This research mainly aims to realize the system architecture of high availability, fault self-recovery and dynamic resource scheduling of heterogeneous databases in the cloud environment, realize the unified operation and maintenance management of heterogeneous databases in the cloud environment, and improve the high availability and application scope of databases, so as to provide guarantee for the construction of the new generation of State Grid information system based on the cloud platform, big data and other technologies.

**Keywords:** Big data · Cloud technology · Database

## 1 Introduction

Nowadays, with the promotion cloud platform, the platform application has achieved initial results. Some business system applications have gradually migrated to the State Grid cloud platform. In the current cloud environment, the deployment of database services based on physical resources has problems such as insufficient support capacity and poor compatibility, which seriously affects the work of business system database migration to cloud services. Based on the urgent need of database migration to cloud service, this research mainly studies the highly available self-service cloud database based on physical resources [1], and proposes key technologies of intelligent load balancing, automatic deployment, scalability, dynamic resource scheduling, unified allocation, self-recovery of faults, centralized monitoring, agile delivery, high availability, intelligent operation and maintenance, high-performance data protection strategies and algorithms of various types of database resources in the cloud environment, which provides standardized and automated application experience and technology accumulation for the cloud platform to manage the databases of various resources and realize the installation and deployment, data protection, application, fault handling, monitoring and operation and maintenance of different types of databases, and provides technical support for database migration to cloud services.

## 2 Research on Database Cloud Resource Automation, Load Balancing and Dynamic Resource Scheduling Model Based on Physical Resources

### 2.1 Theoretical Basis

This research is mainly based on the server load balancing algorithm and dynamic resource scheduling model. The research determines the initial installation and running nodes of the database server through the server load balancing algorithm [2]. In addition, it determines whether the dynamic scheduling of database resources is required and how to schedule the resource according to the current load through the dynamic resource scheduling model [3], so as to realize the economical use of server resources, and avoid the database becoming the performance bottleneck of the system during the business peak.

Server load balancing algorithm.

There are many kinds of load balancing algorithms for servers. The common load balancing algorithms include Round Robin, Random, Hash, Weight Round Robin, Weight Random, Least Connections, etc. The corresponding algorithm should be selected according to the specific use scenarios.

Round Robin. It is easy to implement the Round Robin. It allocates requests to back-end servers in turn, and treats each server in a balanced manner, regardless of the actual number of connections to the server and the current system load [4].

Random. According to the size value of the back-end server list, one of them is randomly selected for access through the system random function [5]. According to the theory of probability and statistics, with the increase of the amount of calls, the actual effect is more and more close to the average allocation of traffic to each back-end server, that is, the effect of Round Robin.

Hash. The idea of Hash is to get a hash value through hash function calculation according to the IP address of the client requested by the service consumer, and then carry out modulus operation on this hash value and the size of the server list. The result is the serial number of the server address to be accessed [6]. When the Hash is used for load balancing, the same IP client will be mapped to the same back-end server for access if the server list remains unchanged [7].

Dynamic resource scheduling model.

As there a large number of operations, data nodes and running tasks in the cloud computing environment, dynamic resource scheduling is often required to achieve optimal task allocation.

There are many research results on dynamic resource scheduling model in the cloud computing environment. The widely used dynamic resource scheduling algorithms include user negative exponential distribution and comprehensive utilization rate product method of cloud computing resources.

There is also a lot of research in this field in China, such as the resource pool scheduling management algorithm proposed by Liu Sai et al., a method based on Boolean quadratic exponential smoothing to predict user requests to dynamically adjust

the number of running nodes proposed by Mi Haibo et al., and a cloud computing resource scheduling method based on dynamic reconfiguration of virtual resources proposed by Lin Weiwei et al. [8].

## 2.2 Practical Basis

No matter which server load balancing algorithm and dynamic resource scheduling model are adopted, they are based on the timely and accurate acquisition of server loads. Otherwise, no matter how good the algorithm is, it will not have good execution results. On the basis of long-term monitoring of server resource utilization, a set of practical and effective comprehensive load calculation of the server is established. This calculation method takes into account the CPU utilization, memory utilization, IO load and network load of the server in a period of time. The database resources are manually scheduled according to the comprehensive load score, which achieves good results. The comprehensive load calculation method of the server has laid a solid foundation for the use of server load balancing algorithm and resource dynamic scheduling model. As for which existing algorithms and models will be adopted, or whether algorithms and models need to be further optimized, it is only necessary to compare through simulation experiments and select the optimal algorithm and model. The preliminary work has accumulated the preliminary foundation and practical basis for the smooth implementation of the project. The experimental conditions of the project team are superior, which can provide support for completing the research task with high quality and achieving the expected research objectives [9–11].

## 3 Research on End-To-End Automated Deployment and Agile Delivery Technology Based on Physical Resources

### 3.1 Automatic Deployment of the Oracle Database in the Complex Environment

Among all kinds of mainstream databases, the installation of Oracle database is more complex and highly dependent on the environment. Some changes in the environment may cause the automated script installation to fail. It is difficult for the scenario of automatic installation failure, because the process of system deployment is in an intermediate state, which is neither a state successful installation nor a state of no installation. Running an automated deployment script again in an intermediate state often fails. The cloud database needs to be able to intelligently diagnose what kind of intermediate state it is currently in. Then it can roll back to the initial environment or complete the remaining installation steps after judging and processing it immediately.

### 3.2 Automatic Deployment of Various Database Clusters

The automatic deployment of the single instance database server is relatively easy, while the automatic deployment of all kinds of database cluster architecture is relatively

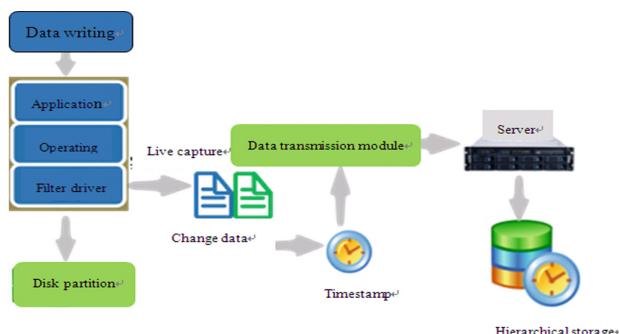
complex. For the implementation of Oracle data multi-node RAC deployment and Data Guard backup deployment in the cloud environment, it is necessary to consider the dynamic increase and decrease of the number of RAC database nodes, the number of DG backup databases and the number of nodes in the backup database, so as to realize the dynamic switching between the primary database and backup database and complex change of data between the primary database and backup database. Although it is difficult to deal with these complex cluster application scenarios automatically, it's the key to realize the automatic deployment of database cluster in the cloud environment.

SG-RDB database cluster adopts the form of single master and multiple slaves for deployment and application. This project is to study the high availability architecture of heterogeneous database cloud to realize that both the master database and slave databases can be installed and deployed and can run on multiple nodes. At the same time, the running nodes can be switched dynamically. The fail-over capability between the master database and slave databases can be automatically realized by script. After switching, other slave databases copy data from the new master database, and the number of slave databases can also be increased or decreased dynamically. This kind of cluster application scenario is very complex, which is the key and difficult point to be studied and solved.

## 4 Research and Pilot Application of Key Technologies of High Availability of Cloud Environment Data

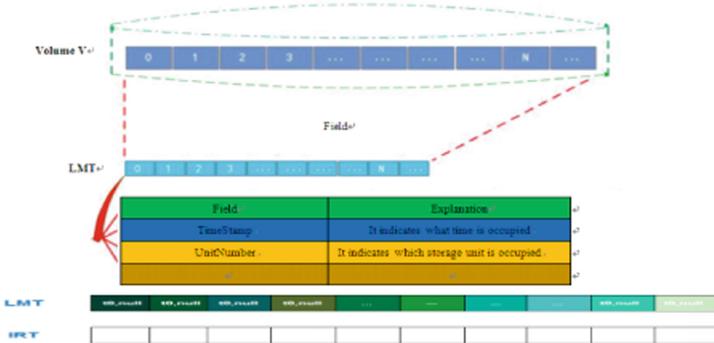
### 4.1 Volume Level Real-Time Protection Technology for Second Level Data

Based on the research and development of high-performance domestic servers, the multi-dimensional linked list CDP technology is used to protect the data in all aspects. The operation and maintenance migration function is used to mount the data at any time point to the virtual machine for disaster recovery simulation exercises. In extreme cases, the virtual machine can take over the business that produces servers with the version data in the most recent time point, so as to realize the business continuity of the information system (as shown in Fig. 1).



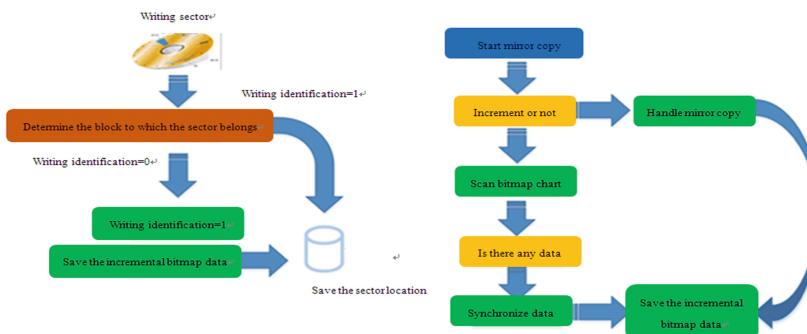
**Fig. 1.** Massive data protection technology

The IO logging algorithm based on the multidimensional linked list is to mark the occupied storage unit and time by adding a TimeStamp and the owner Unit Number to each data block of the logical volume, and to set up the LMT (logic mapping table) that records the current location that the data block points to and the IRT (IO recording table) that records the size of the maximum backup set of data. According to the block index, the algorithm can quickly reconstruct the data at any time point, and set the retention time policy to automatically reclaim the space occupied by the real-time protection data of the volume (as shown in Fig. 2).



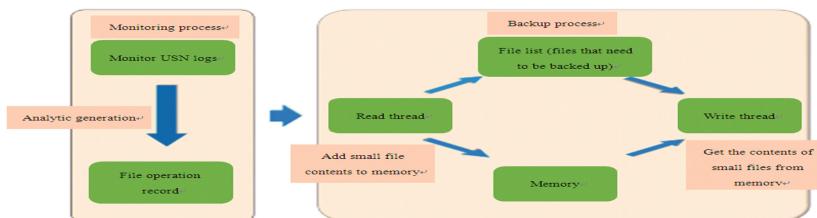
**Fig. 2.** IO logging algorithm based on multi-dimensional linked list

After the volume mirror is interrupted, the fast incremental initialization method can be used for incremental initialization. Assuming the current system has 10TB of valid data, if the system reads at 250MB/S, it will take more than 10 h to read the current valid data. Therefore, when the mirroring relationship between the production volume and the mirror volume is interrupted, resulting in inconsistency of data and the need to reinitialize, the system CPU, IO resources and memory will be occupied for a long time and the operation of the production system will be affected. This technology solves this problem (as shown in Fig. 3).



**Fig. 3.** Fast incremental initialization after volume mirror interrupt

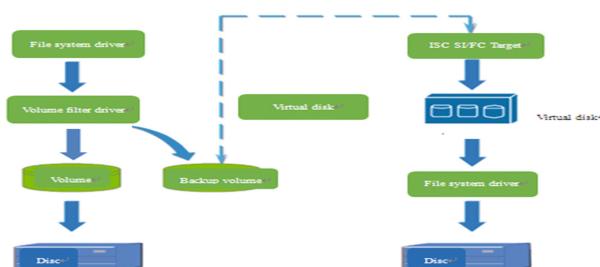
Using the massive file backup method based on USN log (as shown in Fig. 4), users only need to turn on the USN log of partition in NTFS format, and the changed files in the massive files can be quickly backed up through the corresponding program. During the backup process, the reader thread stores the contents of the file into the memory, and the writer thread writes the contents of the file from the memory to the storage directory disk according to the offset and file size, so as to improve the reading and writing speed and save the backup time. At the same time, the incremental backup sets generated in the process of massive file backup are summarized to form a composite backup. Restoring a composite backup is equivalent to restoring multiple incremental backups.



**Fig. 4.** The method of massive file backup based on USN log mode

## 4.2 Rapid Emergency Recovery Technology for Massive Data

The volume-level real-time recovery algorithm for PB level data is mapped to the production server through the iSCSI /FC target, and all IO operations of the production disk are also distributed to the virtual disk through the volume filter driver. The volume level CDP algorithm is applied on the virtual disk to protect the whole logical volume in real time. Similarly, the backup version at any point in time can be generated into a virtual disk, which can be mounted to any server through the iSCSI /FC protocol, or mapped to a virtual machine as a raw disk, so as to quickly take over the production server application when the production server fails (as shown in Fig. 5).

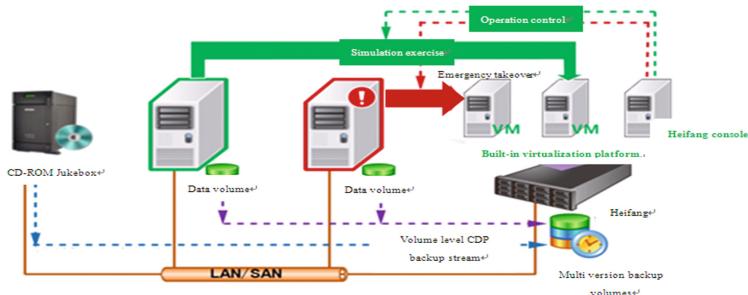


**Fig. 5.** The volume-level real-time recovery algorithm for PB level data

Highly reliable multi-granularity variable metric adaptive fault tolerance technology includes the fault tolerance design when the data server is unavailable, the fault tolerance design when the rack is damaged and the fault tolerance design when the primary server is unavailable. The big data bearing platform has good fault tolerance by adopting the strategy of replica + detecting data corruption. Once software and hardware errors occur, the data will not be lost, thus ensuring the safe storage of data.

#### 4.3 Traceability Technology of Disposable Time Sliced CD-ROM Archive Data

The traceability technology of disposable time sliced CD-ROM archive data uses the round - trip CDP algorithm for multidimensional linked list at any time point, which can quickly reconstruct the data at any time point, that is, it can restore the time slice, and at the same time realize the data recovery through the CD-ROM archiving, providing the information system with non-repudiation time slice. Through volume level mount recovery at any point in time, it provides scenario restoration for audit tracing and tracing checking of information system data (as shown in Fig. 6).



**Fig. 6.** Traceability technology of time sliced CD-ROM archive data

**Acknowledgements.** This work was supported by the 2020 college-level scientific research project of Chengdu Polytechnic, “Research on Key Cloud Technologies of Highly Available Self-Service Database Based on Physical Resources”.

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# Teaching Mode Reform of Art Design Major Under the Background of Information Technology

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**Abstract.** This article systematically analyzes the teaching of art design through the method of documentation, interviews with teachers, students and students, graphical methods, and case analysis. It aims to explore the reform of the teaching mode of art design under the background of information technology, and the research concludes that the teaching of art design It should develop from a single curriculum system to the direction of “multi-level and deep integration”, and to develop from the traditional teaching method to the direction of “multiple, mixed and open”.

**Keywords:** Information background · Art design major · Teaching mode reform · Blended teaching

## 1 Introduction

As advocated by the “National Medium and Long-term Educational Reform and Development Plan”, information technology has a revolutionary influence as the main body and core of the education system, and core reform research has entered a new stage [1]. As the main place of school education, the success or failure of classroom education reform is closely related to the overall success or failure of the education system reform. Educational issues such as the methods of educational reform in the classroom and the corresponding reform effects have aroused people’s attention [2, 3].

The development of information technology has created a new method of disseminating knowledge and culture. Its development has greatly promoted the reform of university education concepts and educational models. On the one hand, it provides educational concepts and educational models, and on the other hand, it also brings a lot of problems to the simple education of universities [4]. The education platform based on the previous education model cannot achieve the current talent training goal. The newly emerging open and diverse education models have gradually shown their own unique educational advantages, and the multi-dimensional education model framework combined with the traditional three-dimensional education platform has gradually formed [5, 6].

The innovation of this article lies in the application of Lag Behavior Sequence Analysis (LSA) in video teaching, by recording the behaviors of teachers and students,

and drawing relevant objective conclusions [7, 8]; revealing the transformation of various elements in the process of classroom teaching reform In order to ensure the reliability of the survey results to the greatest extent, confirm the survey results by using the results of the relevant questionnaire survey [9].

## 2 Reform Method of the Teaching Mode of Art Design Under the Information Background

### 2.1 Educational Information

The concept of information technology education was promoted along with the construction of the higher education system in the 1990s. In particular, the application of information technology in American education is an important method for implementing educational reform in the 21st century. This movement aroused the enthusiasm of countries all over the world. In this regard, China began to join the IT army in the late 1990s. With the popularization of network technology, the relationship between the development of the entire society and information technology is getting closer. People began to pay special attention to the impact of information technology on social development, and the term “information society” appeared. With a series of educational reforms and developments, the term “educational information” also began to appear. Regarding the interpretation of computer technology, Kankan also gave a more accurate definition of “education informatization”: information and information technology are commonly used in various departments to promote the development of training and education. The understanding of education informatization in this article is also based on this definition.

### 2.2 Art Design

“The so-called design refers to the process of conveying a method of design, planning, envisioning, and problem solving through visual communication. Its core content includes three aspects, namely: planning, formation of ideas, and vision the communication method and plan are through the specific application after the communication,” Art design is the integration of the aesthetic function and expression techniques of art in the design process. Subject to the limitation of the expression carrier and the service object, the art design is a highly comprehensive subject. Discipline integrates the knowledge of humanities, nature and other disciplines. The essential connotation of art design is a science that combines culture, art and science and technology, serves the public, and creates material and spiritual products for human life. From the perspective of design, design includes two categories: thought and practice. Therefore, a design has to go through a systematic approach from the initial idea to the final shaping or putting into practice. Therefore, art design is another one. A systematic discipline includes many disciplines. It must go through multiple links from cultural foundations to artistic foundations to artistic creation to give full play to the function of artistic design. Literally understood, artistic design is a specific group Word style is used as a professional expression of modern design in China.

### 2.3 Reform of Teaching Mode of Art Design Major

The basic course teaching of art design major is different from other ordinary course teaching, and its content should highlight the teaching characteristics of this major. All courses are based on “space” and emphasize the expression and transmission of the sense of space and the combination of elements. The form of space composition is different from simple modeling exploration and programmatic training of ordinary sense of form. It focuses on the practical functions of space, spatial organization form, space and building structure and other core issues of space environmental design as the teaching goal.

(1) Design sketch

Design sketches are aimed at training the ability to express design intent. The composition requirements are not as exquisite as drawing sketches. As long as you pay attention to the range of up, down, left and right in the composition of a single object, you can leave a moderate space around, and the objects of expression can also be arranged. In the center of the screen. The design sketch does not emphasize the virtual and real relationship of space, and requires a comprehensive and thorough analysis and representation of the object structure.

(2) Design color

The color teaching in the design direction and the sketch color teaching in the painting direction are both related and different. Painting and sketching colors mainly focus on natural light conditions and direct perceptual processing of colors under psychological and visual conditions. This kind of color research and color application is purely intuitive and perceptual color expressions.

(3) Composition courses

The three major constituent courses are the basic course content required for college art design majors. It summarizes a set of scientifically based constituent methods from three aspects: plane, color and three-dimensional by studying the internal structure of things, and uses their respective element characteristics and organizational research. The basic rules of modeling and the preliminary understanding of the application of different forms in design practice have laid a certain sense of form foundation and foundation of design creative thinking for students to better enter the professional design system.

### 2.4 Research Methods

This article is based on the discussion of the art design teaching model, using a combination of theory plus practice and classroom teaching case analysis to systematically analyze the three-dimensional art design teaching model. The specific methods include:

(1) Documentary data method: through inquiries on related books and documents, the history of the School of Art of Panzhihua University, the course structure and other materials, and through the Internet such as CNKI, the documents related to this article were obtained.

- (2) Teacher-student interview method: Through communication and discussion with fellow teachers, we can understand the confusion and deficiencies in specific teaching, and through conversations with students, we can understand the specific ideas and needs of students for professional learning, and get a lot of valuable Suggestions.
- (3) Graphic method: through the analysis of chart data and the presentation of the schematic diagram of the professional teaching summary, the specific content of the three-dimensional teaching is explained.
- (4) Case analysis method: Analyze specific cases in teaching by the author and colleagues to demonstrate the advantages of the three-dimensional teaching model.

### **3 Reform of the Teaching Mode of the Art Major Under the Background of Information Technology**

#### **3.1 Diversified Teaching Modes**

The learning system of the art design major is composed of different knowledge types and structures. In the teaching process, different teaching methods should be selected for different types and knowledge structures: basic professional theoretical knowledge adopts problem-based learning professional skills combined with classroom teaching and independent online learning, makes full use of books, and understands how to search and use existing resources And the resources needed for development. In the connection of the overall teaching design, it is necessary to focus on the combination of theory and practice, define relevant curriculum work for students, and use work-based learning to enable students to cooperate in integration; complete work and corresponding learning goals. In order to further enhance the practical ability of teachers and students, teachers and students must first communicate and exchange with industry experts and professional technicians.

#### **3.2 Mixed Open Teaching Mode**

Under the differentiated guidance of “students as the main body, teachers as the protagonist, and ability training as the goal”, the application prospect effect of the mixed open learning model will be discussed. The entire curriculum system must include a five-dimensional open learning model of “regular online learning, independent learning and joint learning, structured learning and unofficial learning, adaptive content and non-adaptive content, and comprehensive and innovative hybrid professional skills.” Network technology applications, such as video streaming, text, sound, etc., are conducive to traditional learning methods and online learning. Combining their respective advantages to truly realize the technology of education and learning, the highest educational effect can only be achieved in the crossover process. Practice has proved that through the implementation of multiple education and mixed open teaching, students' basic knowledge level, independent learning ability, coordinated learning ability and problem-solving ability have been improved.

## 4 Reform of Environmental Art Teaching Mode Under the Background of Information

### 4.1 Current Situation of the Teaching Mode of Art Design

#### (1) Conventional teaching mode of art design major

At present, the level of art and design education in my country has been significantly improved compared with the past, but there are still some problems. For example, in the traditional teaching model, the shadow of exam-taking still exists, the teaching practice content is still relatively lacking, and there is insufficient high-quality and high-level education; there are few social practice courses, the content of the course design is outdated and not innovative enough. As a result, students almost In the state of talking on paper. The existence of this kind of situation makes students unable to meet the actual needs of enterprise development, and the phenomenon that students find it difficult to find jobs has become more and more serious.

#### (2) Outstanding problems between teaching mode and actual needs of students

Art design has high requirements for professional quality. Art design professional teaching is a perfect combination of technology and art. The unique traditional teaching methods and methods can no longer meet the actual needs of society. In the actual instruction process, the content of the course is basically based on the instruction of the classroom, and the instruction activities are carried out by teachers and teaching materials. Students are in a state of passively accepting knowledge and have no desire to learn. In this way, after graduation, students face the “fierce” competition in society, they are not competitive, and they lose what they must do in order to work. This will reduce their ability to adapt to society and will not help them in their future careers.

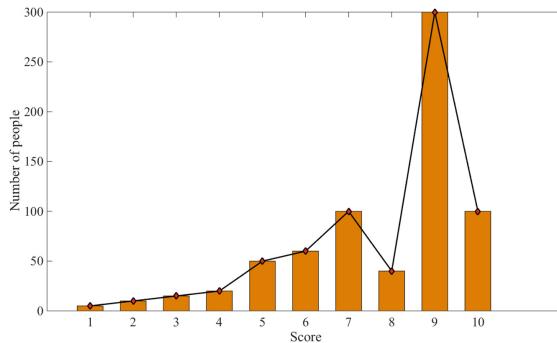
### 4.2 Students' Recognition of Teaching Model Reform

After statistically analyzing the scores of students in the recognition of teaching model reform concepts, the distribution diagram shown in Table 1 is obtained. It can be seen from the data in the table that students with a score of 9 account for the highest proportion of the total number of students, reaching 170. Correspondingly, the mode of the 700 sample scores is 9, and the median is only 9. It happens to be the score of 300 students. In addition, there are 200 students with a score of 6 and below 9. There are 100 students with a score higher than 9, accounting for only 30% of the total sample, indicating that the current proportion of students who have a high degree of recognition of the teaching model reform concept is not high.

**Table 1.** Students' recognition of teaching model reform theory

Number of people	5	10	15	20	50
Score	1	2	3	4	5
Number of people	60	100	40	300	100
Score	6	7	8	9	10

Continue to investigate the students' recognition of specific practices related to the reform of the teaching model, conduct frequency analysis, and make a corresponding statistical chart, as shown in Fig. 1.



**Fig. 1.** Students' recognition of teaching model reform practice

According to the data analysis in the figure, the scores are also concentrated in the 9-score segments. Most of the students can score above 9 points, which shows that most students agree with the relevant practice of teaching mode reform.

## 5 Conclusions

This paper reforms the teaching mode of art design specialty based on information technology, analyzes the current situation and existing problems of the teaching mode, and proposes related solutions to the problems. The teaching reform of art design is a very difficult task. It is necessary to change the traditional teaching concepts and cultivate students' innovative ability. At the same time, to a large extent, it integrates information on vocational education and modern apprenticeship education methods, and cultivates talents with thoughts and comprehensive professional skills.

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# Application of Network Intelligence in College English Teaching

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**Abstract.** Traditional college English teaching methods can't meet the requirements of educational advancement any more, and can't cultivate the quality of students in all respects. During the reform process, the implementation of network teaching has achieved great results, enriched teaching ways and ensured the quality of teaching. This article aims to study the application of network intelligence in college English teaching. At first, it elaborates network artificial intelligence based on literature research. Then it introduces the application of network teaching in English and explains its advantages. Finally, it finds out the main problems in college English instructing and puts forward solutions. The results of experiment in this paper show that in comparison with traditional English teaching, the effect of college English instructing has been improved and the students' English scores have been greatly improved.

**Keywords:** Network intelligence · College English teaching · Multiple interactive teaching mode

## 1 Introduction

The conventional teaching method is teacher-oriented, which makes learners in an inactive state in English learning. In the traditional operation process, English teaching just explains some English skills and theories; and the teachers arrange some related English exercises. By completing the exercises, students will gradually improve their language skills. To guide students to alter the concept of foreign language learning, cultivate the consciousness of self-learning and master the strategy of voluntary learning, the reform of teaching mode is crucial [1].

In 2007, the Higher Education Department of the Ministry of Education stated clearly in college English Course Teaching Requirements that colleges and universities should make the best of modern infotech, accept the English teaching mode on the basis of computer aided classroom, and enhance the simplex teaching model on the basis of teacher teaching. The new teaching mode should be sustained by modern infotech, above all network technique [2]. In order to address the needs of the Ministry of Education, colleges and universities have carried out the reform of web-based College English teaching model [2]. With the aid of the mesh and multimedia, traditional interactive classroom teaching has become a kind of multimedia computer interaction, which increases college students' interest in learning English and reflects

information and practical teaching. Due to the application of Internet plus in English teaching, unlimited learning resources continuously stimulate students' interest in learning, innovate and cultivate students' diffuse thinking, providing them with more extracurricular English knowledge. Therefore, web-based interactive teaching way can incentive learners' interest in English study and improve their English level in English teaching.

The innovation of this article is to combine the questionnaire survey and test scores to analyze the students' sense of identity with the model and the practical teaching effect, and reflect on the model after practice, and offer some personal proposal to advance the effectiveness of interaction and classroom evaluation.

## 2 Network Intelligent English Teaching Method

### 2.1 Network Artificial Intelligence

Artificial intelligence refers to the intelligence that can be made by machines, which is a kind of opposition to human intelligence and natural intelligence demonstrated by humankind and other animals. Artificial intelligence technology is a novice type of intelligent machine that focuses on understanding the nature of intelligence, reacting like human intelligence, understanding the environment, and taking actions to maximize goals.

If artificial intelligence technology is to be applied across borders, researchers need to integrate knowledge in multiple scientific fields to clarify the comprehensive features of AI technology better. The basic industrial chain of artificial intelligence is divided into basic layer, technical layer, and application layer. Applications such as intelligent driving, intelligent finance, intelligent medical care, and intelligent security are all based on algorithm models related to basic materials. The usage of artificial intelligence technology combines artificial intelligence with traditional industries, and the introduction of AI technology into the education field is to apply AI technology in the field of education.

A great deal of network information, business datum and user information will be generated during network operation, including status data, detection data, temporary data, and external information data related to multimedia forms, such as voice, image and text data. In order to apply AI technology to English education, it is vital to rely on big data, computer clouds, high-performance computer chips, use pattern recognition, machine learning, and other artificial intelligence technologies to process large-scale and rich network data, and use linking feedback. This can provide enterprises with a decision-making basis trusted by network operators, simplify the application process, cut back operating costs, and strengthen the quality of education.

### 2.2 Use of Online Teaching in College English

#### (1) Enrich students' learning content

In the daily teaching process, the implementation of online teaching can enrich teaching ways and promote improvement in college learners' academic

performance. Students can learn information through the Internet to help students complete the goals of online teaching.

(2) Innovative English teaching methods

In some English classrooms, the teaching methods adopted by teachers make learners feel bored, and the whole teaching process is dull. Students already have a certain degree of English proficiency and strong self-control, but if they study in such an environment, their desire to learn will be further reduced and they will lose their long-term enthusiasm for English learning. Through the implementation of online learning, teaching methods have undergone a brand-new reform. Teachers can use the micro-class room to improve students' academic performance in other ways.

(3) Improve self-learning ability

The research results of foreign language independent learning from different perspectives show that Chinese college students are deficient in foreign language independent learning ability. A few researchers have tried to cultivate the ability of independent English learning [3–6]. The research results of foreign language independent learning from different perspectives show that Chinese college students are deficient in foreign language independent learning ability. A few researchers have tried to cultivate the ability of English self-learning [7–9]. Self-discipline learning is the most basic learning ability that present students must have, and it is a good way to study grammar. Therefore, in the reform of English education, it is essential to take students as the main subject, expand students' learning guidance and learning space, advance their independent studying ability, and stimulate students' desire and enthusiasm for learning. Therefore, in the daily instruction process, teachers must master the learning features of students in detail, plan educational content according to the learning rules of students, design educational content according to the learning rules of students, and upload these contents in tiny forms. On the online platform, you can select what you need to learn according to your learning situation.

### 3 Construct Experiment of Multiple Interactive Teaching Model on the Basis of Network

Through the analysis of the characteristics of learners in the college and the foundation of previous research results, a set of four-fold interaction mode suitable for the network teaching environment has been constructed. Firstly, it is the interaction between students, teachers, teaching materials and Web learning resources, namely Content interaction; Secondly, it is the interaction between students, teachers and students, that is, interpersonal interaction; Thirdly, it is the interaction inside and outside the classroom, that is instant and empty interaction; Fourthly, it is between students, teachers and synchronous or asynchronous media Interaction, that is, media interaction.

(1) Content interaction

Content interaction is mainly the interaction between students, teachers, teaching materials and Web learning resources. It is a practical activity of sharing network

teaching resources using modern information technology. Teachers (or educational institutions) through the design, development and delivery of subject curriculum materials or subject teaching content, establish rich, high-quality Web learning resources, and guide learners to share and use. Web teaching resources are equivalent to a huge reserve system. Both teachers and learners “inject” and “take out” their needs into this library. Through such content interaction, learners continue to think, generalize new and old knowledge to improve their own knowledge system, change the original knowledge framework during accumulation, and obtain new knowledge.

(2) Interpersonal interaction

Throughout the ages, the interaction between teachers and students has been the most basic and necessary form of interaction in education, and online education is no exception. Throughout the teaching process, teachers' learning guidance, behavior guidance and emotional influence on students are important factors that affect students' effective learning. Hence, during the online teaching, especially adult teaching in TV universities, we should try to appropriately increase the face-to-face opportunity between teachers and students.

(3) Spatio-temporal interaction

Spatio-temporal interaction means that learners are almost free from time and space constraints, and can interact with teachers and peers anytime and anywhere in the classroom and outside the classroom. In the network environment, the teaching interaction is not affected by the region any more, but has a high degree of spatial flexibility. The interaction can occur in the classroom or outside the classroom, on campus or off the campus, and is irrelevant to the geographical location of the interactive participants.

(4) Media interaction

Network-based interaction is dependent on technical media, which is a necessary intermediary for the two-way interaction between teachers and learners. This kind of interaction based on technical media is called media interaction. In the media interaction of online education, people often use online interactive tools. The network interactive tool is simply an interactive software platform that uses computers and the Internet to communicate.

## 4 College English Teaching Model on the Basis of Network Intelligence

### 4.1 Status Quo of College English Teaching

Firstly, the concept of test students' study effect is more profound. Most students and their parents use English performance to measure their academic performance. They think that English courses are courses of grammar and structure, and they will remember words and expressions during the learning process. Some students pay attention to the practice of English, but they have very little understanding of cultural content. Secondly, education and education models are very unique. In the past

classroom teaching, the learning process of students was very passive, and students were not regarded as the main subject and did not consider their learning needs. Therefore, students face difficulties in improving learning quality and adapting to college English learning in the classroom. In the class, girls usually study English very hard because they are more serious than boys, have a high passion on English learning and will study English better.

#### **4.2 College Students' Evaluation of the Efficiency of Network Intelligent Teaching Mode**

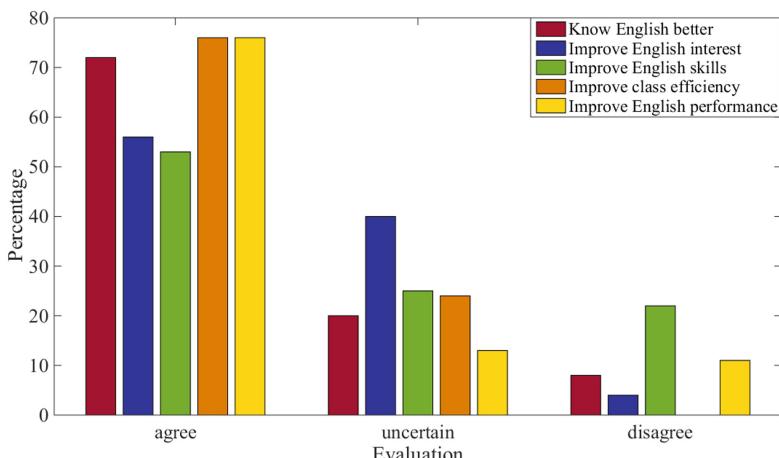
According to the research of many experts and scholars, among the many social and emotional factors, self-esteem and curiosity are the most important factors for students to overcome difficulties. Motivation is one of the key factors that determine the success or failure of learning. This kind of motivation not only provides students with the initial desire to learn, but also promotes the long-term boring learning process; the online courses will improve the learning effect by increasing learners' interest and participation. The survey results shows 72% of students believe that this teaching method allows them to access more authentic English materials and have greater confidence in learning English; 56% of students hold that this teaching method can enhance their English Interest; 53% of students are willing to devote more time to English learning and their English language skills have improved; 76% of students believe that they are more fully prepared for extracurricular time and learn more efficiently in face-to-face tutoring. The results are displayed in the Table 1 shown. The survey results show that students' participation and interest in learning have improved. Therefore, the author believes that the learning effect should be improved accordingly. The actual survey also shows that 76% of students believe that the current teaching model has significantly improved their overall English level.

**Table 1.** Students' self-evaluation of the effectiveness of the teaching model

Evaluation	Know English better	Improve English interest	Improve English skills	Improve class efficiency	Improve English performance
Agree	72%	56%	53%	76%	76%
Uncertain	20%	40%	25%	24%	13%
Disagree	8%	4%	22%	0%	11%

In order to more intuitively observe the College students' evaluation of network intelligence English teaching mode, the table is drawn into a graph, as shown in Fig. 1:

From the above structural analysis, it explains that the role of network on the basis of intelligent teaching methods in improving adult English learning performance is greater than the traditional teaching methods of network teaching. During English imparting, it is obvious to use all kinds of interactive instructing approaches to advance learners' academic performance through the Internet.



**Fig. 1.** College students' evaluation of network intelligent English teaching mode

In short, the current teaching model is to utilize network technology to realize students' self-directed learning on the one side, and on the other side to utilize network technology to realize students' self-learning, and reasonably inherit the on-site interactive links of traditional instructing. By practicing, it has proved that this teaching mode has cultivated students' self-learning ability to a certain extent, and achieved relatively ideal teaching practice results.

## 5 Conclusions

With the fast-growing progress of network technique, the traditional college English imparting methods have undergone major changes. This article puts forward the significance of network technology in college English teaching and corresponding reform strategies, and constructs a network-based multiple interactive teaching mode to step up the effectiveness of college English teaching and promote the boost of students' all-round English level.

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# Reform of Teaching Management Based on the Perspective of “Deep Learning”

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**Abstract.** Over the past few years, the demand for social skills has been increasing every day, which is important in the education system of schools and universities, in order to develop and move their talents. The traditional teaching model, the high quality and inclusive skills of colleges and universities, which leads to a serious challenge for future students. This article started a study on the reform of the teaching direction of the “deep learning” perspective. In the study, this article uses questionnaire methods to analyse the status of teaching administrations at universities in China, to solve the problems in university management, and to propose reforms in education management from the “deep learning” perspective to these problems. In addition, from the “deep learning” perspective, we chose ways of teaching frequently as a comparative analysis to improve the effectiveness of reform changes. The results show that the score of teaching management in deep learning is 81 points in teaching method, 85 points in teaching concept, 83 points in teaching mode and 90 points in teaching evaluation method, which is far greater than that in shallow level learning. Therefore, the teaching management reform measures proposed in this paper based on the perspective of “deep learning” are feasible.

**Keywords:** “Deep learning” perspective · Teaching management · Shallow learning · Reform strategy

## 1 Introduction

The concept of deep learning originates from the study of artificial neural network [1, 2]. Its occurrence and development in the field of education originated in the mid-1950s. Some academics believe that they can transfer and learn to develop their own thinking skills to improve the knowledge that students learn and can use [3, 4]. Together with the development of the community, human life rhythm accelerated and accelerated. In an environment like this, learning slowly became fast-food and many students don't learn very often. This is for the development of students, that's very troubling [5, 6].

Education governance means that school is driven by primary education laws. To achieve their goals, people, finance, materials, time, etc., to improve healthy and regularly, and to complete the curriculum in a difficult way. Many factors will co-ordinate and control organisation activities. To achieve the optimization of school educational impacts, the quality of education will continue to increase and achieve its

objectives [7, 8]. In today's society where fast food culture prevails, school management should take deep learning as the guidance, integrate theory with practice as the direction of education and training, and cultivate comprehensive skill generalists as the ultimate goal of education and teaching, so that students can adapt to the needs of future social development and make more contributions to the cause of socialist modernization [9, 10]. Therefore, from the perspective of "deep learning", it is of great significance to study the reform of teaching management for the cultivation of talents.

In order to do better research, this article first presents a general view of deep learning from artificial intelligence and education. Secondly, we used questionnaire methods to analyse the problems of universities in our country's educational system and suggested reform changes from the "deep learning" perspective to these problems. Therefore, to verify the effectiveness of the changes in this article, we use the teaching direction proposed in this article as a control to verify the effectiveness of reform changes.

## 2 Overview of Deep Learning

### 2.1 Deep Learning in the Field of Artificial Intelligence

In the field of artificial intelligence, deep learning comes from artificial neural network, also known as deep neural network, which is a kind of complex neural network. In the neural network, the input of each layer is obtained by the linear combination of the output neurons of the upper layer. Obviously, if there is no nonlinear transformation between neurons, the mapping relationship is still linear no matter how deep the network is. Therefore, people often add a fixed nonlinear function to realize this function before the output of various neural networks, which is called activation function.

#### (1) Sigmoid function

Sigmoid is a very classical activation function. The ideal activation function is a step function. When the input is greater than 0, the unit is activated and the output is 1, otherwise the output is 0.

$$\text{sigmoid}(x) = \frac{1}{1 + e^{-x}} \quad (1)$$

#### (2) Tanh function

The form of tanh is as follows:

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} \quad (2)$$

## (3) Rectifying linear unit (relu)

In modern neural networks, the most recommended activation function is rectifier linear unit. Of relu function.

In the form of:

$$\text{relu}(x) = \max\{0, x\} \quad (3)$$

Its advantages are as follows:

- (1) When  $x > 0$ , the gradient is constant to 1, which solves the problem of gradient dissipation.
- (2) Because the form is simple, only need to compare the input with 0, the calculation speed is very fast. It not only makes the gradient easy to operate, but also enables the network to obtain nonlinear mapping ability through nonlinearity.

## 2.2 Deep Learning in the Field of Education

Deep learning is an important concept in the field of contemporary learning science. It originates from the comparison with shallow learning. It pays attention to the way, process and result of deep learning. It is not a complete learning form. Deep learning has the following characteristics:

- (1) Critical understanding

Deep learning means understanding and criticism. Critical learning on the basis of understanding requires us to maintain a critical or skeptical attitude towards the current teaching management methods, treat the new knowledge of teaching management critically and think deeply, so as to deepen the understanding of deep knowledge and complex concepts of teaching management.

- (2) Information integration

Knowledge is dynamic and generative, and knowledge is not objective and definite. In the process of teaching management, it is necessary to scientifically select, organize and present knowledge content according to the actual situation, students' needs and teaching objectives, break up the original teaching management content, integrate multi-part, cross college and new and old information, so as to make it conform to the internal logical relationship of knowledge and the law of students' development, so as to facilitate students' acceptance, reorganization and internalization.

- (3) Constructive reflection

Construction reflection focuses on the construction of teaching management reform structure, and focuses on the reflection after teaching management reform. Learners are required to actively understand and criticize information and critically examine the scientificity of conclusions and arguments. By reflecting on the series of reforms, we constantly compare, summarize and abstract the solution methods and rules of problem situations, internalize them and produce problem-solving schemata in specific fields.

### 3 Research Design

#### (1) Questionnaire survey

In the research, this article uses a questionnaire to investigate. This article carries out questionnaire work on teachers and students in many of our universities. We applied an open questionnaire in the study, a total of 1,000 questionnaires were organized and 942 valid questionnaires were returned. The content of the questionnaire is to understand the state of the Chinese universities' education administration, and then we categorize back-sent questionnaires and address the challenges of colleges and universities' education to build more research.

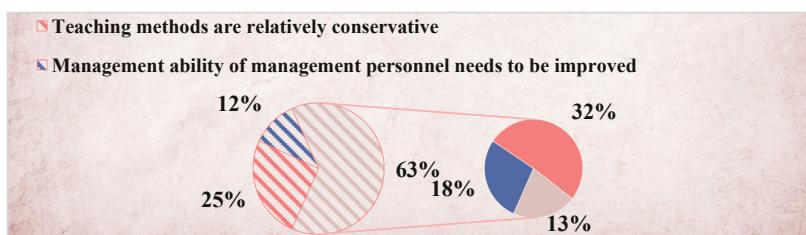
#### (2) Strategy evaluation and analysis

In order to evaluate these reform strategies, we choose the teaching management method of shallow level learning as a contrast. In order to evaluate the reform strategies, we choose the teaching management method of shallow learning as a control and teaching evaluation methods.

### 4 Analysis and Discussion of Research Results

#### 4.1 Analysis of the Current Situation of Teaching Management in Colleges and Universities

This paper first analyzes the current situation of teaching management in colleges and universities, and according to the results of the questionnaire survey, summarizes the problems of teaching management in colleges and universities. The results are shown in Fig. 1.



**Fig. 1.** Current situation of teaching management in colleges and universities

According to Fig. 1, there are mainly problems in the following aspects. First, the teaching methods are relatively conservative, accounting for 25.3% of the problems. Second, the management ability of teaching administrators needs to be improved, which accounts for 11.4% of the total. Third, some teaching management concepts lag behind, accounting for 17.6% of the total. Fourth, the teaching management form is contrary to students' personalized development thinking, which accounts for 32.3% of

the total. Finally, some colleges and universities have a single way to evaluate students, which accounts for 13.4%. This is analyzed in detail below.

(1) Teaching methods are relatively conservative

Traditional teaching models usually take teachers as the core of teachers. In the course of teaching, students play a passive role and push special initiatives. In particular, for students who have the foundation of weak learning, they've been taught mechanically by teachers for a long time. They can only accept passively, which is why I'm often nervous, and I'm very nervous, and I'm not interested in learning at all.

(2) The management ability of managers needs to be improved

At universities, management personnel responsible for governance education are not far from the speed of development of time and can't go beyond the general benefits of school. In a violent marketing competition, they can't face other universities properly, which is why the government is homogeneous; reform and innovation strategy, other colleges and universities are totally characterized and are not seriously in the process of school and development. Some managers have weakened their ability to adopt new information and new methods, and have no effect on the daily learning of high school universities and lack of comprehensive understanding, reforms and innovation, and lack of systematic and deprived management training. It doesn't create a system.

(3) The concept of teaching management lags behind

The traditional teaching management concept is that the management dominates the school education management mode. The decision of the management directly determines the level of teaching in colleges and universities, and even restricts the normal development of colleges and universities. The lack of self-motivated managers, lack of a correct understanding of their own management level, holding the traditional management concept and not giving up, and social development fault, such colleges and universities are difficult to cultivate excellent professional talents. Many colleges and universities lack of people-oriented management concept, the teaching requirements are not practical, which leads to improper teaching methods, ignoring the needs of students, poor communication between the upper and lower levels, seriously affecting the teaching level.

(4) The form of teaching management is contrary to students' individualized development thinking

College students have mature personal thinking and thinking. They will have certain personal thinking whether in the process of learning or in the process of receiving management. When the behavior direction given by the outside world deviates from its judgment, most college students will first examine whether their thinking is wrong. However, once it is found that the external behavior deviates from its own development needs, it will inevitably produce a certain degree of resistance to the language or behavior given by the outside world.

(5) The evaluation method is single

The situation of "one volume determines the universe" still exists in the classroom teaching management of some colleges and universities. Teachers' evaluation of students is still based on the traditional academic performance and ability as the

only evaluation standard, and as the basis for determining the learning achievements.

#### **4.2 Analysis of Teaching Management Reform Strategy Based on the Perspective of “Deep Learning”**

In view of the problems existing in the teaching management of colleges and universities, this paper puts forward a series of reform measures based on the perspective of “deep learning”. The results are shown in Table 1.

**Table 1.** Teaching management reform strategies based on the perspective of “deep learning”

Strategy	Objective
Improving teaching mode	Improve students' interest in learning
Improve the quality of management personnel	Constantly innovate management means
Improve the standardization level of teaching management	Improve management efficiency
Strengthen cooperation among departments	Promote the improvement of management level
Strengthen school enterprise cooperation	Improve students' practical ability
Improving teaching management mechanism	Further improvement of teaching management

As can be seen from Table 1, these articles suggest improvement strategies in different ways, such as teaching methods, teaching models, teaching levels and teaching mechanisms. First of all, we need to develop a teaching model, to increase the interest of students learning, and second of all, to improve the quality of the management staff and improve the management methods. Furthermore, by improving the standardization of the teaching administration, the effectiveness of the teaching administration We're tired. Split up. In addition, we need to increase the cooperation of the department to promote the improvement of the governance level. We can also increase the cooperation of schools and businesses and improve the skills of students. Finally, we need to improve education management mechanisms and improve education management.

##### **(1) Improving teaching mode**

Time moves and the teaching model should be updated continuously. The needs of the community are constantly changing for its skills, which requires innovation and reform in education, teaching concepts, teaching models and information structures. Teachers use multimedia teaching to change traditional teaching modules that can increase the interest of students in learning. It is necessary to create a sense of ownership and ensure that students participate in the education process, use their intelligence in full meaning, develop their special engagement and monitor the education administration.

(2) Improve the quality of management personnel

In the reform and innovation of teaching management in colleges and universities, managers should not stick to the weak, but should constantly learn new management skills, abandon old teaching concepts, keep up with the pace of the times, realize their own shortcomings, continue to learn, and improve their professional quality. Managers need to keep learning, master the most cutting-edge management means, new management concepts, to adapt to the development of the new era.

(3) Improve the standardization level of teaching management

Under traditional education, the university's administration is to use a lot of management for development. Knowledge technology is commonly used in all parts of life, so it leads to university education. When it comes to improvement, we can also choose ways of managing information to improve the standardization of education.

(4) Strengthen cooperation among departments

Colleges and universities should follow the principle of two-way combination of teaching management and student management, establish department collaborative development mechanism and department cooperation linkage mechanism, promote the improvement of teaching management level with student management, optimize student management pattern with teaching management performance, and create a harmonious, healthy and positive macro environment for students' healthy development, so that departments can carry out various daily work. There are rules to follow and rules to abide by.

(5) Strengthen school enterprise cooperation

Colleges and universities should break the bottleneck of traditional teaching management, combine theoretical teaching with practical teaching, establish long-term practical cooperation with social counterparts, and create a relaxed atmosphere for students' practice and practice.

(6) Improving teaching management mechanism

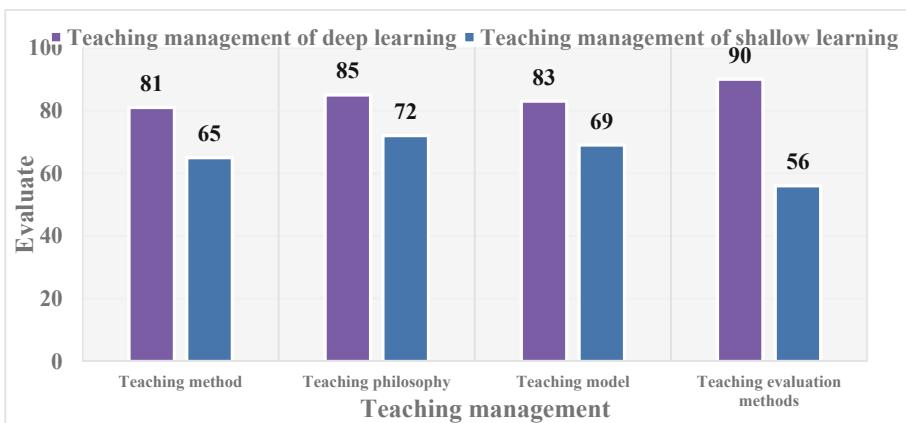
In the process of teaching, administration mechanisms need to be improved. First of all, colleges and universities need to establish a reasonable governance organisation, to effectively set the objectives of traditional governance and specific business content, and to ensure that they meet the highest level of education needs. Second, to support the education management mechanism effectively, In order to achieve the reasonable integration of educational governance, management tasks need to be improved to achieve the highest degree of access to educational goals. Based on this, teachers need to promote their primary role effectively in order to ensure that they can bring their values to the highest level in the integration of student intervention.

#### **4.3 Comparative Analysis on Teaching Management of Deep Learning and Shallow Learning**

In order to evaluate the teaching management reform measures based on the perspective of deep learning, this paper selects the teaching management of shallow level learning as the contrast, and then scores the teaching management under two different levels of learning. The results are shown in Table 2 and Fig. 2.

**Table 2.** Comparison of teaching management between deep learning and shallow learning

Teaching management	Teaching method	Teaching philosophy	Teaching model	Teaching evaluation methods
Teaching management of deep learning	81	85	83	90
Teaching management of shallow learning	65	72	69	56

**Fig. 2.** Comparison of teaching management between deep learning and shallow learning

This article from the teaching method, the teaching idea, the teaching pattern and the teaching appraisal way four aspects launches the appraisal. According to Table 2 and Fig. 2, the score of teaching management in deep learning is 81 in teaching method, 85 in teaching concept, 83 in teaching mode and 90 in teaching evaluation. The score of teaching management in shallow learning is 64 in teaching method, 72 in teaching concept, 69 in teaching mode and 90 in teaching evaluation. From the evaluation results, we can see that the management of teaching methods of deep learning is better.

## 5 Conclusions

In college and universities, education management reform and innovation are a long-term and difficult job. In this article, based on the perspective, is to examine the reform of teaching administration. In this article, when it comes to a deep learning perspective, the university administration does not need to have the ability to manage and to have a comprehensive education, at the same time; the teacher team believes that there are high necessities. During most teachers, education management must implement

reforms and innovation changes. In this process, the ability to implement and improve the full skills, eliminate weaknesses, evaluate the application, promote the application. It is our responsibility to promote development and promote the sustainable development of universities.

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# A Study on the Strategies of College English Teachers' Job Burnout Under the Information Teaching

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**Abstract.** With the continuous development of science and technology, the product of informatization is reflected in all aspects of life. More and more colleges and universities have carried out information-based teaching, which can broaden students' knowledge and enable students to learn anytime and anywhere. All sectors of society believe that information-based teaching is to reduce the teaching burden of university teachers, and is no longer bound by time. However, under the information-based teaching, in fact, it increases the workload of college English teachers, and more and more college English teachers show the phenomenon of job burnout. Based on this, this paper analyzes the causes of college English teachers' job burnout under the information-based education, and discusses the coping strategies. At the same time, it elaborates from four aspects: social support, school construction, teachers' personal professional development, and students' and family support. Teachers should adjust their mentality in time, create a pleasant learning atmosphere and establish a good relationship between teachers and students.

**Keywords:** Information technology teaching · Colleges and universities · Public English teachers · Job burnout

## 1 Introduction

Teaching informatization refers to using information technology to digitize all aspects of teaching, so as to improve teaching quality and efficiency [1–3]. It is guided by modern teaching concept, supported by information technology, and applied in modern teaching methods [4]. Teaching information research is about the change of teaching state, the goal is information technology, and this is about how to use information technology to make all teaching links informative [5]. Therefore, teachers focus on information-based teaching in order to achieve better classroom teaching. In the effective classroom of information teaching, students can learn online, which can expand students' knowledge and improve their learning skills. At the same time, teachers can arrange their own time to teach, also can refer to other teachers' teaching and learning practice. Teaching information has also changed from a promotional tool

to a cognitive tool for students' active learning, collaborative exploration, construction of definitions and practical problem solving. Students use materials to ask for information, search for information, and collaborate and communicate [6].

Teachers' job burnout is a sign that teachers lack professional motivation and interest in teaching, and their interest in teaching is not high, which may lead to boring teaching and learning [7, 8]. The professional behavior of Public English teachers in colleges and universities is the highest risk group. The research shows that [9], the most vulnerable to job burnout in helping professions. Teaching is a profession to help others and one of the most vulnerable groups to job burnout. As teachers themselves and the society have high expectations for the profession of teachers, teachers' work is to teach and educate people, and their work tasks and their social responsibilities are heavy, which makes teachers unable to deal with the pressure of work well and produce job burnout [10].

Therefore, this study, which takes college English teachers as the research object, first studies the causes of College English teachers' job burnout, and then measures teachers' job burnout from three aspects: Teachers' self-concept scale, teachers' self-efficacy scale and Job Burnout Questionnaire. Finally, according to the job burnout of College English teachers, the corresponding countermeasures are provided to further improve the job burnout of College Public English teachers.

## 2 The Reasons and Measurement of the Burnout of Public English Teachers in Colleges and Universities

### 2.1 Causes of Job Burnout of College English Teachers

Public English teachers in Colleges and Universities are a special group in the teaching staff with a high incidence of job burnout. As a front-line teacher, English teachers directly face the whole school students and undertake the Basic English teaching work of students with different backgrounds and majors. The teaching content is repetitive and the teaching task is heavy. As we all know, the best teaching method of language teaching is in small class, but the class size of colleges and universities is generally more than 40 people, even because of the shortage of manpower, sometimes we have to share classes. Such a variety of reasons lead to poor classroom teaching effect, deepen the sense of frustration of teachers, and result in the reduction of work enthusiasm.

Secondly, the professional title evaluation and performance evaluation of teachers in Colleges and Universities are not limited to classroom teaching, but have strict requirements in scientific research, social practice and social service. College English teachers passively accept the teaching management policy and assessment system. They are in a marginal position for a long time. They are at a disadvantage in the allocation of resources such as project application and training. There is no hope of promotion and long-term hard work in teaching positions is not respected and rewarded, which will lead to job burnout.

Finally, from the perspective of social development, with the progress of science and the development of Internet technology, network resources about foreign language learning are becoming more and more abundant, and artificial intelligence translation

has also been greatly improved. Most of the students ignore the hard work and long-term investment in English learning, and the practical application ability of foreign language is not satisfactory. Due to the needs of education internationalization and economic globalization, the school has higher requirements for students and the society for employees' foreign language proficiency. As a result, students, schools and the society generally think that English teaching is time-consuming and inefficient, thus foreign language teachers are blamed. This also brings great confusion and pressure to college English teachers, and even denies their professional ability and professional value.

## 2.2 Measurement Methods of Teachers' Job Burnout

With the development of job burnout research, there are many tools to measure job burnout. Maslach (MBI) is the most widely used questionnaire. It includes MBI-HSS, teacher burnout scale and general burnout scale. MBI questionnaire contains 22 items, including emotional exhaustion, dehumanization and personal accomplishment. It has good reliability and validity after testing. In this study, MBI is used to measure the job burnout of College English teachers.

The purpose of this paper is to study the characteristics of College Public English teachers' Self-worth, teaching efficacy and job burnout, so as to comprehensively consider the individual factors of College Public English teachers, so as to facilitate the teachers of this group to understand their own burnout and make necessary adjustments, so as to promote the development of their subjective consciousness and positive beliefs.

## 3 Research Design

### 3.1 Research Object

This study takes college English teachers as the research object. Using the method of questionnaire survey, this paper tests the teachers' job burnout. Public English teachers from 23 universities in Heilongjiang, Jilin, Liaoning, Inner Mongolia and other provinces and cities were selected as the survey objects. A total of 350 questionnaires were distributed. There are 72 male teachers, 156 female teachers, 64 associate senior titles, 112 intermediate titles and 52 teaching assistants. A total of 210 valid questionnaires were collected, and the effective recovery rate was 92.1%. The survey information is shown in Table 1.

### 3.2 Research Tools

#### (1) Teachers' Self Concept Scale (TSCES)

Teachers' self-concept includes "emotional exhaustion", "low personal achievement", "depersonalization" and "job burnout". The internal consistency of the measurement was 0.86. The questionnaire covers five factors of professional skills,

**Table 1.** Basic information of college English teachers

Variable		Number of people	Constituent ratio
Gender	Male	72	31.6%
	Female	156	68.4%
Education	Master degree and below	164	71.9%
	Doctor degree and above	64	28.1%
Marital status	Married	176	77.2%
	Unmarried	52	22.8%
School location	Provincial capital city	126	55.3%
	prefecture-level city	108	44.7%
Salary	<4000	56	24.6%
	4000–6000	99	43.4%
	>6000	73	32.0%

personal ethics, social acceptance, interpersonal relationship and student feedback, with a total of 20 questions.

#### (2) Teacher efficacy scale (TES)

There are 15 items of personal teaching efficacy and general teaching efficacy. The higher the score of each item, the higher the level of teaching efficacy. The internal consistency coefficients of each factor and the whole questionnaire were 0.887, 0.763 and 0.862, respectively.

#### (3) Job Burnout Questionnaire

Job burnout questionnaire includes three factors: emotional exhaustion, depersonalization and low sense of achievement. The reliability of the three dimensions was 0.89, 0.78 and 0.79, respectively.

## 4 Research Results and Analysis

### 4.1 General Situation of Job Burnout of College English Teachers

In this study, SPSS was used to analyze the effective questionnaires. This paper makes descriptive statistics on the overall situation of College English teachers' job burnout, and the results are shown in Table 2.

A total of 123 questionnaires were collected in this survey. The total average score of job burnout of College Public English teachers is 1.9872, which is less than 2 points, but it is very close. It shows that there is a certain degree of job burnout among College Public English teachers. If they do not respond in time, their degree of job burnout will soon deepen. According to the design of the questionnaire and the calculation of the 5-point scoring system, it shows that a considerable number of College Public English teachers have a serious degree of job burnout. From the score distribution of each dimension, the average value of emotional exhaustion is 2.9634, the highest score is 3.42, and 59% of the total number score more than 2 points, indicating that most

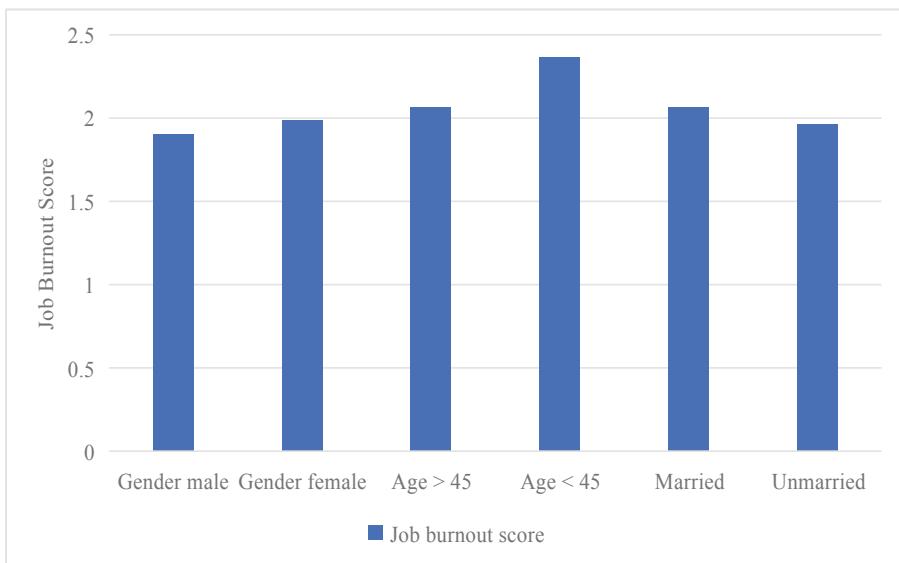
**Table 2.** General situation of job burnout of college english teachers

Dimension	N	Mean value	Standard deviation	More than 2 points
Emotional exhaustion	123	2.9634	0.7148	59%
Depersonalization	123	2.1243	0.6556	30%
Low personal accomplishment	123	2.2779	0.5513	31%
Job burnout	123	1.9872	0.4368	43%

college English teachers have the problem of emotional exhaustion. The incidence of the three dimensions from high to low was as follows: emotional exhaustion was 59%, low personal accomplishment was 31%, and depersonalization was 30%. Therefore, the professional fatigue of College English teachers is usually manifested as emotional exhaustion, and depersonalization and low personal accomplishment are not obvious. As far as standard deviation is concerned, depersonalization varies greatly, followed by emotional exhaustion and low personal accomplishment.

#### 4.2 Differences of Job Burnout Among College English Teachers

One-way ANOVA was used to analyze the job burnout of College English teachers with different genders, ages and marital status.

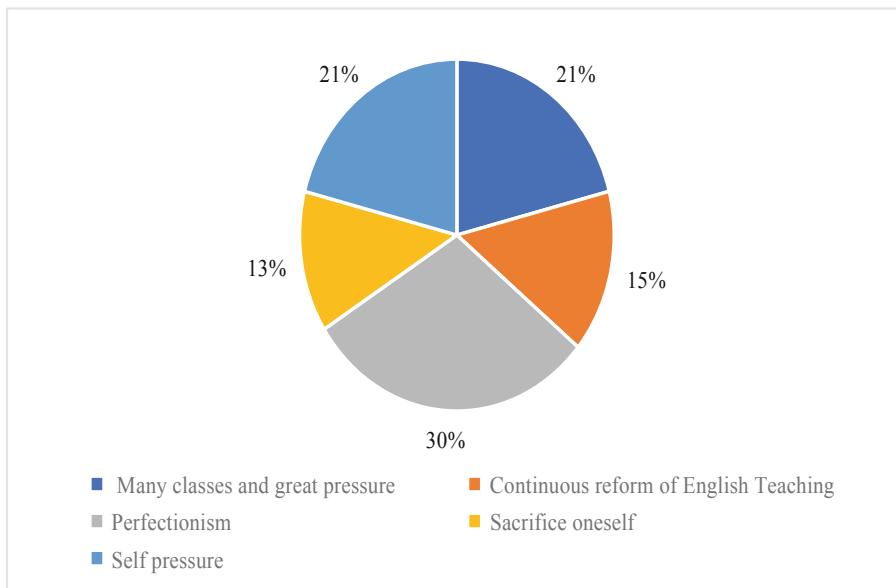
**Fig. 1.** Differences of job burnout among college english teachers

From Fig. 1, it can be found that local college English teachers generally have the problem of job burnout, which belongs to moderate intensity and is not serious on the

whole (scores above 3 indicate that job burnout is serious). In terms of gender, age and marital status, female teachers are more tired than male teachers, teachers younger than 45 are more tired than teachers older than 45, and married teachers are more tired than unmarried teachers. Generally speaking, the pressure of young married female teachers is relatively high, mainly because the pressure of teachers' life at this stage is relatively large, and the phenomenon of job burnout is more likely to occur.

#### 4.3 Reasons for Job Burnout of College English Teachers

Whether in ancient times or in modern times, all sectors of society have high requirements for teachers, which also endow teachers with various responsibilities and require them to play different roles. In order to be a teacher, teachers have to pay attention to their own image anytime and anywhere, and even demand that they achieve perfection. This will often suppress and negate the desire of teachers as normal people. In the face of their own mistakes, teachers' sense of self blame and guilt will be stronger and more lasting than others. Facing with so many requirements, teachers can only give up their own interests, for the sake of work and students to make self-sacrifice, in order to meet the external evaluation and positioning of their own. This paper makes a questionnaire survey on the causes of College English teachers' job burnout.



**Fig. 2.** An analysis of the causes of College English teachers' Job Burnout

From the data in Fig. 2, it can be found that there are five main reasons for job burnout of College English teachers: more class hours, high pressure, and continuous

reform of English teaching, perfectionism, and self-sacrifice time and self-pressure. These five aspects are characterized by teachers' self-sacrifice, so that teachers can not feel the relaxed and pleasant external atmosphere. In the long run, how can teachers not feel heavy and tired, and how can they avoid job burnout?

#### 4.4 Countermeasures for Job Burnout of College English Teachers

From the above analysis results, we can see that nearly half of College Public English teachers have job burnout, and 59% of them have obvious performance in emotional exhaustion, which is the most important dimension. This shows that the phenomenon of job burnout of College English teachers cannot be ignored. The influence of education is long-term. College English teachers are the direct implementers of College English reform in higher education. Once they have job burnout and lose their enthusiasm for work, they will not only hinder the smooth progress of College English reform, but also bring about the lack of talents in the society. Therefore, we should pay attention to the phenomenon of College English teachers' Job Burnout and take measures to alleviate it. It is a very complex project to alleviate the job burnout of College English teachers, which needs the joint efforts of all aspects. This study elaborates from four aspects: social support, school construction, teachers' personal professional development, and students' and family support.

##### 1. Social support

Teachers' working environment is relatively closed, which makes the teaching profession a "lonely profession". Therefore, it is very important to build a harmonious and good social support system to alleviate the job burnout of College English teachers. In recent years, the concept of "invigorating the country through science and education" has appeared more and more in the educational reform documents. Therefore, it is necessary to speed up the construction of the national foreign language ability assessment system and attach importance to the role of teachers in the reform of College English teaching. The reform of college education should also be carried out step by step. We should listen to the suggestions of College English teachers, strive for their direct participation, enhance their enthusiasm and initiative, obtain a sense of achievement, and alleviate job burnout.

##### 2. School construction

School system and school management should be based on "teachers", so that they can obtain dignity in the process of work, so as to achieve the goal. If the school can provide a supportive and continuous learning environment for teachers, then the level of teachers' job burnout will be reduced. It is very necessary to create an ecological campus and give college teachers a good working environment. Secondly, the school should also improve the management system, give some power to teachers, and build a development platform for College Public English teachers according to the theory of teachers' career cycle, and give incentives and support. For College English teachers, the understanding and support from school leaders can improve their job burnout.

### 3. Teachers' personal development

Teachers are the most important and the first resource of sustainable development in a school. If the school wants to survive in the fierce competition, the professional development of teachers is an essential factor. Only with the continuous progress of individual profession and the recognition of the school, can teachers get satisfaction, reflect their self-worth and no longer suffer from job burnout. Therefore, teachers' professional development is the most important step to alleviate job burnout. Teachers can improve their self-efficacy in self-development, cultivate reflective teaching and help each other, which can relieve teachers' job burnout.

### 4. Student and family support

The educational process itself is an interactive process. Teachers who can produce "antibodies" to the sense of burnout must be able to establish a harmonious and intimate relationship between teachers and students. Therefore, it is also very important for College English teachers to overcome job burnout by gaining students' understanding and support. The occurrence of job burnout will not only bring physical harm to teachers, but also cause hidden dangers in psychology, which will affect the relationship between them and family members and lead to the increase of family conflicts. Therefore, family support can alleviate the job burnout of College English teachers. Teachers can get too much emotional support from their families, which is conducive to relieving psychological pressure.

## 5 Conclusion

Through questionnaire survey and prediction analysis, this paper summarizes the current situation of College Public English teachers' job burnout under the background of information-based teaching. The results show that 59% of college teachers have emotional exhaustion, especially the married female teachers younger than 45 years old. Secondly, there are five reasons for the job burnout of College English teachers: more class hours, great pressure, and continuous reform of English teaching, perfectionism, self-sacrifice time and self-pressure. Therefore, in the context of information-based teaching, in order to improve the problem of teachers' job burnout, it is necessary for teachers and universities to make joint efforts to enhance teachers' self-concept and teaching efficacy, so as to alleviate teachers' job burnout.

**Acknowledgments.** This work was supported by Social Science Foundation of Qiqihar Medical University, the project number QYSKL2019—03.

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# Using Big Data to Enhance the Targeted Research of College Students' Developmental Education

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**Abstract.** How to carry out formative education and develop good habits is the basis for developing a good personality, so that college students can adapt to the current social needs and become useful talents for society. Forming a systematic set of good habits and applying them in practice is an important way to shape the perfect personality of college students. This article uses literature research methods, comparative analysis methods, theory integration with practice, multi-disciplinary comprehensive research methods and other methods, using big data as the entry point, to define the concept, theoretical exploration and countermeasures of college students' development education. First, the research summarized the concept and communication characteristics of big data, discussed the nurturing education of college students in the big data environment, and analyzed the relationship between big data and nurturing sex education of college students. Secondly, it sorts out the status quo of college students' developmental sex education in the big data environment and a series of problems currently facing, and conducts a series of analysis from the three aspects of students, universities and big data environment. Third, in response to the shortcomings in the development of college students' developmental education, corresponding countermeasures are put forward in the three aspects of the reasons for the shortcomings, and it is clearly pointed out that the construction of the main body of college students is improved, and the construction of the developmental education system under the big data environment of colleges and universities. It is an effective way to promote the development of sex education for college students in the context of big data such as the construction of big data.

**Keywords:** Big data · Developmental education · College students · Big data environment

## 1 Introduction

First of all, contemporary college students have a weak sense of social morality. Although most contemporary college students admire the traditional virtues of the Chinese nation and hate some unhealthy practices in today's society, they often worship heroes and role models, and hope to change the bad social atmosphere and help those in need through their own efforts [1]. For example, support education, blood

donation and voluntary blood donation in remote areas. These activities have won praise from contemporary college students in society. However, there are still some college students who have weak social moral awareness and cannot consciously comply with relevant regulations such as spitting, cheating on exams, and noisy public places [2]. There are also some college students who ignore some undesirable phenomena around them. They all think this matter is not their own, and they are hanging up high. This erroneous view is due to the weak social moral consciousness of students. Secondly, lack of good study, living habits and hardworking spirit [3]. After entering the university, many college students think that they have studied in high school for three years, so they do not need to continue studying seriously in the university. Even some college students lack good study and living habits, and their consciousness is also very poor [4].

Cultivating education is based on an understanding of the nature of education. The contemporary Chinese educator Ye Shengtao said: "What is education?" He also pointed out that from elementary school teachers to university professors, their primary task is to help students develop good habits and help them develop good political, cultural and scientific habits. Sex education is to develop good behavior and study habits, as well as good exercise habits [3]. In his article "Habits Become Nature", he wrote: "We should have the ability to observe". We must really observe; if we want, we must have the ability to work, we must start working; if we want to have the ability to read, we must open the book and really read; if we want to be good citizens, we must truly do what citizens should do everything of [5].

Nowadays, with the social transformation of the market economy under the background of economic globalization, higher education has entered the popularization stage [6]. College students are no longer a group with obvious common characteristics. The imbalance between ideological level and ability quality is a realistic problem that we must face at present. College students lack self-confidence and self-awareness [7]. For contemporary college students with the above-mentioned complex characteristics, if they continue to receive pure elite education in management ideology education in college students' ideological education, it will be difficult to complete the task of training social builders and successors [8]. In order to create a good learning environment and discipline for students, it is necessary to create a good learning environment and discipline. Quality is based on personal inheritance, social culture as an external condition, personal will (active) and personal experience (passive) as internal conditions [9].

## 2 Method

### 2.1 Early Warning Indicator System

There are m early warning indicator systems, each indicator supplies n original data, and the early warning indicator system processes these data, so that a standard matrix can be obtained:

$$\mathbf{T} = (r_{ij})\mathbf{m} \times \mathbf{n} \quad (1)$$

Among the m indicators, the i-th indicator is defined as:

$$E_i = -\frac{1}{\ln n} l_{ij} \ln(l_{ij}), i = 1, 2, \dots, m. \quad (2)$$

Among them:

$$l_{ij} = \frac{r_{ij}}{\sum_{i=1}^n r_{ij}} \quad (3)$$

$$W_i = \frac{1 - E_i}{m - \sum_{i+1}^m E_i}, 0 \leq W_i \leq 1 \quad (4)$$

For the safety accident early warning indicators of the corresponding heavy, medium, and light alarm states, the dimensionless processing is performed by formula (1) to obtain the dimensionless value  $x_i$ , and the weighted value is obtained by multiplying the index and the corresponding quantitative value by weighting and summing. Average value:

$$\Delta = \sum_{i=1}^m W_i x_i \quad (5)$$

$$R(t) = P\{x(t) < [x]\} u(t) \geq [u] \quad (6)$$

$$P_{FR}(t) = \frac{u(t)}{[t]} P_{RSD}(t) = 1 - \frac{u(t)}{[u]} \quad (7)$$

$$t_r - t_1 = \frac{\frac{1}{2}(t_2 - t_1)^2}{(t_2 - t_1) - \frac{1}{2}(t_3 - t_1)} \quad (8)$$

## 2.2 Strengthen System Construction and Formulate Effective Incentive Mechanisms

In order to improve the effectiveness of formative education in colleges and universities, the most important thing is to strengthen the construction of the teaching system, because formative education is inseparable from normative constraints. In the process of developing formative education, colleges and universities should formulate effective travel rules and regulations, and use the rules and regulations to restrict, guide and regulate student behavior, and ultimately improve the quality of students. In this regard, colleges and universities should rely on systematic management to strengthen the educational concept of nurturing education, and further implement relevant regulations and requirements of nurturing education by formulating moral education curriculum and implementation plans. In addition, colleges and universities should also formulate

effective incentive mechanisms to improve the discipline and reward system for students. For example, colleges and universities have established a scoring system, and students from the school are entered into the system and managed by the head teacher of each class. When the student's behavior meets the requirements, the head teacher can add the corresponding score to the student. If it does not meet the requirements, it can be deducted accordingly learn.

### **2.3 The Implementation of Nurturing Education Must Ensure that the Plan is Systematic and Orderly**

From the perspective of content composition, the formative education of college students includes the formation of daily behavior, study habits, moral habits, and professional awareness. Each level is closely connected, which constitutes the systematic and orderly nature of nurturing education for college students. Generally speaking, the above aspects of education should be carried out sequentially. It is necessary to take daily behavior training education as the most basic content of education, and to enhance the awareness of personality of college students by improving the awareness of discipline and to maintain their mental health. On this basis, moral education can be carried out. Starting from adhering to social ethics education, standardizing behavioral norms, and establishing professional ethics, college students will be elevated to the level of advocating ethics; the most basic criterion is not to infringe on the interests of others, and then willing to help others, and then willing to make contributions. In order to cultivate students' professional awareness and improve their professional quality, it is necessary to improve students' professional awareness and improve their professional quality. The cultivation and education of college students is a huge systematic project that needs to be balanced and promoted gradually.

## **3 Experiment**

### **3.1 Experimental Investigation Objects**

In order to be able to further analyze the current use of big data to enhance the targeted research of college students' developmental education, this article conducts a special survey of students from a certain industrial university. Among the college students who accept the questionnaire survey, the number and proportion of each grade survey is there are 115 freshmen, accounting for 24%, sophomores 126, accounting for 27%, juniors 118, accounting for 25%, and seniors 110, accounting for 24%. Among the survey subjects, the urban population of college students is 273, accounting for 58%, and the urban population is 196, accounting for 42%. Among the survey respondents, the political outlook of the students is that there are 40 CCP members, accounting for 9%, 80 probationary members, accounting for 17%, and 349 League members, accounting for 74%. Among the students surveyed, 382 were only children and 87 were not only children.

### 3.2 Experimental Research Design

**Table 1.** Questionnaire statistics

	Valid questionnaire (parts)	Invalid questionnaire (parts)	Total (parts)
Questionnaire on the status quo of nurturing education for college students	469	31	500
Questionnaire on the concept and method of fostering sex education for college students	412	31	443
Employer's Evaluation Questionnaire on the Cultivation Education of College Students	50	0	50

The questionnaires were compiled in blank form. A total of 500 questionnaires were issued in the “Questionnaire on the Status Quo of College Students’ Developmental Education”, all of which have been recovered, including 469 valid questionnaires and 31 invalid questionnaires. A total of 500 copies of “Questionnaires on the Ideas and Methods of Fostering Sex Education for College Students” were issued and 443 copies were recovered, including 412 valid questionnaires and 31 invalid questionnaires. A total of 50 copies of the “Employer’s Evaluation Questionnaire on the Development of College Students’ Sexual Education” were distributed and all were recovered. (See Table 1 for the specific questionnaire recovery.) The results show that the distribution of the four grades in the questionnaire survey is relatively uniform, which can fairly reflect the living habits and ideological and moral concepts of college students in each grade; the distribution of student resources can objectively reflect the structural distribution of college students; Among the students surveyed, the proportion of league members is greater than the proportion of party members in the probationary period, while the proportion of party members is smaller. It can be found that only children account for the vast majority. The questionnaire can objectively and fairly reflect the actual situation of college students.

## 4 Results

### 4.1 Investigation and Analysis of Experimental Data

Economy is the foundation of politics. With the rapid development of China’s economy, citizens’ enthusiasm for participating in political life has increased. The development of this country has not left every citizen, but college students are the builders and successors of the cause of socialism. Through the questionnaire survey, most students have high political enthusiasm and full of confidence in the party and the country. Through these courses, it provides a platform for college students to understand Marxist thought, understand the Chinese Communist Party and understand the current political situation. But in the age of statistical data, it is found that there are still some problems in the ideological and political education of college students.

## 4.2 Experimental Data Survey Results

Whether it is through questionnaire surveys or face-to-face communication, it can be found that many students do not understand what “parenting education” is, which can be reflected in the data in the Table 2 below.

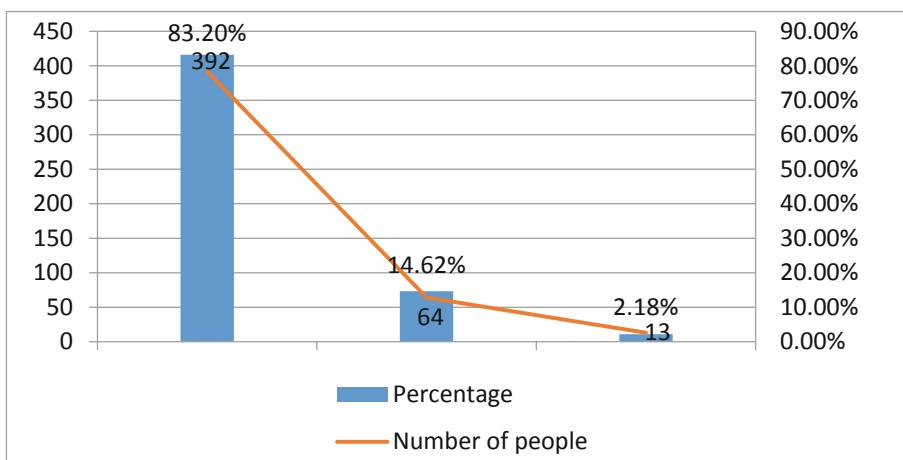
**Table 2.** Undergraduates’ understanding of the content of nurturing sex education

	Content	Number (people)	Percentage (%)
Which of the following aspects do you think the developmental education includes?	Good political literacy	275	58.6
	Good study habits	355	75.7
	Good habits	460	98.1
	High moral character	370	78.9
	Mental health	223	47.5
	Innovative spirit and practical ability	288	61.4
	Number of people who selected all six options	106	22.6

According to surveys, many Chinese scholars also equate “nurture education” with these three aspects. In fact, with the development of society, the content of parenting education is constantly adding new content. It can be found from the table that many students do not regard “mental health” as an important aspect of parenting education. This is a need that Chinese education should pay attention to. At a time when under great pressure of study, many students have hidden dangers in their mental health, such as anxiety, depression, insomnia and dreams. Many school health consultations are just a decoration. In terms of innovation and practical ability, data shows: 60% of students pay attention to the importance of innovation and practical ability, but this level of attention is far from enough. The better development of social economy depends on new technology, which requires most students to constantly think and practice.

Although 22% of the students in the data believe that nurturing sex education includes these six aspects, through communicating with students, they asked “Why did they choose these six options” and answered “Because of multiple choices and seeing that the options match the correct values, so choose Therefore, college students are very” unfamiliar with nurturing education. When asked, “Do you think college nurturing education is important for future personal and social development?” The answer statistics are shown in Fig. 1. Figure 1 shows: 83.2% of college students They believe that nurturing sex education is important for future development. 14.62% of college students believe that nurturing sex education is of general importance, but 2.18% of college students think nurturing sex education is not important. With the continuous reform of ideological and political education in China, Some measures taken by our

school have achieved some results, and their attractiveness and effectiveness need to be further improved.



**Fig. 1.** The importance of nurturing education for college students to future personal and social development

## 5 Conclusion

In the context of the development of ideological and political education, it is of great practical significance to do a good job of nurturing education for college students, because nurturing education occupies an important position in the ideological and political education system engineering. Therefore, colleges and universities must firmly grasp the formation education of college students and cultivate the talents needed by employers. However, nurturing sex education is not accomplished overnight, but a progressive process. In this process, colleges and universities should, in accordance with the law of development of higher education, the law of growth of college students, and the status quo of social development, continuously integrate new developmental education content, and promote college students to participate in social practice in an orderly manner, and develop a good life habit. In practice, foster a spirit of innovation and promote the free and comprehensive development of the university. At present, the theoretical foundation of college students' developmental sex education is not perfect, and the specific practical operation is not mature enough. More and more experts and scholars need to further strengthen and strengthen the theoretical discussion and practical research of the formation education of college students. During the cultivation process, problems are constantly discovered and targeted corrections are made. Finally, a relatively good education mechanism was formed, which effectively promoted nurturing education.

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# Impact of “One Belt One Road” on Intercultural Communication in Local Colleges and Universities in the Internet Background

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**Abstract.** In the context of the current global Internet, the “One Belt One Road” strategy is currently the highest top-level strategy in my country. It is highly valued at home and abroad, and it is also a new round of comprehensive opening up in China. Conducting research on cross-cultural communication in my country’s local universities under the background of the “One Belt and One Road” has great theoretical value for promoting the influence spread of China’s local universities’ cross-cultural communication under the strategic background of this new era and the development of “Belt and Road” cooperation priorities. The purpose of this article is to study the influence of the “Belt and Road” on the cross-cultural communication of local colleges and universities in the context of the Internet. This article analyzes the related concepts of cross-cultural communicative competence, and introduces the related theoretical basis of competence training. Then, based on the analysis of local colleges and universities, a reasonable questionnaire of cross-cultural communicative competence was formulated for a local college to investigate, and it pointed out the main problems in the intercultural communicative competence of local college students. Finally, it analyzes the characteristics of international students’ cross-cultural communication and their influencing factors, and uses this as a basis to formulate effective suggestions for the enrollment, teaching and management of Chinese students. Research shows that “for better employment opportunities” accounted for 41.7%, ranking first, and still the main motivation for students to study in China. Interviews revealed that the reason is that after intercultural communication, students have gradually adapted to the way of life and learning in China, and their Chinese level has also been fully improved.

**Keywords:** Internet age · “One Belt One Road” · Cross-cultural communication · Motivation for studying abroad

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## 1 Introduction

With the promotion of the “One Belt One Road” initiative in the context of the Internet, humanities exchange projects, especially the cooperation between universities, international student education think tanks, youth exchanges [1, 2], civilization dialogue, and language and cultural learning will become bilateral cooperation. At the same time, the cornerstone of China’s strategic partnership will further promote China’s strategic partnership to a new historical stage [3, 4]. Cross-cultural communication skills are required for internationalization [5]. In order to satisfy the students’ ability to adapt to the trend of internationalization, cross-cultural communication is a basic skill that must be mastered [6, 7].

In the research on the influence of the “Belt and Road” on the cross-cultural communication of local colleges and universities in the context of the Internet [8], for example, many scholars have studied it. For example, Jaforullah believes that “through innovative and strategic partnerships, educational courses have been the sea has come to China”, and the mobility of higher education continues to increase [9]. Bnisch-Brednich B conducted further analysis and research on communicative competence based on predecessors, and then described communicative competence in more detail. They believed that communicative competence is grammatical competence, text competence, social language competence and strategy. The sum of abilities [10].

This article proposes effective solutions to the problems in the cultivation of intercultural communication among students in local colleges and universities, and analyzes the countermeasures from the aspects of teachers’ intercultural communication quality, students’ intercultural mentality, teaching environment, and cultural introduction, in order to improve the intercultural communication of local college students. Communicative skills lay a good foundation. This article is adapted from the existing questionnaires of the predecessors to make it more in line with the characteristics of vocational education students. The questionnaire is investigated, and the questionnaire is further improved through the analysis and summary of the survey results, which provides a guarantee for the true validity of the research. And then summarize and analyze the survey results.

## 2 Influence of Cross-Cultural Communication in Local Colleges and Universities Under the Background of the Internet

### 2.1 Necessity for Universities to Face the Internationalization of the “Belt and Road”

The internationalization of universities can encourage private universities to “go global” in foreign cooperation in running schools. Many world-class universities are private schools and are far ahead in the field of higher education. For local schools, they have great potential to go international and export Chinese private education brands.

(1) Provide talent support and promote cultural exchanges

From the perspective of responding to the government's call, in the process of building the "Belt and Road" economic cooperation framework, the exchange and construction of policies, economy, trade, culture, and technology are inseparable from the creation of new types of international talents. Cultivation puts forward new requirements. It will change the value orientation of overly focusing on economic benefits in the past, and expand cooperation with countries along the route in the fields of infrastructure, logistics, transportation, and cultural exchanges.

(2) Deepen the integration of production and education to serve local enterprises

After the "Belt and Road" initiative was put forward, many Chinese companies that went global through the "Belt and Road", local universities and these companies established an international cooperation platform for key projects such as economic and trade cooperation, resource development and utilization, and ecological protection, and carried out orders to train talents and enterprises. Training, technical research and other content, provide talent motivation and technical support for exporting "Made in China", and better serve the "Belt and Road".

(3) Going further and facing international transformation

The internationalization of local colleges and universities can make up for their own lack of educational resources by introducing advanced educational concepts and faculty from well-known foreign universities and learning from some excellent colleges and universities' educational experience, and finally realize the optimization of the overall structure of local higher education. On the other hand, it can also encourage local colleges and universities to "go out" in foreign cooperation in running schools. Many of the world's top universities are private schools, leading the way in higher education. Many regions also have many colleges and universities with well-developed teachers and strong school-running capabilities. For these schools, they have great potential to go international and export Chinese private education brands.

## 2.2 Internationalization of Local Universities Under the Background of "One Belt One Road"

(1) Lack of organization and management, and weak international competitiveness

The internationalization of organization and management is mainly embodied in the internationalization strategy formulated in the university development plan and the establishment of specialized international institutions. Many local universities have failed to incorporate internationalization measures into the school's strategic development plan, and lack the initiative, enthusiasm and creativity for international development.

(2) The international influence of scientific research is not strong, lack of interaction

With the development of the local economy and the prominent location advantages of foreign trade, local colleges and universities have begun to receive the attention of national and local higher education development strategies and plans due to their growing scale. Due to differences in national conditions, the status of local higher education in the country and private higher education is very different in the world.

The social popularity and public recognition of local universities is far less than that of public universities in foreign regions. Therefore, in the context of the “Belt and Road” initiative, there are many aspects of exchange of teachers and students, exchange of credits, and mutual recognition of academic qualifications with foreign partner universities insufficient.

### **2.3 “One Belt One Road” Local Universities’ Internationalization Strategies**

#### **(1) Establish an international education concept**

Accelerate the training of international talents that meet the needs of the local economy, and have successively introduced majors such as “logistics management”, “network finance” and “German” that are urgently needed in the Pearl River Delta with first-class educational resources.

#### **(2) Establish and improve policies and regulations for the internationalization of private universities**

Local governments are the leaders in promoting exchanges and cooperation between local governments and countries and regions along the “Belt and Road” initiative. Colleges and universities are the implementers of promoting local participation in educational exchanges and cooperation in the “Belt and Road” initiative. “Change to the role of “service provider”, increase awareness of serving the internationalization of private universities, build a good humanities exchange mechanism for private universities to carry out international exchanges and cooperation, and jointly run schools, scientific research exchanges, and joint training of talents for private universities and universities along the route Such activities are equipped with international platforms to broaden the ways for local universities to participate in international scientific research cooperation and exchanges.

## **3 Experimental Research on the Influence of Cross-Cultural Communication in Local Colleges and Universities Under the Background of the Internet**

### **3.1 Conduct of Investigation,**

The questionnaire survey of this study was conducted in two steps. First, send out 20 initial questionnaires, randomly select 15 students to conduct the survey, and modify and improve the questionnaire based on the survey results and students’ feedback. The questionnaire is a mature questionnaire. Then collect the WeChat of the survey subjects, make the questionnaires into electronic questionnaires through the questionnaire star software tool, and distribute them to the survey subjects point-to-point through WeChat. Since the survey subjects have been contacted in advance and their approval has been obtained, a total of questionnaires were distributed in this survey 220 copies and 201 questionnaires were returned. After consulting, there are 193 valid questionnaires.

The interview site on campus was chosen to be held at the alumni's home. The environment is elegant and there are few people coming and going. It is more relaxed with music atmosphere.

### 3.2 Data Processing

After the questionnaire was retrieved, the researcher sorted out and analyzed the questionnaire. The questionnaire star software is fully functional. After the questionnaire is collected, relevant data charts can be generated directly on the website. The data obtained from different questions can be compared, and the two parts of the survey results can be combined to analyze their correlation. The researchers performed descriptive statistics, data analysis and summary on the basic information of the research object, cross-cultural communication adaptability, learning motivation before and after coming to China, and motivation for choosing the target institution.

## 4 Experimental Research and Analysis of the Influence of Cross-Cultural Communication in Local Colleges and Universities Under the Background of the Internet

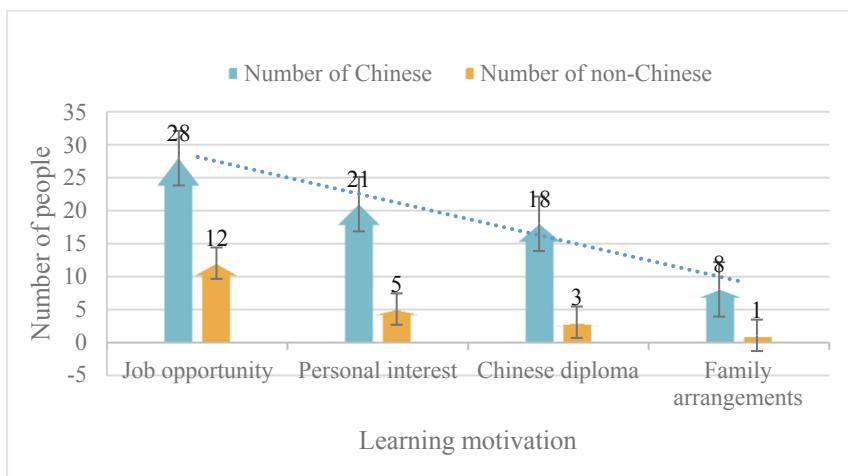
### 4.1 After Coming to China, the Motivation to Study Abroad Becomes More Autonomous and Diversified

In the questionnaire, the researchers screened out the students who will leave China after the end of this stage of study, a total of 64. The remaining students are about to choose to stay in China to continue their studies or have entered the second stage of study, a total of 143 people. For these 136 students, the researchers investigated their motivation for choosing to continue studying in China. Similarly, the researchers conducted statistics on the two major groups of Chinese and non-Chinese. The specific results are shown in Table 1.

**Table 1.** Statistics on the motivation of overseas students to study in China

Learning motivation	Number of Chinese	Number of non-Chinese
Job opportunity	28	12
Personal interest	21	5
Chinese diploma	18	3
Family arrangements	8	1

As shown in Fig. 1, it can be seen that "for better employment opportunities" accounted for 41.7%, ranking first, and it is still the main motivation for students to study in China. There are 26 people with "personal interest to improve Chinese level", which reflects that after cross-cultural communication, students' dependence on friends and the desire to improve their Chinese level are low. Interviews revealed that the



**Fig. 1.** Statistics on the motivation of overseas students to study in China

reason is that after intercultural communication, students have gradually adapted to the life and learning style of China, and at the same time their Chinese level has been fully improved.

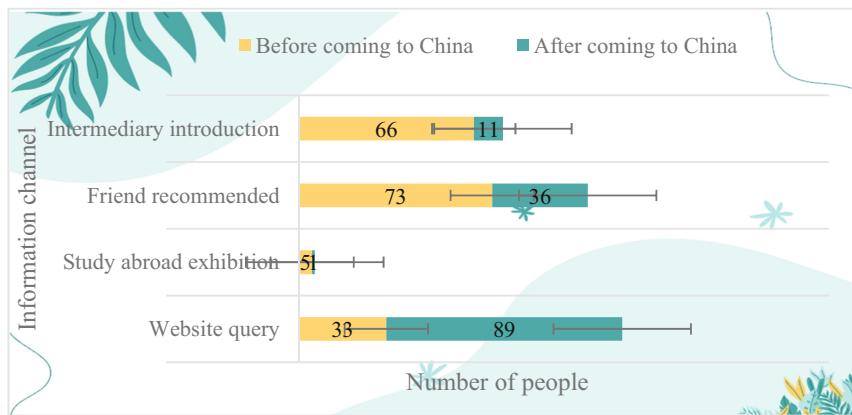
#### 4.2 Implications for Enrollment, Teaching and Management

In this article, in terms of the ways to obtain information about coming to China, the researcher lists four ways of website query, study abroad exhibition, friend recommendation, and agent introduction. The survey is conducted in the form of multiple-choice questions. The specific data are shown in Table 2.

**Table 2.** Statistics on the way to obtain application information for international students in China

Information channel	Before coming to China	After coming to China
Website query	33	89
Study abroad exhibition	5	1
Friend recommended	73	36
Intermediary introduction	66	11

As shown in Fig. 2, it can be seen that the way students obtain information before and after coming to China has changed greatly. The number of students introduced through the school before coming to China is the largest, followed by friend recommendation. After coming to China, after a period of cross-cultural communication, most students choose to obtain application information through website inquiry and on-site consultation, and the application process tends to be autonomous.



**Fig. 2.** Statistics on the way to obtain application information for international students in China

## 5 Conclusions

This paper starts with in-depth research from the aspects of local college students, local college teachers, local college training concepts and training methods, and combines the shortcomings of local college students' English learning ability and cross-cultural communication ability, from teaching methods and teaching methods. The environment and other aspects put forward more targeted training strategies, and provide feasible suggestions for improving the cross-cultural communication ability of local college students.

**Acknowledgements.** Research Fund: Project supported by the Research Fund of Yunnan Technology & Business University, 2019—Key project: Study on Intercultural Communication in Local University under the context of “One Belt & One Road”. Project number: YGSKY2019003.

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# Research on the Optimization of University Performance Management Information System in the Big Data Era

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**Abstract.** In modern society, the rapid development of knowledge economy has made human resources the core of a country's economic and social modernization. Under such circumstances, human resource management has attracted more and more attention and attention. As the foundation of all aspects of human resource management, performance management refers to the weaknesses of the management, control, decision-making and incentive processes within the system. Lack of management methods. Therefore, this article attempts to explore and consider optimizing the performance evaluation system of college students on the basis of the existing theoretical research results, hoping to establish a relatively scientific student performance evaluation index system. This article makes extensive use of management theory, teaching theory and performance management evaluation theory to analyze and study the status quo of student work management and performance evaluation system in my country's colleges and universities through questionnaire surveys. And found some of the existing major problems in the evaluation of college student management performance, and then used relevant theoretical knowledge, such as analytic hierarchy process and fuzzy comprehensive evaluation model to appropriately adjust various indicators and weights to the college student management performance evaluation system, and Defines a relatively high-level general guidance student evaluation performance evaluation system. At the same time, through the application of the evaluation system of student work performance in the actual management of students, it has proved its feasibility in reality. After analyzing the evaluation results, we also put forward more sensible suggestions and improvement measures to promote the development and improvement of student work management. Through the method of this article, the performance information system of universities in the era of big data has increased by 23% compared with traditional universities.

**Keywords:** Big data · University performance management · Computer science · Optimization research

## 1 Introduction

### 1.1 Background and Significance

In modern society, the necessary factor for the development of a modern economic society is to continuously increase the possibility of technological innovation. From the

perspective of globalization, the competition between the economic power of different countries and the total power of the country is actually the competition of modern scientific and technological forces [1]. In the rapid development of science and technology, high-quality talents are a solid foundation for strengthening national strength. In a sense, the quality of the high-quality talent pool represents the strong international development of a country and a country. The size of power in global competition. Universities are the main entrance to the high-level ethnic elite education in our country [2]. College students are facing severe challenges in applying science and technology to innovative countries, which are vital to the construction of a modernized country and its development. Social economy. His role [3, 4].

This article selects a dedicated research team for college students. The university student working group is responsible for ideological and political education, study management and life, organization of leisure activities, employment guidance, etc. The task is laborious, the volume is large, and the field is wide. Establishing and perfecting a student work evaluation system suitable for schools, and conducting regular evaluations, is an important link for a complete and objective description of the work status of the student work group [5]. For the student management team, it is very important to strengthen communication, achieve scientific management, clarify responsibilities, promote responsibilities, optimize the team, improve overall quality, mobilize enthusiasm and lay the foundation for growth and reduce rewards and punishments. Therefore, this article will further improve and supplement the existing performance management theory [6, 7].

## 1.2 Related Work

Due to the importance of managing university performance, more and more research teams have begun to pay attention to university performance management methods, but with little effect [8]. Hanna summarized the management of the university based on previous data and summarized a set of performance management methods [9], but with the passage of time, social changes are getting faster and faster. This method is also not suitable for the current society, so this article recommends using big data to optimize the university's performance information system to see if it can play a positive role [10].

## 1.3 Main Content

In order to solve the problem of optimizing the informationization of university performance management, this paper firstly studies and analyzes the past university performance management models through literature research and other methods. Then, through case studies and other methods, the university performance information system in the era of big data was studied, and the conclusion of this article was reached. Through the method of this article, the university performance information management system in the era of big data is better than the traditional 23% university performance.

## 2 Research Methods of University Management Information System Optimization in the Era of Big Data

### 2.1 Comparative Research Methods

The Oxford Advanced English-Chinese Dictionary explains: Comparative research is a method of studying and evaluating the similarity or different degrees between things and between people. Comparative research method can be understood as a method of investigating two or more related things according to certain standards, searching for similarities and differences, and exploring global law and special law.

### 2.2 Empirical Research Methods

Empirical research methods refer to methods that use statistical and quantitative analysis methods to quantitatively analyze data and information of economic activities, and to study the mutual influence of various related factors that affect economic activities. It tries to overcome the value judgment, especially the answer, which is a question of “what”.

### 2.3 Literary Research Methods

The method of bibliographic research mainly refers to the method of collecting, identifying and compiling documents, and refers to the formation of scientific understanding of facts through bibliographic research. This article collects and explores information related to this article by searching “China Journal Network”, “Chinese Journal Full-text Database”, “Chinese Outstanding Postdoctoral Dissertation Database”, “Superstar Library” and other network database resources, financial systems, etc. Use the above various research methods to compare and analyze the positive factors of performance management.

### 2.4 Case Study Method

The case study method is to combine reality, use typical cases as materials, and through special analysis and anatomy, prompt people to enter a specific process, create real emotions and seek solutions to problems.

## 3 Research Experiment on Optimizing University Performance Management System in the Era of Big Data

### 3.1 Theoretical Basis of Performance Management

The term performance is the combination of performance and efficiency in literal analysis. Performance is performance, it contains the goals of the organization, efficiency is a kind of efficiency, influence, attitude, behavior, behavior and method of behavior and it reflects the maturity of management organization goals. Definition

Performance management is a management method used to reach a grassroots consensus between target managers and employees and how to achieve goals, and to help and encourage employees to achieve organizational goals. The ultimate goal of performance management is to stimulate the enthusiasm of employees and improve their own skills and qualities, thereby improving the company's overall performance. Performance management must first solve the following problems: (1) How to reach a consensus on goals and achieve goals. (2) Performance management is not a single task management. It also emphasizes communication, guidance and employee capabilities. (3) Performance management emphasizes the realization of process and goals at the same time, not just result-oriented. Performance management is the continuous improvement of performance between managers and employees in the cyclical process of corporate governance.

### (1) Performance factors

The main factors affecting performance management are the external environment, internal conditions and employee incentives. Organizations and individuals dealing with the external environment are not organisms, but objective factors beyond our control; internal conditions refer to the work needs of organizations and individuals with different resources, and some objective factors restrict us to a certain extent. Internal conditions; motivation is related to the initiative of organizations and individuals in order to achieve goals and motivations, that is, the subjective factors of motivation.

### (2) The focus of performance management

The focus of performance management is reflected in the following two aspects: 1. In spite of the crisis, the design still focuses on the process rather than the evaluation; seeking to solve the problem rather than finding the error; integrating the two aspects of behavior instead of the human resource process; Threatened. 2. The main purpose of performance management is to improve performance and efficiency; performance improvement goals have been included in the performance plan; performance improvement requires the joint efforts of managers and employees; improvement of key performance is to improve the quality and ability of employees; performance management cycle process It is the process of improving performance; this is the ability of employees and quality to participate in the performance management process.

### (3) The importance of performance management

The implementation of performance management is related to the thinking of the company's current situation and prospects to a certain extent. The company hopes to spend more time at work, but only spends very little time thinking about the past, rarely summing up past successes and failures, and just succumbing to the established goals, so as not to waste money summing up the past. Management of its performance is inefficient. Good performance management can enable the system to summarize the results of the organization in a short time, form a systematic summary report, diagnose problems for the organization, and accumulate strength to make timely adjustments for the development of the organization. So that it can grow faster and more efficiently. Therefore, before preparing for the implementation of performance management, the company should investigate the problems in

management, summarize the essence of the problems, formulate solutions to the problems, and implement them effectively in the new performance plan. The importance of performance management must be related to the implementation of the strategy.

## **4 Research and Analysis on Optimizing University Performance Management System in the Era of Big Data**

### **4.1 Student Performance Evaluation**

According to the data and information of the Ministry of Education and the “2018 National Economic and Social Development Bulletin”, according to relevant documents of the Ministry of Education, “The employment ratio of university consultants” is usually 1:200, and there are more than 12,000 colleges and universities. Preliminary research by universities at all levels can learn that there is a lack of scientific methods for effective management and evaluation of the performance of college student working groups, and is not under the guidance of scientific theorists. Performance management.

According to the 12th edition of the evaluation index and the weight of the evaluation method, the evaluation of the performance of university student work management in 2018 will focus on three aspects, namely content, index and weight. The performance evaluation of colleges and universities on student work is divided into four indicators, namely comprehensive indicators, two secondary indicators, eleven three-level indicators and 65 four-level indicators. Most indicators are defined accordingly. The weight reflects the degree of the important indicator rating system.

### **4.2 Problems in Student Performance Evaluation**

#### **(1) The overall goal system is not clear**

Although universities have developed detailed student performance evaluation systems for each department, the overall goal of the strategy is still unclear on the development of student work management in many universities. However, the lack of overall development goals will make it difficult to decompose the goals, which will result in a lack of guidance and many specific problems in managing the performance of college students.

#### **(2) Lack of a comprehensive, comprehensive and systematic rating indicator system**

The existing performance indicators of college students are based on the previous daily management and summary evaluation of various departments. There is a lack of guidance and coordination of work processes among various functional departments. Therefore, the definition of evaluation indicators should be more comprehensive and systematic.

#### **(3) Lack of internal incentive mechanism**

Colleges and universities pay more attention to the management and evaluation of the student work management team, while ignoring the development and

development of student staff (such as counselors), resulting in insufficient incentives for them. Employee. For student work in the 21st century, only when the overall quality of relevant student staff is significantly improved can it develop better with the school.

#### 4.3 Experimental Analysis of Big Data Performance Management and Traditional University Performance Management

This paper compares the traditional model with the performance management model based on big data. The detailed comparison is shown in Table 1 and Fig. 1.

**Table 1.** Comparison of traditional model and performance management model based on big data

	Big data performance management	Traditional performance management
Student satisfaction	9.2	7.9
Positivity	Very positive	General
Performance test	72.1	66.3



**Fig. 1.** Comparison of traditional model and performance management model based on big data

From the figure, we can see that students have better enthusiasm for the performance management model through big data, and the results are also very huge. Therefore, we can think that the performance management model through big data can play a positive role in the performance management of students.

## 5 Conclusions

With the rapid development of my country's higher education, among the many management modules in colleges and universities, the key component of the student management performance evaluation index system. The scientific management rules in the management of student work have important practical significance for evaluating student performance, strengthening management and improving school management. This article has made some achievements, but there are still the following problems: (1) the research of this article mainly focuses on colleges and universities. It mainly analyzes and evaluates the management performance of students in new undergraduate colleges such as universities. It has not been verified for widespread use in practice. (2) Due to the limited research time and limited actual work experience and ability of the author, the research on the optimization of the evaluation system is not in-depth enough. Future prospects: (1) Theoretical depth. Performance management has received more and more attention, but the student performance evaluation system has not received enough attention from the theoretical community. (2) Practical application. The research on the student performance evaluation system has not yet really turned from theory to practice, especially in our country, where there are few practical applications of theory. (3) Field expansion. The research on the performance evaluation system of college students is still in its infancy, and the application fields of theory and practice are very limited. We need to conduct in-depth research on these aspects, hoping that effective performance management models can be applied to different schools as soon as possible.

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# An Action Research on Comprehensive English Course Construction Based on Foreign Language Network Teaching Platform

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**Abstract.** With the development of modern information technology, multi-media technology has become an indispensable part of College English teaching. Network teaching platform has grown into an important part of it. Based on constructivism theory and ubiquitous learning theory, this paper intends to construct a multi interactive teaching mode of Comprehensive English through the design of teaching operation and evaluation procedure, and tries to enhance the construction of Comprehensive English Course based on campus information platform.

**Keywords:** Teaching platform · Comprehensive English · Course construction

## 1 Introduction

The concept of course construction appeared relatively late in the field of teaching research in China, and the research on Course Construction in educational circles began in the 1980s. Since the 1990s, the modern information technology with computer network has been integrated into the practice of College English Teaching in China, leading to the evolution of teaching concept design, teaching process, teaching activities, teaching methods, teaching evaluation system and teaching objectives, which has brought unprecedented influence on English teaching.

In the teaching mode part of the syllabus of English for English majors issued in 2000, it specially pointed out that universities should actively adopt modern, diversified and all-round teaching mode [1]. The building of computer network system will create conditions for updating teaching contents, improving teaching efficiency and cultivating students' effective learning methods. Meanwhile, it will provide students with a more flexible, convenient, practical and broad space for learning and practice. At present, many universities with English majors are actively exploring the construction of English course. Regardless of what kind of teaching philosophy and mode are adopted, the teaching process must be communicative and foreign language teaching must be based on application. In 2004, the Ministry of education of the People's Republic of China issued the teaching requirements for College English Course (Trial Implementation) [2]. It aims to emphasize students' listening and speaking ability. This requirement clarifies the direction of College English reform and proposes to reform the

existing teaching mode of College English in China. The new teaching mode should be established on the basis of network technology to comprehensively improve students' Comprehensive English application ability, so as to adapt to the needs of international development.

Foreign language network platform is a software system based on multimedia information technology, which is independently developed by domestic colleges and universities or commissioned by domestic enterprises to establish cooperation, and is committed to providing comprehensive support services for foreign language teaching. Foreign language network teaching platform helps to realize teaching integration, create a network environment for students' autonomous learning, help teachers improve teaching mode and objectively quantify teaching management, so as to realize the optimization of teaching process. The foreign language network teaching platform mentioned in this paper is based on Moodle free open source code online course management system.

## 2 The Theoretical Basis of the Study

Constructivism believes that knowledge is not learned by teachers, but by means of sense building with the help of other people (including teachers and learning partners) in a certain situation, that is, in the social and cultural field. As learning is a process of sense building under certain social and cultural context, with the help of others, that is, through interpersonal collaborative activities, constructivist learning theory holds that "situation", "cooperation", "conversation" and "meaning" are the four elements or four attributes of learning environment. Teachers are to help build a "situation" through the platform, so that students can achieve "sense building" through "cooperation" and "conversation" [3]. Constructivist learning theory provides a strong theoretical support for network platform assisted teaching. First of all, constructivism advocates learning under the guidance of teachers and student-centered learning. Teachers are the helpers to promote the sense building of students rather than the imparters of knowledge. Students are the participator of information processing and the meaning building, rather than the passive receiver of external stimuli [4]. In order to become the promoter of students' constructivism, teachers should start from the following aspects: 1) using network technology; establishing interactive learning mode; building a better learning platform for students to present the content they need to master, such as images and sounds, so as to mobilize students' learning enthusiasm; 2) encourage students to explore actively, create learning groups and advocate cooperative learning as far as possible. Students should accumulate more materials for sense building, actively think, search and consult relevant materials, try to integrate the old and new knowledge, and cooperate with teachers and students to wind up the learning task. From the perspective of Constructivism on the teaching requirements of teachers and students, the network platform assisted teaching has successfully realized the role transformation between students and teachers, and students have become the main body of learning. The direct instillation of teachers to students is reduced, and the guidance to students is enhanced.

U-Learning, as the name implies, refers to all-time communication and ubiquitous learning. It is a way for anyone to obtain any information they need at any place and at

any time. In the ubiquitous learning environment, students learn in various spaces and ways according to their own needs, that is, all the actual space becomes the learning space. The optimal intelligent environment of knowledge acquisition and rebuilding will improve students' creativity and competence in solving problems [5].

### 3 Teaching Experiment and Research

#### 3.1 Research and Preliminary Preparation Stage

##### 3.1.1 Combination of Foreign Language Platform and Course Construction in Other Universities

According to the survey, many universities in China are actively exploring the teaching of English related courses. For example, Xu Peng from the school of foreign languages, Changchun University, discusses the feasibility, mode, scope and effect of modern educational technology in the course [6]. Sun Guangping of Ningbo Institute of technology, Zhejiang University, takes the construction of Comprehensive English as an example to explore the theoretical basis, teaching mode construction, teaching effect and problems in teaching practice of autonomous inquiry learning in the network environment [7]. On the foundation of exploring the theoretical basis of multimedia network teaching and summarizing the current situation of network English teaching, Hua Xin and Chen Min of the school of foreign languages of Zhejiang University designed a comprehensive English course based on the Internet and combined with multimedia teaching methods, and gradually constructed an interactive teaching mode of cooperation, exploration and autonomy in teaching practice [8].

##### 3.1.2 Platform Usage for English Major Students in Chengdu Neusoft University

For most English Majors in Chengdu Neusoft University, they have few chances using foreign language teaching platform before entering the University. They are beginners when they enter the university, and a small number of them have never used the computer before entering the University. After completing military training, the students will register the foreign language teaching platform account number for each student. The account number is set as the student's student number, which is convenient for students to log in and save the memory of the account number, and it is also convenient for teachers to identify the students' identity.

At the initial stage of using the teaching platform, students all expressed their inadaptability of the platform. Through teacher interviews and student feedback, some are specifically reflected in the following aspects: 1) students have never used the teaching platform before, and they are not adapted to the way of teaching interaction through the teaching platform; 2) students are generally unfamiliar with how to use the platform 3) most students present that it was inconvenient to use the platform, they need to log in every time, and even forget their login user name and password; 4) most students express that they will not actively log in to the platform to learn, complete the teacher's requirements or search without the teacher's mandatory requirements.

### 3.2 Implementation Stage

At the initial stage of the project, teachers are in the exploration stage of teaching platform for course teaching, and the design of teaching activities related to it. Generally speaking, the teaching activities on the platform at the beginning of the project can be summarized into two sections: 1) one week preview task arrangement; 2) homework and task arrangement after class. To sum up, it can be seen that the teaching tasks and activities designed by teachers on the teaching platform are single and insufficient, or just the pile-up of task words and lack of interaction with students, resulting in students' weak interest in learning. So far as the learning effect is concerned, students generally neglect the use of the platform and fail to utilize this tool, resulting in the teaching activities carried out through the teaching platform cannot be smoothly carried out, which directly affects the teaching effect and the course construction.

Based on the platform teaching and course construction in the first semester, all teachers in the project actively explore, and unify the course content and various teaching activities related to the course. At the second stage, some rearrangements are as follows: (1) the first text of each unit should be regarded as the content of intensive teaching. (2) the second text of each unit is treated as fast reading, which mainly includes reading skills and main information points; (3) unified assessment method: formative and summative evaluation account for 50% respectively. The formative assessment includes: attitude (10%), including classroom performance and homework completion; extracurricular homework (20%), including regular preview tasks, the completion of exercises and comprehensive exercises in textbooks; stage test (20%), including unit test. The final examination accounts for 50% of the total score.(4) Unify the form of after-class work: the arrangement of preview tasks requires students to ask questions, especially difficult sentences, in the process of preview; the arrangement of discussion tasks requires students to discuss after class and summarize their views, and students are required to provide QQ screenshots of the discussion as evidence; the arrangement of speech or debate topic requires students to discuss and summarize their opinions by individuals or groups. (5) Rearrange the teaching tasks related to the comprehensive English course in the teaching platform, strengthen the interaction between teachers and students, take the development of tasks as the basis of course construction; take unit test and final examination as one of the means to test the effect of teaching tasks, and seek the relevance between the design of unit test and final examination and the platform task.

## 4 Research Achievements and Teaching Effects of the Project

### 4.1 The Initial Formation of Multi-dimensional Interactive Teaching Mode of Comprehensive English

Since the implementation of the project, the teaching mode of Comprehensive English course is also more diversified with the construction of teaching platform more in-depth and comprehensive. At present, the integrated English course has developed from classroom teaching to multi-dimensional teaching mode, including in-class teaching,

platform interactive learning, academic competition project embedding and students' course learning. In particular, the platform interactive learning part and subject competition are combined with comprehensive English course and platform.

During the construction of the platform of the foreign language department, the feedback data obtained from the questionnaire survey on students in the first stage of the study shows that the module contents that students expect to add mainly include unit knowledge, cultural background knowledge, unit key and difficult points, autonomous learning module and translation practice. The teachers of the project team have successively added the above units in combination with the teaching practice. The stage module has also changed from the previous two single pre class preview tasks and after-school learning detection tasks into three parts: pre-class learning, in-class learning and after-class review. Students' learning enthusiasm and initiative have been significantly improved.

#### **4.2 Further Integration of Subject Competition and Comprehensive English Course**

Subject competition has been embedded in the course system of Comprehensive English and has been gradually improved. At present, the teaching platform module mainly involves three parts: speech, debate and translation. At present, according to the students' situation, the project team teachers mainly integrate the speech and daily report into the comprehensive English course for English Majors in the first year. These tasks are published on the teaching platform by the teachers. It provides students with a platform for actual combat exercises by means of separate exercises. In the second academic year of English majors, the teachers of the project team will focus on training, integrate debate into the Comprehensive English Course, adopt the methods of platform individual debate and class group debate, and emphasize on the cultivation of students' critical thinking ability. In these sections, teachers set corresponding tasks in combination with the content of the course unit. By adopting various ways such as online mutual evaluation, group task and classroom display, the content of the subject competition is well combined with the comprehensive English course. Students' English ability, team cooperation ability and critical thinking ability are greatly improved in practice.

#### **4.3 Gains for Students and Teachers**

The construction of foreign language teaching platform can promote the interaction between teachers and students, and further clarify the course orientation as well. Besides, the utilization rate of students' platform and their satisfaction with the course are also greatly improved.

During the development of the project, the members of the project team made great efforts to carry out the project related activities, and achieved rich results. Teachers of the project group have won the second and third prizes in the college T-C teaching competition.

## 5 Project Effect Evaluation

### 5.1 Project Features

In the course of design and implementation, the project follows the students' learning habits and the actual situation of our college students, and uses the teaching platform of our foreign language department to solve the problems existing in the construction of Comprehensive English course and the improvement measures, aiming to break the shackles of traditional teaching methods and teaching materials. It reflects the cultivation of students' comprehensive English skills and critical thinking.

The project is well prepared, and on the foundation of project research, combined with the existing experience, the existing resources are integrated. The project is systematic and phased and combines the professional nature and college characteristics. The effect of the project is obviously improves the students' English skills and critical thinking ability.

### 5.2 Project Innovation

The research on the construction of Comprehensive English course based on teaching platform not only includes the construction of teaching platform itself, but also realizes the multi-line interaction with the teaching platform in the design and arrangement of Integrated English teaching tasks, and also promotes the construction of the course outline. Network teaching platform can not only promote the course construction, but also promote the construction of teaching resources and create an information-based teaching environment [9]. From the research content and implementation of the project, it is in line with the law of gradual progress, and fully reflects the characteristics of integrity and system.

The construction of Comprehensive English Course based on foreign language teaching platform can fully promote students' learning autonomy and enthusiasm, promote the development of network assisted teaching and the construction of course resources, help to carry out abundant teaching activities, update and adjust the course content, and cultivate students' cooperative learning ability and critical thinking ability. Third, the project design vision is broad, and combined with the project teaching method in engineering education.

From the perspective of interdisciplinary, especially from the perspective of engineering education, it is a new exploration way to design practical projects of language majors in different academic years [10].

## 6 Conclusion

In the 21st century, China's College English teaching mode has gradually adjusted from the traditional teacher-centered teaching mode to the cooperative teaching mode with teacher-student interaction and the multimedia teaching mode with students as the main learning body. As the core subject of English major, comprehensive English should bear the brunt of the reform of the model of teaching brought by the new media

technology. We should seize this opportunity to improve the course construction and cultivate excellent practical talents with solid English basic knowledge and comprehensive ability for the country and society. The significance of this paper is to explore the construction of Comprehensive English Course based on the foreign language network teaching platform, hoping to help the current English teaching reform and provide useful information for the national professional English teachers, so as to promote the construction of professional English course in Colleges and universities.

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# Mode Innovation of Network Multimedia Technology in Literature Teaching

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**Abstract.** Modern society is an information-based society, and education is also in the forefront of information reform. Combine the traditional classroom education mode with modern teaching means, break the shackles of the traditional mode, and adopt multimedia teaching innovatively. Based on this, this paper combines literature teaching with network multimedia technology to carry out network teaching platform, and develops a new teaching mode. With the help of network teaching platform, teachers can face the stories and characters in literary history with a more intuitive image, and broaden their horizons. In this paper, an experimental class and a control class are set up. The experimental class adopts the network multimedia teaching mode to carry out literature teaching, while the control class adopts the traditional teaching mode. At the same time, it analyzes the students' and teachers' love for the hybrid teaching. The results show that 93% of the students and 87% of the teachers prefer the mixed literature teaching.

**Keywords:** Modern teaching means · Network multimedia technology · Network teaching platform · Mixed teaching

## 1 Introduction

Multimedia technology mainly refers to multimedia computer technology, which refers to the use of computers to manage and control multimedia information such as text, image, animation and video, so that different information can be logically connected, integrated into the system and interacted [1–3]. With the help of multimedia technology, people will be able to describe, disseminate and manage all types of audio-visual information naturally and efficiently, with higher participation and creativity [4]. Multimedia is now widely used in all parts of life. However, people's understanding of it is not enough. How to make the best use of it in education and learning still needs our exploration [5].

Chinese literature is a compulsory course for college students. Its teaching content is a treasure house of literature, which has been stored for thousands of years around the world [6]. It includes not only the interpretation of literary history, but also the introduction and analysis of many writers and works in different countries and different historical periods [7]. In teaching practice, we should not only guide students to understand the huge cognitive structure in the history of literature, but also improve

their basic quality [8]. The importance of literature course is obvious. It includes a combination of cultural studies, history, philosophy, aesthetics, theology, language and other disciplines [9]. This undoubtedly sets a high standard for teachers' knowledge, teachers' teaching skills, students' insight, aesthetic insight skills and the ability to distinguish literary works [10].

Based on this, this paper first analyzes the current situation of the application of network multimedia in literature teaching, and finds that there are many problems in the current multimedia teaching. For example, most of the teaching methods are too simple and too fancy, and many teachers' teaching methods are relatively simple. They just transfer the knowledge from the textbook to the courseware, which leads to the teaching quality not rising but falling. Therefore, this paper solves the problems existing in the current literature teaching, and proves the advantages of this method by using the method of comparative experiment.

## 2 Application of Multimedia Technology in Teaching

### 2.1 Classroom Teaching from Blackboard Era to Multimedia Era

The traditional classroom teaching mode is blackboard, chalk as the medium of teaching, when the teacher turns to write on the blackboard, the classroom time is also passing. Now the intervention of multimedia technology in teaching, the use of computer and projector, so that teachers as long as do a good job in preparing lessons, making good courseware, class only need to control the computer to cooperate with their own explanation, so adults save the time of writing on the blackboard. It provides students with time to fully understand and master the knowledge of this class, and also provides sufficient time for teachers to expand the teaching content.

### 2.2 At Present, Too Simple Courseware and Too Fancy Courseware Coexist in Most Teaching

Now most schools are using multimedia teaching, which uses courseware made before class as the medium of teaching. Some courseware's list the knowledge points, key and difficult points, exercises, etc. in this kind of courseware, only the content that should be written on the blackboard is moved to the courseware. Although the class time is saved, the teaching effect is no different from the traditional teaching. Some teachers' courseware is too rich. Many pictures contain not only color pictures, but also beautiful music and some strange sounds, such as clapping, typing and breaking glass. It pursues the audio-visual results of the course materials unilaterally, but pays no attention to the actual results of the course. This type of audio-visual course not only fails to realize students' effective learning. On the contrary, it will distract students' attention, disrupt their thinking, and weaken the effect of classroom learning.

### 2.3 The Multimedia Teaching Method is Single

Teachers use projectors to display the course contents one by one in the classroom, and use complete computer multimedia teaching tools for slide presentation. Some teachers only allow students to view the content software for learning. This kind of teaching method makes the teacher become the student's slide projector. The teacher's simple projection and explanation lack of interaction with students. Make the whole class into an ornamental class, so the efficiency of classroom teaching is greatly reduced.

### 2.4 The Capacity of Making Multimedia Courseware is Too Large

Multimedia has powerful visual display function, which can make teachers display a lot of teaching content in a short time. Many teachers take advantage of this opportunity to show more slides of teaching content, which poses a severe challenge: too much teaching content and limited knowledge digested by students in one class. It makes the students feel confused and fidgety, which is not conducive to classroom teaching.

## 3 Experimental Ideas and Design

### 3.1 Experimental Ideas

The purpose of network multimedia teaching is to improve students' learning quality and learning ability. The current multimedia teaching not only does not improve students' learning ability, but also makes students more difficult in the process of learning. With the continuous development of information technology, colleges and universities are also constantly carrying out new teaching mode. Therefore, this paper introduces network teaching platform into literature teaching, and realizes literature teaching through network platform teaching. Teachers can publish the teaching content and homework in the network teaching platform. Students can log in the teaching platform and hear the course. After listening to the course, they can answer questions on the teaching platform and ask their own learning questions in the Q & a module. The network teaching platform mode can improve the teaching level of teachers and the learning ability of students. It can also strengthen the communication between teachers and students, and constantly improve the learning effect on the basis of improving the learning plan.

### 3.2 Experimental Design

In the design, this paper adopts two forms: questionnaire survey and field interview. 463 college students and 50 professional teachers were selected as the survey samples. Among the interviewees were college students and professional teachers. The purpose of this study is to improve students' learning quality and learning ability. Through the analysis of questionnaire survey and interview results, this paper adopts the experimental method of experimental class to analyze 100 literature majors and divide them into two groups. One is the experimental group, which is learning through the network

teaching platform, and the other group is the control group, which is the traditional teaching method.

In this experiment, the formula of mean square error in the satisfaction survey of students and teachers is as follows:

$$RMSE = \sqrt{\frac{\sum_{(u,i) \in T} (r_{ui} - r'_{ui})^2}{|T|}} \quad (1)$$

## 4 Discussion

### 4.1 Analysis of Students' Class Situation

After a semester of teaching, we investigated and analyzed the literature reserves of the students in the two groups of liberal arts colleges. This paper analyzes the literature reserves from five aspects: the discussion in class, the expansion of knowledge, the final examination results, the increase of literature reserves and whether it is helpful for employment. The results are shown in Table 1. Based on the survey results of the two groups of students, the literature teaching based on the network teaching platform is more effective than the traditional teaching methods.

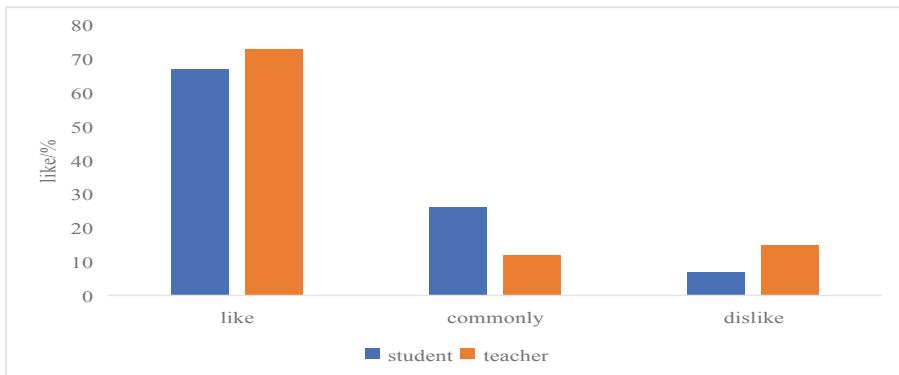
**Table 1.** Investigation and analysis of students' class situation and literature reserve

Investigation factors	The experimental group (%)	The control group (%)
Actively participate in class discussion	75	45
Expansion of knowledge	79	33
Final exam results	84	73
Literature reserves increase	86	53
It's good for employment	84	45

According to the data in Table 1, compared with the traditional teaching mode, the teaching mode carried out by the network teaching platform has many advantages. 79% of the students think that their knowledge has been expanded, 86% of the students' literature reserves have been increased, and 84% of the students think that their future employment will be helpful. Only 45% of the students in the control group thought it would be helpful for their future employment.

### 4.2 Survey and Analysis on the Popularity of Network Teaching Platform

According to the questionnaire results of students and their teachers, this paper analyzes the popularity of online teaching platform, and the analysis results are as follows:



**Fig. 1.** Survey and analysis of students' and teachers' preference for online teaching

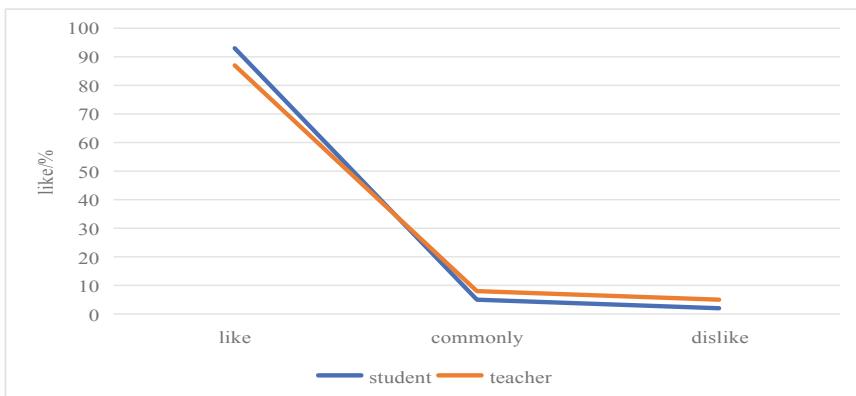
According to the data in Fig. 1, both students and teachers have a high degree of love for the literature teaching carried out by the network teaching platform. Among them, the students' liking degree was 67%, and the teachers' satisfaction was 73%. The satisfaction of teachers is higher than that of students, because the network teaching platform can improve the teaching level of teachers. Teachers can watch other teachers' teaching videos in the network teaching platform to check the deficiencies and make up for the omissions, constantly supplement their own literature knowledge and improve their teaching level. At the same time, teachers can query the learning effect of students by making statistics according to the classroom tests submitted by students through the office anytime and anywhere. For students, they can watch the teaching videos released by teachers and watch other videos, learn literature knowledge according to their own interests, and constantly improve their literary literacy. For some timid students, they do not need the courage to ask questions from teachers, they can directly ask questions in the answer questions. The question answering module is not only limited to teachers but also students. Such a teaching mode can improve students' participation and the communication between teachers and students.

However, there are still some teachers and students who do not like this teaching mode in the teaching of network teaching platform. Therefore, this paper discusses the mixed teaching mode. That is to say, teachers teach in the classroom and publish the teaching content to the network platform.

#### 4.3 Investigation and Analysis on the Liking Degree of Mixed Teaching Mode

According to the data in Fig. 2, it can be seen that both students and teachers love the hybrid teaching of literature. Among them, the students' love degree reaches 93%, and the teacher's love degree reaches 87%. Students' liking degree is higher than that of teachers. For students, most of the students' autonomous learning ability is relatively poor, without the supervision of teachers, it is difficult for them to complete the learning content by themselves, which leads to the learning effect of this part of

students getting worse and worse. But mixed teaching can make up for this problem. Mixed teaching is completed under the supervision of teachers. Students learn once in the classroom, and teachers upload the teaching video to the network teaching platform. Students can learn again according to the questions in the classroom and the parts they don't understand. This teaching mode can improve the learning effect of students.



**Fig. 2.** Investigation and analysis of students' and teachers' preference for Blended Teaching

#### 4.4 Innovation Research of Chinese Language Course in the Network Environment

##### 1) Give full play to the advantages of network mode

With the rapid development of science and technology, multimedia teaching has become one of the most important links in education, and new teaching methods have gradually become the focus of education. First of all, the use of network teaching method in literature teaching can solve the impact of time and space constraints on traditional teaching methods. When teachers and students understand a particular learning situation and learn from existing problems through guidance and other methods, they can have real communication with students. Secondly, there are abundant teaching resources in the network environment. In the traditional teaching mode, resource sharing is affected in many aspects, and the information teachers can provide to students is limited to permanent categories. However, with the help of network technology, the use of resources in the current stage of teaching can be improved.

##### 2) Reshape the role of teachers

The use of network technology can effectively enhance the richness and sharing of knowledge. Therefore, in the development of education, teachers need to change their roles, update their learning concepts and ideas, clarify the essence of online education, and do a good job in Chinese literature creation. It is not only the renewal of technology and road in the network environment, but also the renewal of ideas and ideas. Therefore, in order to ensure the superiority of "thinking" in

education and ensure the nature of higher education on the basis of meeting the needs of “development”, we must adhere to the “democracy, transparency and equality” aspect of the Internet. Therefore, teachers in the classroom should not only do a good job in teaching from the perspective of knowledge dissemination, but also actively learn advanced skills and change roles to improve students’ learning enthusiasm.

### 3) Improve the teaching mode

In the network environment, we need to start from the traditional teacher centered teaching mode, innovate the learning mode, highlight the central position of students, and play a leading role. Therefore, from the special teaching practice of research-based teaching methods, combined with the characteristics of literature teaching, to help students develop this knowledge. Teachers should also integrate teaching content into teaching, determine teaching objectives and methods, design good teaching, and promote advanced teaching materials to support teaching. In addition to students’ perspectives, we also need to focus on the development of students’ participation, so that students can combine specific topics and in-depth research to carry out teacher led classroom. Ensure students’ reading and thinking skills and stimulate their curiosity.

## 5 Conclusions

Teaching reform is an eternal topic. The use of modern multimedia and other teaching technology can enrich and expand the teaching content with knowledge and skills, improve teaching methods, stimulate students’ interest and improve teaching effect. In this paper, first of all, this paper analyzes the disadvantages of the current network multimedia teaching, according to the disadvantages of teaching carried out a new teaching mode. The experiment proves that both students and teachers prefer literature teaching based on hybrid teaching mode. Therefore, in the trend of teaching reform, the application of modern information technology can be applied to the current teaching, but colleges and universities should constantly adjust teaching methods combined with the learning effect of students, so that it can improve the teaching effect.

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# Application of Computer Network Multimedia Technology in the Teaching Reform of Advanced Algebra

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**Abstract.** With the rapid development of computer technology and the needs of modern higher education reform, computer network multimedia technology has begun to be applied more and more to the application of higher algebra teaching reform in universities. This article mainly analyzes the advantages of using computer network multimedia technology in the reform of advanced algebra teaching, as well as the problems that should be paid attention to when applying it to network multimedia in the teaching process, and puts forward the corresponding problems in how to use its network multimedia to carry out advanced algebraic mathematics reform Suggestions. This article mainly analyzes the advantages of using computer network multimedia technology in the reform of advanced algebra teaching, as well as the problems that should be paid attention to when applying it to network multimedia in the teaching process. The research of this article is dedicated to the deeper understanding of mathematics teachers in colleges and universities. Network multimedia technology the theoretical basis and substantive understanding integrated in the teaching of advanced algebra. Understand the various factors that hinder the effective integration of network multimedia technology and course teaching, and truly realize the real and effective integration of multimedia technology into the reform of higher algebra teaching, and comprehensively improve the quality of teaching. By mainly expounding the time that network multimedia technology is used in the process of advanced algebra teaching, different cases of multimedia teaching are given for analysis from the perspectives of new courses, review courses, research-based learning, and elective courses. Experimental research results show that the application of computer network multimedia technology in the reform of higher algebra teaching is to meet the needs of the development of the times, but the better application of this technology should be combined with the development of the school itself. Teachers continue to understand the teaching skills of network multimedia and give full play to its role.

**Keywords:** Computer technology · Network multimedia technology · Advanced algebra · Teaching reform

## 1 Introduction

Improving the teaching quality of higher education is the main goal of the current higher education reform in our country. With the rapid development of modern technology, very high requirements are also put forward for the quality of college students [1]. Therefore, carrying out effective teaching reforms, establishing a modern teaching method system, and improving teaching quality have become an inevitable trend in the development of higher education in my country [2]. The National Higher Education Teaching Conference proposed that the reform of teaching content, curriculum system and teaching methods should be based on modern educational technology. The application of computer network multimedia technology in university mathematics teaching is exactly in line with this reform trend. With the continuous expansion of colleges and universities in our country, as a compulsory basic course for students of science and engineering, economics and management, the application of computer network multimedia technology for the teaching tasks of advanced algebra has solved these problems well [3].

With the widespread application of the Internet and computer information technology, the emergence of new computer network media not only has a huge impact on the production and life of the general public, it also affects education at all levels [4]. Judging from the current development of computer network multimedia technology in colleges and universities, computer network multimedia technology has shown a certain popularization and development trend on campus, but most college algebra teachers have not realized the importance of using network multimedia teaching, so computer network multimedia The developmental role of auxiliary functions in advanced algebra teaching is not ideal [5]. With the help of the advantages of network new media technology, the innovation of higher algebra teaching model has not been widely carried out. In the current social background where network information technology and network new media technology are widely used, college mathematics teachers should pay close attention to the innovation of mathematical teaching models supported by network new media [6].

In the traditional advanced algebra teaching, most students still stay in the teacher's blackboard teaching mode. However, with the development of computer network technology, in the process of advanced algebra learning, college students need to combine the application of computer network multimedia technology to help them better master the methods and skills of advanced algebra learning [7, 8]. In traditional advanced algebra teaching, most of the teaching content is based on theoretical knowledge, emphasizing that basic mathematical concepts and properties should be mastered in mathematics [9]. This article starts from how to increase the interest in algebra teaching in colleges and universities, and puts forward new insights and viewpoints to arouse the attention of mathematics educators, increase the interest in the higher algebra teaching process and the effective teaching mode of mathematics [10].

## 2 Method

### 2.1 Make Good Use of Network Multimedia Technology to Create Teaching Situations and Improve Students' Self-learning Ability

A good teaching environment can bring a better experience for students. In the teaching process, teachers should establish a multimedia teaching environment according to different teaching links and the characteristics of students' psychological thinking to stimulate students' interest in learning. Multimedia teaching is an important way to improve students' learning ability. For example, the important and difficult part of the dynamic algebraic advanced mathematics teaching, it embodies the idea of combining number and shape, it can cultivate students' logical thinking ability and spatial imagination ability, but in the teaching process, many students have insufficient ability to master algebra problems, especially for some relatively abstract algebraic knowledge. With the continuous innovation and development of education and teaching technology, the application of computer network multimedia technology in teaching has also begun to develop in a diversified direction. It also puts forward higher requirements for computer hardware equipment, but currently some schools have limited education funds. Therefore, the computer equipment that can be provided to the mathematics classroom is not very complete, which also affects the smooth development of network multimedia teaching work. This can actively strengthen the application of computer multimedia.

### 2.2 Focus on Cultivating a Student-Based Teaching Model and Teach Students in Accordance with Their Aptitude

The traditional teaching mode of higher algebra adopts indoctrination teaching, which exaggerates the status and role of teachers and ignores the dominant status of students. In traditional classroom teaching, teachers mostly use chalk to write and draw on the blackboard. According to the students' psychological characteristics, acceptance and understanding, there is no reasonable teaching content, teaching method and teaching plan. The teacher only pays attention to whether the content can be explained within the prescribed class time and ignores the interaction with the students. This not only prevents students from fully learning and understanding the abstract logical reasoning content in mathematics, but also is not conducive to cultivating students' thinking ability and mathematical quality.

### 2.3 Establish an Early Warning Indicator System for Students' Multimedia Course Teaching

There are m early warning indicator systems, each indicator supplies n original data, and the early warning indicator system processes these data, so that a standard matrix can be obtained:

$$\mathbf{T} = (r_{ij})\mathbf{m} \times \mathbf{n} \quad (1)$$

Among the m indicators, the i-th indicator is defined as:

$$E_i = -\frac{1}{\ln n} l_{ij} \ln(l_{ij}), i = 1, 2, \dots, m. \quad (2)$$

Among them:

$$l_{ij} = \frac{r_{ij}}{\sum_{i=1}^n r_{ij}}$$

$$W_i = \frac{1 - E_i}{m - \sum_{o+1}^m E_i}, 0 \leq W_i \leq 1 \quad (3)$$

For the safety accident early warning indicators of the corresponding heavy, medium, and light alarm states, the dimensionless processing is performed by formula (1) to obtain the dimensionless value  $x_i$ , and the weighted value is obtained by multiplying the index and the corresponding quantitative value by weighting and summing. Average value:

$$\Delta = \sum_{i=1}^m W_i x_i \quad (4)$$

$$R(t) = P\{x(t) < [x]\} u(t) \geq [u] \quad (5)$$

$$P_{FR}(t) = \frac{u(t)}{[t]} P_{RSD}(t) = 1 - \frac{u(t)}{[u]} \quad (6)$$

$$t_r - t_1 = \frac{\frac{1}{2}(t_2 - t_1)^2}{(t_2 - t_1) - \frac{1}{2}(t_3 - t_1)} \quad (7)$$

### 3 Experiment

#### 3.1 Experimental Research Objects

In order to be able to analyze the impact of the reform methods and methods of the advanced algebra teaching model based on the strong background of computer multimedia technology in a more in-depth manner, this article chooses an applied undergraduate university to conduct experiments in two classes, which are divided into experimental classes and control classes., Each has 40 students, and two classes total 80 students. After the staged teaching and learning, conduct knowledge tests on them and conduct computer network multimedia on the experimental students to investigate the impact of the teaching reform model on the teaching effect of the teaching reform

model, and solve some problems existing in the current practical teaching model. This research is oriented to It's the junior college students who conduct research.

### 3.2 Experimental Research Design

This research aimed at two classes in the university for practical teaching. The experimental class adopted the new method of reforming the current advanced algebra professional teaching model based on the background of computer network multimedia technology, while the control class adopted the traditional professional teaching model. After the practical teaching is completed, compare the knowledge mastery of the two classes and analyze the comparative method. Then, the “Questionnaire on the Effect of College Students’ Practical Teaching” was issued to the students. This practice survey is aimed at a series of links such as students’ practical teaching courses, and investigates the current situation of the professional teaching mode of the colleges and universities. At the end, wait three months after graduating from the senior year, and then do a questionnaire survey on the employment rate for a comprehensive analysis.

### 3.3 Application Advantages of Computer Network Multimedia Technology in Advanced Algebra Teaching

Computer network multimedia technology is widely used in classroom teaching with its advantages of integrating graphics, text, images, animation, sound and other functions. It can not only attract students’ attention, stimulate their interest in learning, but also mobilize students’ enthusiasm for learning, so as to actively learn. As an applied undergraduate college, according to the teaching needs, the content of higher algebra teaching is more and the class hours are relatively small. If you follow the traditional teaching methods, this contradiction cannot be solved well. If there is network multimedia teaching, teachers can the teaching content is designed in the courseware. As long as the teaching is explained in the classroom, it saves the time of the teacher writing on the blackboard, which not only saves time, but also greatly increases the amount of teaching information and improves teaching efficiency. This part of the time saved can be expanded according to teaching needs.

## 4 Results

### 4.1 Experimental Investigation and Analysis Results

It can be seen from Table 1 that we conducted visits and surveys to the students of the two classes respectively and then classified the research according to the results of the survey. We found that the atmosphere of the experimental class and the after-school tutoring were much better, so the overall result was a high quality of school running and employment the rate is high. In the end, we separately discussed the experimental class’s views on the reform, and concluded that the reform will arouse the enthusiasm of the students, resulting in double the result with half the effort.

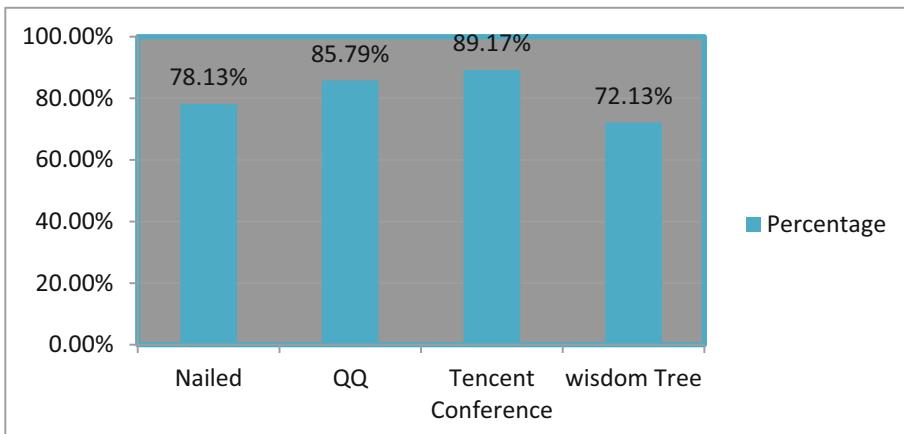
**Table 1.** Higher algebra's use of network multimedia technology on the quality and influence of higher algebra after the reform

	Quality of class	Quality after class	Learning interest	Quality of education	Employment rate
Control class	General	General	General	General	80%
Experimental class	Better	Better	Good	Good	92.5%
Views of the control class on reforming education	Good	Good	Good	Excellent	Good

Although multimedia technology has many advantages when applied to teaching as a teaching method, we cannot blindly rely on multimedia technology. Due to its disciplinary characteristics, the teaching content of advanced mathematics involves a large number of concepts, definitions, theorems, inferences, calculations, etc., and the explanation of its content is often difficult to explain in a multimedia interface, and it involves multiple interfaces. The coherence of students' thinking is a huge test. In addition, because multimedia teaching saves blackboard writing time compared with traditional teaching, it may cause teachers to explain too fast and too short, which will lead to the situation that students can't keep up with the speed of thinking, so teachers should use it in the process of explaining Appropriate speed and give students time to think fully, to avoid the situation that the content of this interface is turned to the next interface before they understand.

From the data summarized in Fig. 1, we know that the “platform of the most frequently used new media” in the questionnaire is because the Tencent conference platform is used for teachers' teaching, homework and teacher-student interaction. He is in an advantage, because he can put almost all the teaching quality that can be achieved offline on the online teaching intact, because the online teaching mode of general psychology is different from other online teaching modes. The experimental materials come from people themselves rather than touchable materials. Therefore, the online teaching of higher algebra in colleges and universities is more convenient and intuitive, the subject experience is more profound, and the experimental conclusions are more consistent with the theory. Students themselves can also conduct some general psychological experiments, which can greatly improve their problem-solving and innovative abilities. However, no matter what kind of new media platform is used for online teaching, the main purpose is to use new media teaching tools to make the knowledge that students obtain online is the same as that of traditional teaching methods, that is, to improve Teaching efficiency.

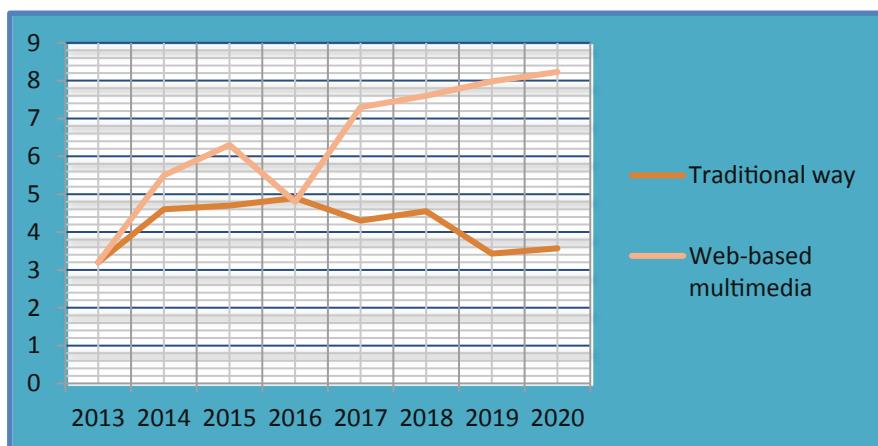
The statistical results of the survey data are shown in Table 2 and Fig. 2. The impression factor statistics of the survey results of the two classes are student factors accounted for the largest proportion, with an average of 3.45, indicating that student factors are the main factors affecting students' appropriate use of self-training., The teacher factor and other factors followed. We analyze the influencing factors in the process of higher algebra teaching for undergraduates.



**Fig. 1.** The presentation of new media teaching content

**Table 2.** Analysis of influencing factors of advanced algebra in new media

Influencing factors	Student factor	Teacher factor	Parental factor	Envirnmental factor	Other factors
Experimental class	3.42	3.21	2.21	2.27	3.96
Mean	2.75	3.33	2.97	2.33	4.05
Control class	2.99	3.58	3.78	3.56	3.88
Mean	1.83	3.52	4.02	4.11	3.79



**Fig. 2.** The development analysis of the two methods in the reform of higher algebra teaching in colleges and universities from 2013 to 2020

Student factors. Among the influencing factors of students, the investigation is the influence of advanced algebra using the computer network multimedia teaching mode. The average value is 3.62, ranking second. This shows that the computer network multimedia teaching method has the greatest influence. The result shows that most students cannot correctly choose the appropriate network learning method.

Teacher factors, in terms of teacher influencing factors, the professionalism of teachers and the use of advanced algebra have a greater impact on the efficiency of the computer network multimedia teaching model, while the teacher's evaluation method has a smaller impact. This shows that teachers improve the theory and teaching methods of advanced algebra. The influencing factors of teachers include their teaching style, professional attitude, charisma, professional qualities and evaluation methods.

Environmental factors. In terms of environmental factors, most students think that the unreasonable setting of the computer network multimedia teaching model in the school's higher algebra will cause them to choose the appropriate method for learning, and the mathematics learning Xicheng cannot be improved. The learning materials and teaching facilities have little impact on it. This shows that in the future, schools can focus on cultivating students' reading training, reasonable computer network multimedia teaching model courses, and strengthen the training of school educators in the use of network new media technologies to improve their teaching efficiency.

Other factors, because it is an online teaching, students use network tools, but this is why the average value of other factors is 4.05, ranking first, because in the process of online teaching, it is difficult for teachers to know the students What are you doing in the learning process. Among other factors, network factors account for a large part, which is also the biggest reason for online teaching.

## 5 Conclusion

In short, computer network multimedia technology has been widely cited in modern education. The application of network multimedia teaching in advanced algebra can meet its advantages such as large amount of information, intuitive and beautiful, and less time. However, it should also pay attention to its shortcomings in the process of use. In the specific practice process, only promote the strengths and avoid it is short, so that the computer network multimedia technology can serve our teaching, so as to achieve the purpose of improving the quality of teaching. To sum up, in the long-term exploration and practice, computer network multimedia technology is conducive to the teaching of thinking in images, and at the same time, it also greatly promotes theoretical analysis and thinking exchange. In the teaching of advanced algebra, multimedia technology has a good prospect. Although the current computer network multimedia teaching still has some shortcomings, as long as we continue to explore and practice actively, gradually reform the development and production of teaching courseware, and adjust the existing application strategies, we can definitely improve the existing shortcomings.

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# Exploration on the Teaching System of Artificial Intelligence Practice Course

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**Abstract.** Artificial intelligence professional course is a new and targeted course in undergraduate colleges and universities in recent years. As an interdisciplinary and interdisciplinary specialty, the theoretical system of artificial intelligence is very complex. How to promote the construction of artificial intelligence practice courses in Colleges and universities and cultivate interdisciplinary and applied talents of artificial intelligence specialty has become a particularly important point. Taking Shenyang University as an example, combined with the experience of teaching practice, the practical teaching of artificial intelligence specialty this paper is analyzed in this paper. Combining the discipline characteristics of artificial intelligence with the characteristics of cooperative enterprises, this paper discusses the practical teaching settings of the course from two aspects of practical teaching system and practical teaching management implementation scheme, and puts forward how to implement reform measures for the talent training system, training mode and talent training objectives in engineering specialty, which is of great practical significance.

**Keywords:** Machine learning · Artificial intelligence · Practice · Teaching management

## 1 Introduction

Artificial intelligence is a new and popular major in Colleges and universities. Due to its huge practical content, there is no mature curriculum system. Therefore, the research on artificial intelligence curriculum system is a key issue. Paying attention to practical teaching and strengthening practical training is one of the important teaching links of integrating theory with practice, ensuring the quality of classroom teaching and improving students' comprehensive skills of engineering technology [1–3]. Through the practical teaching in various stages, it is beneficial to improve students' understanding ability, cultivate students' ability to analyze and solve problems gradually by using multi subject knowledge, cultivate students' creativity and innovation ability gradually, and make students get more complete engineering training [4, 5].

The purpose of this research and practice is to explore the law and characteristics of practical teaching of artificial intelligence course, construct the practical teaching system of artificial intelligence, accelerate the construction of artificial intelligence specialty and improve the teaching quality.

## 2 Practical Teaching System of Artificial Intelligence

Practical teaching is an important link to meet the needs of social development, cultivate students' practical ability and innovation ability, and improve the quality of higher education. The program of talent cultivation in Colleges and universities includes not only classroom teaching, but also various practical teaching courses set up according to the needs of the major.

### 2.1 Traditional Teaching Mode

At present, our teaching mode still pays more attention to theoretical teaching, but ignores some necessary practical teaching links due to various reasons and difficulties. It is mainly manifested in: the construction of practical teaching system in some disciplines or specialties is not perfect, the practice teaching is arbitrary, the examination methods of practical teaching link are not rich enough, the teaching staff of practical teaching link need to be strengthened, and the funds, equipment and places need further investment and construction.

Through the correction of these aspects, it is conducive to improve the construction of practical teaching system and improve the quality of practical teaching. By increasing the proportion of practical teaching courses and the combination of school study and factory practice, the students can learn in typical production environment. In the practice study, understand all kinds of social, economic, production innovation, scientific research information fully, so that students in theoretical learning, practical skills and creativity have been better improved.

### 2.2 Practice Course System of Artificial Intelligence

In order to further adapt to the economic development of Liaoshen region and meet the needs of local artificial intelligence professionals, Shenyang University applied for the artificial intelligence major in 2020. The enrollment standard is engineering and undergraduate, and the educational system is four years. Artificial intelligence is an interdisciplinary subject, involving computer vision, machine learning, deep learning, image processing and other courses, as well as probability theory, statistics, approximation theory and other disciplines [5]. Artificial intelligence mainly studies how the computer simulates or realizes human's learning behavior in order to acquire new knowledge or skills. It has been widely studied and applied in the fields of computer science, such as face recognition detection, speech recognition, stock forecasting, personalized recommendation and so on [6, 7]. Some other disciplines such as finance, management, mechanical engineering, electrical engineering, communication and other fields also widely use the relevant theory of artificial intelligence to inject vitality into its research [8–10]. This interdisciplinary research has become more and more common. Mastering artificial intelligence technology and having relevant practical experience will undoubtedly greatly increase the competitiveness.

As an interdisciplinary and interdisciplinary specialty, the theoretical system involved in artificial intelligence is very complex, and practical teaching is the cornerstone for theoretical teaching to be effectively verified and further applied. Practice

teaching is one of the effective teaching methods to master the theory of artificial intelligence and improve the ability to solve problems. The practice curriculum system embodies the teaching guiding ideology of “ability centered”, which ensures the integration of theory and practice in the whole process of talent cultivation, so as to meet the talent needs of artificial intelligence related industries.

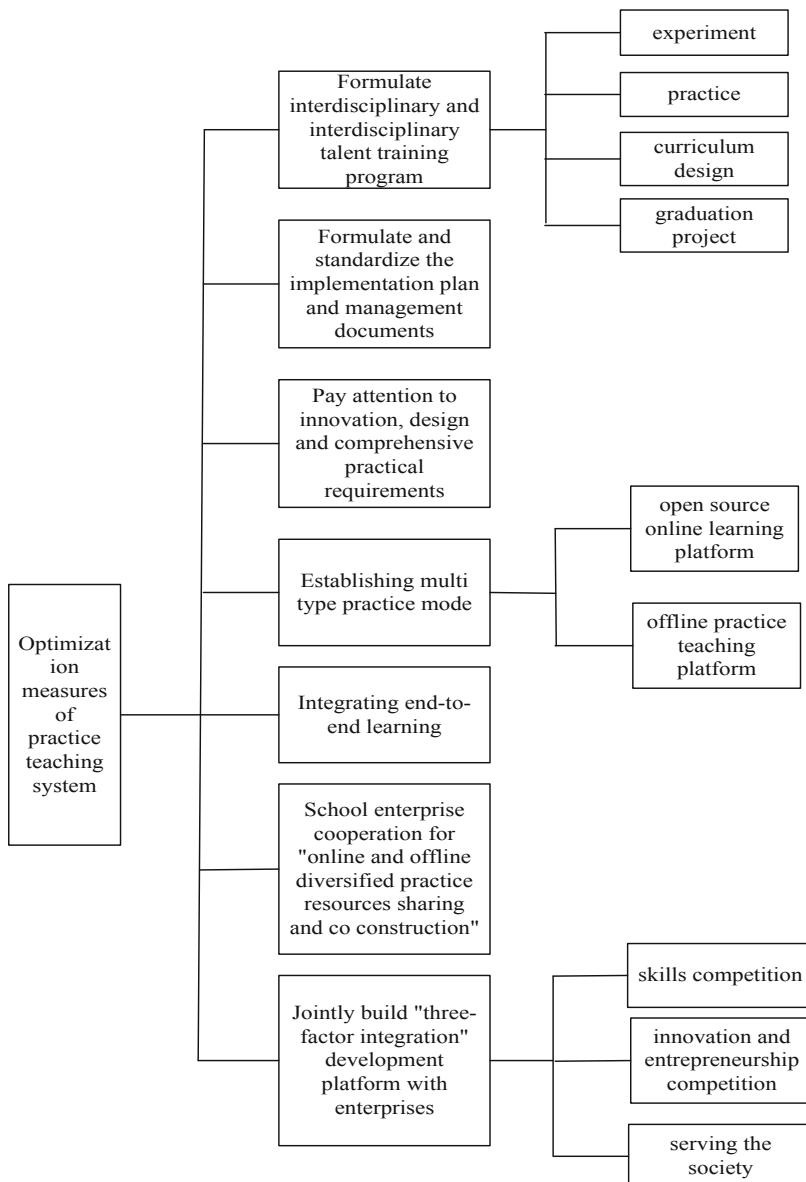
### 3 Reform of Practical Teaching System

In recent years, Shenyang University has carried out reform and Exploration on how to improve the teaching quality, improve the system and standardize the management, and has established a system to guarantee the teaching quality and standardize the teaching management. The school has always supported and encouraged teaching managers and teachers to carry out multi-dimensional education and teaching reform, invested a lot of funds to build artificial intelligence professional laboratory, and established friendly school enterprise cooperation relationship with Huawei Technology Co., Ltd., Neusoft Group Co., Ltd. Based on the above, this paper optimizes the talent training program of artificial intelligence specialty, and establishes the practical teaching system implementation scheme for artificial intelligence specialty.

#### 3.1 Optimization of Practical Teaching System

According to the requirements of talent training objectives of artificial intelligence specialty, this paper summarizes and improves the practical teaching management rules of this major. Through the feasible practical teaching management system implementation scheme, the teaching process of students' practice, curriculum design and experiment is standardized, and the students' creative and comprehensive ability to solve engineering practice is improved. The optimization measures are shown in Fig. 1.

- (1) Formulate the talent training plan of artificial intelligence specialty, construct a teaching system for all practical courses such as experiment, practice and training, curriculum design and graduation design covering artificial intelligence and related fields, so as to realize interdisciplinary and interdisciplinary practical teaching.
- (2) Formulate and standardize the implementation plan and management documents of practical teaching system, establish safeguard measures, standardize the process of practical teaching, and establish safeguard measures, so as to improve the quality of practical teaching.
- (3) Pay attention to the requirements of innovative, comprehensive and design practice teaching, and carry out innovative, design experiment and comprehensive curriculum design teaching practice, so as to improve students' ability of engineering comprehensive design.
- (4) Establish a multi type practice mode, effectively utilize the open source online learning platform such as Baidu PaddlePaddle, combine with offline practice teaching platform, and pay attention to the combination of online practice teaching platform and offline practice platform, so as to enhance students' Multi-dimensional practical ability.



**Fig. 1.** Block diagram of optimization measures for practice teaching system

- (5) According to the characteristics of machine learning, deep learning and other core courses in artificial intelligence specialty, the end-to-end learning mode is integrated into the practice, and the project and competition topics are introduced into the experimental platform, so as to deeply exercise the students' competition thinking and practical ability.

- (6) School enterprise cooperation for “online and offline diversified practice resources sharing and co construction”. School enterprise cooperation adopts the combination of online and offline, integrates the needs of enterprise professional direction and curriculum reform scheme, builds and shares supporting practice teaching guide book, project training guide book, practice case, experimental guidance video, experimental equipment and other contents, forming a diversified resource type.
- (7) Form a long-term strategic partnership with enterprises and jointly build a “three-factor integration” development platform with enterprises, that is, skills competition, innovation and innovation competition, and service to the society.

### **3.2 Formulation of Practical Teaching Management Implementation Plan**

This paper proposes to build a teaching management system covering the practical courses of artificial intelligence specialty, improve the management documents of practical teaching required by the implementation plan, establish a long-term good relationship between school and enterprise, and improve the laboratory of artificial intelligence specialty, so as to improve students' ability of engineering comprehensive design. Specific measures are as follows:

- (1) Put forward the implementation scheme of practical teaching management of artificial intelligence specialty

This paper analyzes the measures to improve the practical teaching quality of artificial intelligence specialty, and studies the contents and measures of teaching reform. Put forward the practical teaching management implementation scheme of artificial intelligence major in terms of experiment, professional practice, curriculum design, graduation design, laboratory construction, practice and training base construction. Put forward the teaching objectives, tasks and requirements of various practical teaching, and put forward the assessment methods and standards in line with the characteristics of the course. So as to improve the practical teaching link of the major, reflect the characteristics of the professional personnel training, and reflect the multi-level quality standards.

- (2) Revision of the practical curriculum syllabus of artificial intelligence

According to the “artificial intelligence professional talent training plan” and “artificial intelligence professional practical teaching management implementation plan”, compile the syllabus of course experiment, professional practice, course design, graduation practice and graduation design. In each syllabus, the starting point of improving college students' innovation, comprehensiveness and design ability is fully reflected. And through practice, it forms a dynamic and benign operation mechanism, and solidifies it into the teaching management system of colleges and departments.

- (3) Put forward the implementation scheme of comprehensive curriculum design of artificial intelligence specialty

change the application teaching mode which only covers the single design of “graduation project”, add comprehensive curriculum design in the teaching process, and construct several sets of comprehensive design schemes, task books for each stage of

curriculum design, guidance books for each stage of curriculum design, and grading standards for each stage of curriculum design, covering “machine learning”, “deep learning” and “python programming language”. In 2020, 2021 students to implement practice, and then improve students’ engineering comprehensive design ability.

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# Research on Teaching Management of Applied University Based on Big Data

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**Abstract.** In recent years, with the rapid development of university education, more and more attention has been paid to the campus network system engineering design, which is an important part of the campus engineering construction data in the era. The establishment of a safe, convenient, environmental protection, open smart campus, to achieve university teaching, information management and life, is inseparable from the campus network infrastructure support. Big data, cloud computing and Internet of things are emerging computer technology, and the growth of data brings new challenges to management. Aiming at these problems, this paper first expounds the concept of big data, then analyzes the development status of big data, gives the application of big data in teaching management, and finally puts forward the key technology of constructing big data teaching resource sharing system. The distributed computing technology is used to realize the four basic educational administration functions in the educational administration management system, including student status management, teaching plan management, achievement management and online course selection. At the same time, in order to highlight the characteristics of online education, the functions of intelligent education cloud classroom, off campus online teaching platform docking and big data sharing knowledge base function are designed. Through the information, intelligence and standardization of the educational administration system, the Internet plus education service and resource sharing have been realized, and the purpose of breakthrough and innovation in educational administration has been achieved. Through the comparison of academic grades, it is concluded that there are 1000 students in total, 999 in practice and 1 absent. The passing rate of this grade is 98%.

**Keywords:** Big data · University teaching management · Assessment and evaluation system · Practice teaching of professional courses

## 1 Introduction

With the continuous improvement of science and technology, intelligent technology has become indispensable in our life. It represents a large aggregate data set that can be captured and stored. Big data analysis uses new technologies and new skills to analyze information flow, thus revealing clues, trends and patterns hidden in data.

With the continuous progress of Internet technology, many experts have carried out in-depth research on big data technology. For example, some research groups in China have studied the quality of practical teaching of professional courses in applied

universities. The potential impact of university teaching has been extensively and rigorously examined. While providing more effective and effective education services for learners, it will also promote the systematic, orderly and scientific development of the platform for Internet plus teaching. Combined with the theoretical basis of big data ecosystem, this paper analyzes the overall framework of ecosystem, so as to determine the development content of big data experiment course. According to the governance theory, this paper puts forward the principles of remolding the university teaching decision-making mechanism, constructs the teaching decision-making mechanism of the Committee University, clarifies the characteristics of the teaching decision-making mechanism of the committee system university and the conditions for the reform of the university teaching decision-making mechanism, and puts forward the diversification of the University teaching decision-making mechanism [1]. Through giving full play to the role of academic power in teaching decision-making, balancing and coordinating the interests of all parties, we can seek the development and quality improvement of university teaching. This paper discusses the test work after the design and implementation of the system, and describes in detail the test principle, test method, system unit test, conclusion of system test and maintenance suggestions. In the later use of the system, the system maintenance suggestions are put forward. This paper expounds the current situation of data mining management system and the existing problems of general system, and then arranges and introduces the main work. Through the elaboration of related concepts, types and characteristics of big data, we can see that the development of big data is closely related to daily life. The elements of university teaching decision-making mechanism are defined as the subject of university teaching decision-making, the content of university teaching decision-making and the operation mode of university teaching decision-making mechanism, so as to establish the correct direction of university teaching development and guide the university teaching to gradually go deep. The application of Internet plus education in teaching management is introduced. Data mining technology helps students to construct a self-learning mode, improve their interest in learning, strengthen their time management, improve their personal learning ability and information management ability, and finally improve their learning effect. Based on the investigation and Research on the existing teaching management system and Teaching Department of the University, the educational administration personnel and the teaching directors in charge of teaching in various colleges have put forward different user needs. According to these user needs, the demand is analyzed and the demand is processed in polarization. Through the summary and summary of the existing research results of domestic and foreign major journals, literature and industry, as well as on-site communication and discussion with many practitioners, the establishment of teaching experience management system will play an extremely important role in improving teaching quality [2]. Although the research results of big data technology are quite rich, there are still deficiencies in the teaching management of big data application-oriented universities [3].

In order to study the teaching management of big data application-oriented university, through the research of big data technology, we found the big data application model. The results show that the big data application model can be applied to university teaching management.

## 2 Method

### 2.1 Big Data Technology

#### (1) Big data

Only through professional analysis, find out the internal relationship of data, grasp the potential logical relationship, and make appropriate education decision-making data, can it be called education big data [4]. Big data is a distributed system infrastructure developed by the foundation. Users can develop distributed programs without knowing the underlying details. Make full use of the power of cluster, high-speed computing and storage. Big data implements a distributed file system. Big data consists of two parts: distributed file system and distributed computing framework. The distributed file system is mainly used for the distributed storage of large-scale data, and the distributed computing framework is built on the distributed file system, which is used for distributed computing of the data stored in the distributed file system. In big data, the distributed file system at the bottom of the distributed computing framework is an independent module. Users can implement their own distributed file system according to a set of agreed interfaces, and the data stored in the file system can be processed by the distributed computing framework. Although colleges and universities seek to support students' opinions with a large number of complex and aggregated data, due to its inherent limitations, big data is limited in the design of intervention measures, including the public. The focus on quantitative data and the disconnection between university services and classroom teaching may not interest staff who are not interested in big data. However, "small data" is one-dimensional teaching analysis, which provides high-quality feedback for teachers and students. Only through professional analysis, find out the internal relationship of data, grasp the potential logical relationship, and make appropriate education decision-making data, can it be called education big data [5]. It emphasizes the instrumental application of big data in Ideological and political education.

#### (2) Data mining

Data mining is user-centered, and its emphasis is on reading and analyzing data information in the process of human-computer interaction [6]. Data mining is to extract effective processed data from a large number of noise random data. In practical application, it has the characteristics of real-time massive data, random query of data required by users, and prediction of few or no market, on the premise of data mining and data relationship analysis, the effective processing and control of data information is realized. In the process of research and analysis of the data mining module of teaching management data analysis system, the functional requirements of the data mining module need to focus on massive data analysis, data information mining and management. The design of data mining system is an important part of the design of distance education management system. The reasonable degree of log mining design determines the running effect of the system and the speed of data access. For the distance education system, all the data information including students' personal information, teachers' personal information, homework information, student status

information, examination results, question answering information, courseware resource information and other important information will be stored in the database of the system. Therefore, we need to consider the security, stability and redundancy of the database. The logical structure design of data mining is to abstract the real objects in real life, and abstraction has become a way for people to understand. The logical structure design of database is the process of system content design. E-R diagram is usually used as a description tool to solve related problems by abstracting system objects. On the premise of ensuring data security, the actual application effect of teaching management data analysis system can be improved [7–11].

## 2.2 Fuzzy Comprehensive Evaluation

Combined with the fuzzy comprehensive evaluation model, the evaluation category set of practice teaching quality of professional courses  $u = \{B1; B2; B3; B4\}$ ; evaluation factor set = (professional curriculum practice teaching background, professional curriculum practice teaching investment, professional curriculum practice teaching process, professional curriculum practice teaching effect). As shown in formula (1–3):

$$WF = [0.571 \quad 0.621 \quad 0.728 \quad 0.729] \quad (1)$$

$$B1 = WF1 = [0.721 \quad 0.831 \quad 0.824 \quad 0.734] \quad (2)$$

$$B2 = WF2 = [0.723 \quad 0.821 \quad 0.783 \quad 0.612] \quad (3)$$

## 3 Experience

### 3.1 Extraction of Experimental Objects

In order to try to explore and solve the X network in the teaching management of omissions, so that x network in the future development of better to create value for students. At the same time, it also hopes to provide some help for the deficiency of teaching management in the field of online education. The goal of using model transformation is to save effort and reduce errors by automatically building and modifying models where possible. The model can be considered as the input of the program. There are a variety of model transformations and their uses, their inputs and outputs, and the way they are expressed. Model transformation usually specifies which models can be accepted as input by specifying the meta model that the model must conform to, and, if appropriate, as the output generated model.

### 3.2 Experimental Analysis

The 0 mg Model Driven Architecture (MDA) is an open, vendor independent approach to meet the challenges of business and technological change. It can be implemented by almost any open or proprietary platform, including web services., Net, Cordoba, J2EE, etc. These platform independent models separate the behavior and business functions

of an application from the specific technical code that implements the application, separates the core of the application from the technology and its continuous development cycle, and realizes separability within the platform and across platform boundaries. With the continuous development of business requirements, the business and technical aspects of application or integrated system can evolve according to their own progress, that is, business logic responds to business requirements, and technology adopts new development methods. Appropriate domain specific language (DSL) is a model driven architecture approach that uses platform independent models (PM) to define system functions. Then, based on the given platform models such as CORBA, net and web, PM is transformed into one or more platform related models (PSM) that the computer can run. This requires mapping and transformation, and it should also be modeled. PSM can use different DSL or common language.

## 4 Discussion

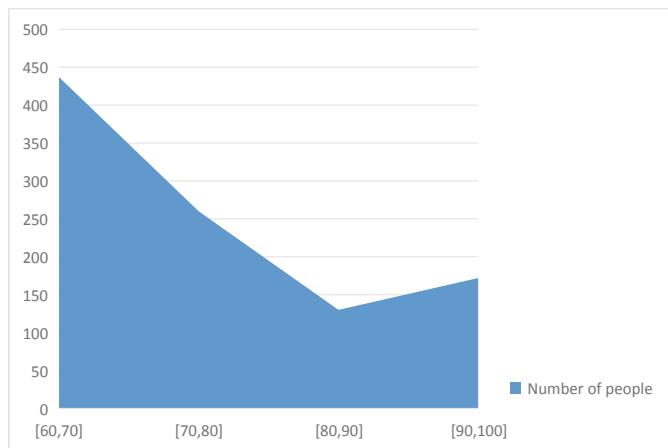
### 4.1 Comparison of Academic Grades

School decision makers use the extreme course teaching system to extract the information with integrity and availability to make scientific decisions, which reduces the blindness of school decision-making behavior. The grade management group uses the diversified examination data analysis system in the extreme course project system to construct a scientific teacher quality assessment content. The multi-dimensional and multi-dimensional evaluation of teachers' personal teaching situation has changed the single evaluation method which only looks at the average score to evaluate teachers' teaching level. The simplest case is that the extreme class system provides the school administrators with a quick statistical table of the examination situation of each class. It shows the total number of students, the number of actual examinees, the number of absentees, the passing rate and the statistics of the whole Yearbook. As shown in Table 1.

**Table 1.** Comparison of university academic grades

Type	Total number of people	Number of actual examinees	Number of absentees	Pass rate
Number of people	1000	999	1	98%
Score interval	[60, 70]	[70, 80]	[80, 90]	[90, 100]
Number of people	437	260	130	172
	43.7%	26%	13%	17.2%

It can be seen from the above that the total number of university academic grade examination is 1000, the number of actual examination is 999, and the number of absent students is 1. The passing rate of this grade is 98%. The results are shown in Fig. 1.



**Fig. 1.** Comparison of university academic grades

As can be seen from the above figure, there are 437 people in the score range [60, 70], 260 in the score range [70, 80], 130 in the score range [80, 90], and 172 in the score range [90, 100].

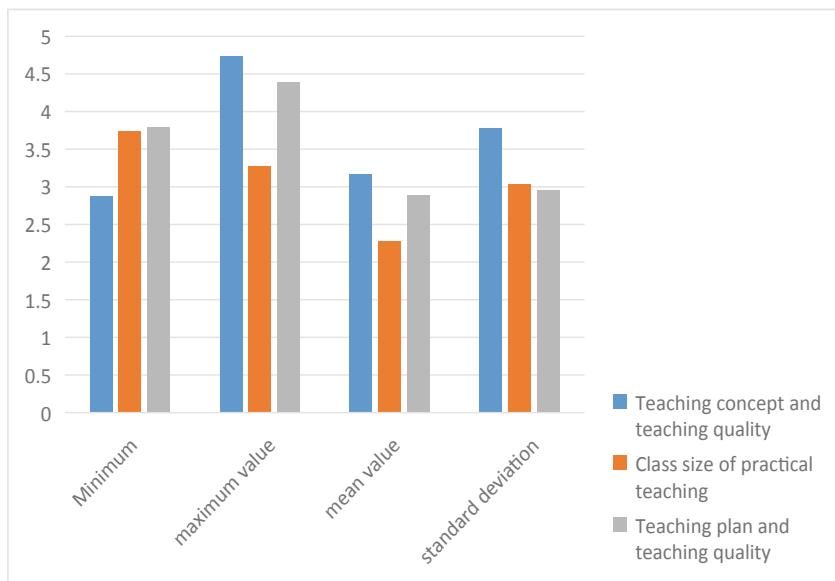
#### 4.2 Descriptive Analysis of Importance Factors

The formal questionnaire was distributed by myself and my friends after class in computer science and technology major of n University. Due to the large demand for samples, some of them are transmitted by the teachers and students of this major to form the survey object of this paper. A total of 100 questionnaires were collected from the formal questionnaire survey on the importance of practical teaching elements of professional courses. The effective recovery rate of the questionnaire was 99%, which met the design requirements and data analysis requirements. The main descriptive statistical indicators of this survey are shown in Table 2.

**Table 2.** Descriptive statistics of the importance of practical teaching elements of professional courses

Measurement index	Item	Minimum	Maximum value	Mean value	Standard deviation
Practice teaching background of professional courses	Teaching concept and teaching quality	2.873	4.728	3.167	3.782
	Class size of practical teaching	3.738	3.277	2.273	3.033
	Teaching plan and teaching quality	3.784	4.393	2.892	2.953

It can be seen from the above that the minimum value of teachers' teaching concept on the quality of curriculum practice teaching is 2.873, the maximum value is 4.728, the average value is 3.167, and the standard deviation is 3.782. The results are shown in Fig. 2.



**Fig. 2.** Descriptive statistics of the importance of practical teaching elements of professional courses

First of all, we compare the importance of practical teaching elements of professional courses by means of concentration quantity (mean value) and difference quantity (standard deviation). It can be seen from the above that the minimum value of the teacher's curriculum practice teaching plan to the curriculum practice teaching quality is the largest, and the maximum value, mean value and standard deviation of the teacher's teaching concept to the curriculum practice teaching quality are the largest.

## 5 Conclusion

Intelligent management information system is also an important research topic of education departments and universities. The intelligent teaching management information system can not only help the school teaching management department to improve work efficiency, but also promote the construction of intelligent, information and digital campus. The Ministry of education has put forward the development plan of educational information under the “Internet plus” environment, and put forward the requirements for the construction of information in Colleges and universities. At the

same time, there are many problems to be solved in the traditional teaching of colleges and universities. This paper analyzes the influence of education big data on the teaching management of higher education and the influence of education big data on the development of higher education. Network distance education, which uses the network for interactive learning, teacher-student communication and discussion learning and lifelong education, has brought about changes in teaching methods and strengthened the interaction between teachers and students. At the same time, this method provides the direction for the development of education information, and network distance education provides the possibility and opportunity to learn at anytime and anywhere for modern education. The effectiveness of information-based teaching activities in Colleges and universities is its effective guarantee. Through the accounting and prediction of the education cost in Colleges and universities, we can make the schools formulate the cost and quota index according to their actual needs, so as to improve the education of financial system and cost management system in Colleges and universities. “Big data” and “fragmentation” are valuable methods to obtain and optimize information management. Starting from the discovery of teaching materials, teaching materials and organization symbols of teaching materials, this paper makes a detailed study and Discussion on the compilation of teaching materials. Network courses are more and more widely used in Ideological and political education.

**Acknowledgements.** This work was supported by 2019 Jiangsu University General Project of Philosophy and Social Science Research “Research on Industry-education Integration promoting Application-oriented Undergraduate Talent Training” (2019SJA1300).

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# Online Model of Professional Translation Learning and Teaching in the Information Technology Era

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**Abstract.** With the continuous development of network technology, online learning has become more and more popular. But currently the research of online translation teaching and learning system is very limited while the online learning model is backward in communication and intelligence. Therefore, this paper makes a detailed research on online English teaching through combining learners' model built by Bayesian network with multi-agent system and Repeat-track Interferometry (RTI). The RTI and multi-agent system are applied in the dynamic regulation of learning and teaching strategy. Then a Bayesian online model based on multi-agent RTI system is proposed. Finally, this proposed model is testified by subjects. Through comparison of the learning results using common model and the proposed model, the reliability and validity of the new model is verified. Besides, in order to further analyze the impact of this model on students' learning habits and learning psychology, a questionnaire survey is conducted on the experimental subjects. It is found that the new model has a positive impact on students' learning attitudes and learning outcomes. This proves that the new model based on Bayesian Networks with multi-agent RTI is efficient and positive.

**Keywords:** Online model of translation teaching and learning · Bayesian network · Multi-agent system · Repeat-Track Interferometry (RTI) system

## 1 Introduction

In the early 20th century, U.S. President Bill Clinton put forward an important plan called “Call to Action for American Education in the 21th Century”, to ensure all Americans can access to efficient learning through the Internet. From then on, the online learning and teaching system has prospered and has been perfected by scholars' thorough research in modern times. Currently, the online learning and teaching is mainly implemented through open classes, national fine-designed courses and massive open online courses (MOOC). Meanwhile, the main problem in these systems exists in the learners oriented model building. In order to further improve the quality of education in teaching and learning systems and promote the education of differentiated talents, many methods of modeling based on student differences and interactive adjustment of learning strategies are focused by researchers [10]. However, due to the

complexity of modeling, the current online learning system still cannot be realized in such aspects as refining students' differences, absorbing knowledge and thinking modes. Therefore, the dynamical adjustment of learners' models and learning strategies are becoming hot topics. Thus, this paper makes a detailed research of modeling of online translation learning and teaching.

## 2 Literature Review

At the beginning of the 20th century, based on the MYCIN system, Clause, et al. established a student model and developed a set of learning system that could achieve preliminary interaction. However, due to the lack of teaching strategies in the system, it could not realize intelligent teaching. Based on this, Anderson et al. conducted a complex modeling by imitating the human teaching process, and finally designed a preliminary intelligent online education system. Since modern times, many scholars from different backgrounds have worked together to develop a new type of intelligent education system [6], which could model student models and enables interaction with learning objects, but was not refined enough for real-time dynamic control of learning strategies. In recent years, as for online teaching system, scholars mainly focus on three aspects. One is the data collection of online learning sample, the second is the regulation of teaching strategies based on student variables, and the third is the meticulous modeling of sample data student models.

## 3 Methods

Based on the development of intelligent network and the rapid improvement of computing power of modern computer technology [3], the college English online teaching and learning system mentioned in this paper adopts Bayesian network and multi-agent intelligent network for student-terminal model, meanwhile the RTI is adopted in the model for dynamic interference. In doing this, the complexity of the RTI intervention system is greatly improved by the Bayesian multi-agent network calculation, and the pertinence and effectiveness of the Bayesian multi-agent student model are improved by the intervention-response model.

### 3.1 Bayesian Network

The Bayesian network, first proposed by Thomas Bayes, mainly uses the evolution of probability and graphics to show the relationship between various random variables and image transformation. In recent years, Bayesian network are widely used in deep learning and big data [9]. The relationship between the main variables is expressed as follows:

$$P(X | Y, v) = \frac{P(X | c)^* P(Y | X, v)}{P(X, c)} \quad (1)$$

The formula (1) is called Bayesian formula, where Y is the additional data, X is the reliability of the data, and v represents the default data conditions. The whole formula shows the final probability under conditional probability. The first term above the formula indicates the reliability of the data under the preset data condition, and the second term means the overall probability of additional data under the condition that the preset data condition and the data are reliably established. The denominator of the formula, on the other hand, represents a variable proportional term that has nothing to do with the reliability of the obtained data. Based on the above formula, the network can deduce the direction and result of the final variable based on a large amount of noise data, and can predict effectively the requested target value of and the data distribution based on the already-existing information.

In recent years, Bayesian network is widely used by scholars in student models [2]. Since the Bayesian network is a kind of information structure chart, which contains many data points, with each small point respectively associated with a specific feature and is represented by a series of probability distributions, the basic network structure model is shown as below:

$$B = (c, M, N) \quad (2)$$

In this formula, C represents the sum of all individual noise distributions, M represents the set of all orientations, and N represents a series of probability distributions. In the network structure diagram, the point and point distribution represent the actual data or graphics or related content, and the connection between them represents the interrelationship among the data, namely data interdependence, mutual exclusion, or independent. At the same time, the probability distribution of each point C represents the frequency of occurrence of this point and its probability of impact on the whole.

The construction of this network requires the establishment of noise, the training of the overall connection and the training of various parameters. The semi-autonomous learning approach is adopted, in which after the relevant staff designs number of noise and the connected relationship, the whole network performs fitting training based on the user data X and finally adjusts the weight value  $\theta$  between the noise to achieve the final optimal network design, just as shown below:

$$L(x_1, x_2, \dots, x_n; \theta') \varphi = \max_{\theta \in \Theta} L(x_1, x_2, \dots, x_n; \theta') \quad (3)$$

### 3.2 Multi-agent Intelligent Network

Agent intelligent network is a system that gives dynamic response based on the results perceived by the surrounding environment and dynamically adjusts its own proxy status. The multi-agent system is a system composed of many agent systems, and it has many excellent features [7], as shown below. Specifically speaking, the proposed model refers to the model provided by Zhu. The multi-agent system is used to simulate the student-side so that it can act based on the students' own circumstances, to change the learning content dynamically.

Here nine frameworks are proposed for the construction of single-agent intelligent network of the online model of English teaching. It includes interactive framework, coordination framework, cognitive framework, extension framework, arbitration framework, design framework, operation Framework, support framework and emergency framework. The interaction framework is primarily responsible for interacting with the acting client and understanding customer information and needs in real time. The coordination framework is to coordinate the information obtained by the interaction framework with the internal information of the network and interact with other agents at the same time [4]. The cognitive framework is primarily responsible for identifying the information obtained. The extension framework extends the information obtained based on what is already known to the agent, while the arbitration framework extends the information extended by the framework for arbitration and rating. Then, after the design framework has arbitrated the result and designed the corresponding execution steps, the operational framework executes the response and the implementation according to the known execution steps. The support framework primarily provides data support and known content assurance for the entire process, and the emergency framework is the logistics framework that deals with possible failures of each of the frameworks.

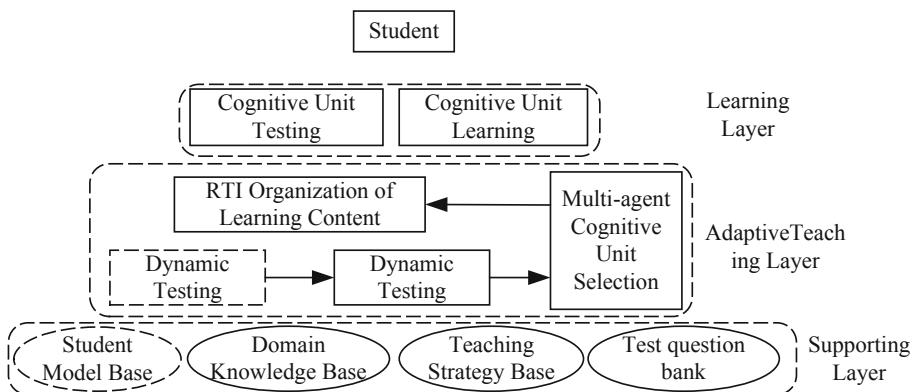
### 3.3 Repeat-Track Interferometry System

Repeat-track interferometry (RTI) system is an interference-response system. It is an interference-response process mainly including convolution, iterative, convolution. The interference system is based on dynamic and static data acquisition and convolution processing, and then brings the convolution results into the iterative system. After iterating many times, the final interference response is obtained through convolution.

The proposed online teaching system refers to Yang's modelling approach to educational networks as illustrated in the bibliography [8]. The construction of the interference network mainly consists of five parts: online data processing and picking, real-time detection, in-depth crosstalk, data arbitration and estimation processing. Firstly, the real-time monitoring system makes real-time access to students' online data, and then the data processing and picking part classifies and sorts the data obtained for different students then sends the data to each agent system. Then the data arbitration and estimation processing system makes estimation analysis and arbitration of the classified data, and finally sends the results to in-depth crosstalk for implementation of changing the learning progress, teaching methods, adjusting the difficulty of teaching, interfering the students' learning, thus completing the RTI system construction. Estimation processing is the core of the whole RTI system construction. The more pertinent and efficient learning intervention depends on the efficiency of the estimation processing part. This paper adopts the interference estimation processing model proposed by Saeki et al. [5].

### 3.4 The Overall Construction of a New Model of Online English Teaching and Learning

The whole idea of constructing a new model, as shown in Fig. 1, is to target at the problems in translation and learning and teaching, to construct a corresponding student user model using Bayesian network, then the multi-agent network combined with RTI structure is used as dynamic programming for dynamic analysis of various data nodes in student learning model and corresponding improvement. Concretely speaking, the user learns and takes tests through the proposed online learning system, based on the evaluation results, a student model will be built by the Bayesian network, and then RTI and multi-agent model makes analysis and dynamic extension based on the data, thus to adjust the teaching scheme, such as slowing down the speed of learning, increasing teaching time, changing teaching methods and so on, and ultimately to complete the construction of the entire teaching model.

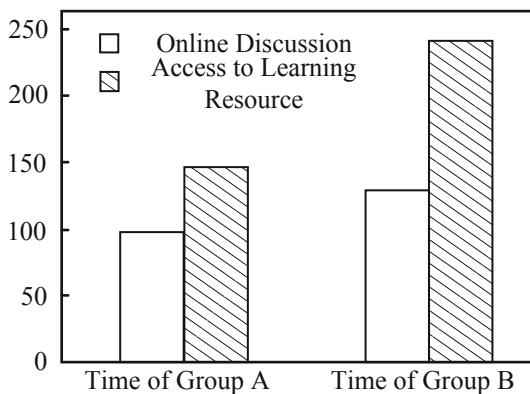


**Fig. 1.** Overall construction of a new model of online English teaching

## 4 Results

In order to validate the proposed new model, an actual data experiment is conducted. The common online English teaching model and the RTI multi-agent Bayesian network model form two control groups in the comparative experiment. This experiment is based on the course of “English Translation and Study” which needs to be studied online. 110 students in two classes are divided into two groups by taking class as a unit, among which group A uses common learning platform, while group B uses the new teaching model for courses learning.

The online discussion and learning resource access activity of the two groups are illustrated in Fig. 2. It shows the number of online discussions in group B is 23, twice that of group A. And the access to learning resource of group B is also significantly higher than group A. This proves that students’ learning motivation and interest have been significantly improved with the proposed model, which further confirms the rationality and efficiency of the model.



**Fig. 2.** Comparative charts of online discussion and resource access of the two groups

## 5 Discussion

To further verify the validity of the model, a detailed questionnaire survey is conducted among the subjects to explore the impact of the model on their learning ability and learning motivation. Based on the learning methods the proposed model provides, subjects are asked about their positive or negative attitudes towards the interference model, their learning motivation of English translation and learning, the sense of accomplishment of learning, the pressure on learning and the model reliability. Overall, there are 106 valid survey results, 53 subjects in each group, and 34 questions. The alpha coefficient is 0.945, and the survey has a reliability test coefficient of up to 0.864. This means that the findings are highly reliable and effective.

According to Ardoïn et al. [1], this also reflects that due to the interference model, students' learning pressure is reduced and their motivation is enhanced. At the same time, students can obtain a higher sense of accomplishment during the learning process. In the long run, the proposed model has a positive effect on students' internal motivation and learning habits, and can weaken their psychological barriers to learn and create a better attitude towards learning with reasonable help.

## 6 Conclusion

This paper focuses on the research of online model of translation learning and teaching. Through the cross-design of Bayesian network, Multi-agent system and RTI system, a set of models for efficient, dynamic and personalized planning of student learning is established. Through the actual modeling and experiment of course of "English Translation and Study", the validity and rationality of this model is verified. Besides, through the experimental study, it is found that subjects who use the new online teaching model can achieve better results and have a stronger motivation to learn. And through the investigation, the new model can not only improve students' learning status and motivation, be helpful in health habits formation, but also can reduce the pressure

on students' learning, and ease their psychological state through the interference system. Therefore, the research of this new online teaching model has important reference value for the construction of online teaching system.

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# An Application Study of Content-Based Instruction Program for English Majors in the Preliminary Stage Based on SPSS Statistical Analysis

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**Abstract.** CBI is a method of teaching second and foreign languages that integrate language instruction with instruction in the content areas. In this context, the purpose of this study is to develop a new CBI program that meets the needs of university English major students in the preliminary stage. This study adopted an action research method and developed a CBI program that can be applied to university English classes by constructing the theoretical frame of CBI. According to literature review and expert advice. In order to confirm the effectiveness of the developed program, 30 students in each of the two basic English classes at JL Engineering Normal University in China were composed of an experimental group and a control group to apply the developed program to the experimental group. Before and after the program, the levels of English proficiency and learning motivation are measured in the experimental and control groups, and in the case of the experimental group. Based on the SPSS statistical analysis, it's concluded that CBI is more effective in improving English proficiency and learning motivation than traditional teaching methods. The significance of this research is that it provides a theoretical framework for CBI-based teaching and provides a method of teaching for the preliminary courses in university English majors.

**Keywords:** SPSS statistical analysis · Content-based instruction program · English majors in the preliminary stage

## 1 Introduction

Nowadays, China has been experiencing dramatic changes as a result of opening up to the outside world. The role of English as a tool of communication has become increasingly prominent in the Chinese environment. The goal of language teaching is shifting from linguistic competence to communicative competence and the mode of teaching from single skill development (reading) to integrated skills training. Evidence shows that when teachers take into account the learners' needs and interests, their motivation and the way to promote group interaction and to reduce their anxiety in learning, the goal of language acquisition and learning is more likely to be achieved

[1]. In addition, a large number of language skills courses are offered in the primary stage of English major, and few courses focus on content and subject knowledge, resulting in insufficient intake of subject knowledge, lack of knowledge structure and limited thinking development of English major students.

Content-based instruction (CBI) has emerged as a reaction to the traditional approach to language teaching. CBI has increasingly grounded language teaching in academic content across disciplines and has changed the focus from teaching language in isolation to its integration with disciplinary content. It shifts dramatically from the traditional focus on language to the teaching of language with or through content [2]. It takes learners' needs, interest and motivation into consideration and abandons the misconception that the interest and motivation into consideration and abandons the misconception that the purpose of teaching language is to teach a set of rules, regardless of the content it carries. A foreign language is most successfully acquired when learners are engaged in its meaningful use. As is well known, language acquisition occurs in context; natural language is never divorced from meaning, and content-based instruction provides a context for meaningful communication to occur [3]. There is wide agreement among researchers that content-based language learning is most effective when it provides both meaningful communication about contents and intentional language development [4]. CBI aims at developing three areas simultaneously, namely, subject matter knowledge, higher-level thinking skills, and language proficiency. It is due to this comprehensive view of language teaching that CBI has received global attention and that there is now accumulatively strong evidence for the effectiveness of content-based approaches to language teaching. Therefore, CBI can be adopted in the Chinese university English major context in order to improve the EFL learners' English proficiency and learning motivation while they are learning subject matter knowledge.

Therefore, in order to better meet the needs of English majors to learn subject knowledge and language skills, as well as higher thinking skills, the study aims to check the effectiveness of the CBI program in improving students' learning motivation and English proficiency based on SPSS statistical analysis.

## 2 Effectiveness of Developed CBI Framework in Application

### 2.1 Research Design

In order to check its effectiveness in English majors' preliminary courses, this study adopted the action research to conduct a 24 class hour teaching experiment in Comprehensive English I. The total class hours of this course are 96 h (16 weeks, 6 h per week). In the first 12 weeks, both the experimental group and the control group adopted regular teaching methods. In the last four weeks, the experimental group conducted a 24-h CBI teaching experiment. The subjects involved in this research were divided into two groups (control group versus experiment group) for a comparative study. Their learning motivation and English proficiency were measured repeatedly before the teaching experiment and after the teaching experiment. The English proficiency tests were administered to them as the pretest and posttest. The questionnaires

on learning motivation were distributed to them at the beginning and the end of the teaching experiment respectively. In this design, the two groups' English proficiency should demonstrate no statistically significant difference when the experiment commenced. The teachers of the experiment group and the control group had the same teaching qualification and similar teaching experiences. That is to say, the variables of the learners' English proficiency level and the teacher were controlled prior to the teaching experiment. Therefore, in the overall design of this study, the ideas of the experimental group and the control group were used to investigate the effect of the CBI program. The specific research design is shown in the following Table 1.

**Table 1.** Experiment research design of CBI program based on university English majors' preliminary course

Research group	Class	Pre-test	Implementation of the teaching	Post-test
Control group	Class E1941 (30)	T	X1	T
		S		S
Experiment group	Class E1942 (30)	T	X2	T
		S		S
				I

T: English Proficiency Test

S: Survey of English Learning Motivation

I.: Interview

X1: Regular teaching program of Comprehensive English I

X2: CBI teaching program of Comprehensive English I

## 2.2 Analysis of the Impact of the CBI Program on Students' Learning Motivation

**Table 2.** Comparison between pre-test and posttest of experiment group and control group on learning motivation-paired sample t-test

	Item	N	M	SD	t
Experiment group	Pre-test	30	3.82	.450	-4.233***
	Posttest	30	4.22	.308	
Control group	Pre-test	30	3.75	.480	-1.324
	Posttest	30	3.59	.557	

\*\*\* $P < .001$

As is shown in the above table, for the control group, the mean of pre-test is 3.75, and the mean of posttest is 3.59. The significance level is set at .05. It can be seen from the tables that there is no significant difference between pre-test and post-test the control group ( $t = -1.324$ ,  $P > .05$ ). These results show that the learning motivation of subjects in the control group didn't change at all. They are still taught with the traditional teaching method. As is shown in the tables above, for the experiment group, the mean

of pre-test is 3.82, and the mean of posttest is 4.22. The significance level is set at .001. As a consequence, there are significant differences for the experiment group between pre-test and posttest ( $t = -4.233$ ,  $p < .001$ ). It can be seen that the learning motivation of the experiment increased dramatically group during the experimental teaching period. They had higher motivation to learn English at the end of the teaching experiment (Table 2).

### 2.3 Analysis of the Impact of the CBI Program on Students' English Proficiency

**Table 3.** Comparison between pre-test and posttest of experiment group and control group on English proficiency- paired sample t-test

	Item	N	M	SD	t
Experiment group	Pre-test	30	77.53	6.658	-4.501***
	Posttest	30	84.97	5.262	
Control group	Pre-test	30	79.47	6.506	-3.286**
	Posttest	30	83.97	5.629	

\*\*  $P < .01$  \*\*\*  $P < .001$

As is shown in the above table, for the control group, the mean of pretest is 79.47, and the mean of posttest is 83.97. The significance level is set at .01. It can be seen from the tables that there are significant differences between pretest and posttest for the control group ( $t = -3.286$ ,  $P < .01$ ). These results show that there is a slight increase of proficiency gains in the control group. They are still taught with the traditional teaching method. As is shown in the above table, for the experiment group, the mean of pretest is 77.53, and the mean of posttest is 84.97. The significance level is set at .001. It can be seen from the tables that there are significant differences between pretest and posttest for the experiment group ( $t = -4.501$ ,  $P < .001$ ). These results show that there is an increase of proficiency gains in the experiment group. The improvement of the experiment group was greater than that in the control group (Table 3).

## 3 Conclusions

First, this CBI program has positive effects on students' English learning motivation. The students in CBI class have higher motivation in learning English mainly because of the three following reasons. The first reason is from the educational perspective. CBI adopts the fundamental educational conception of integrating language teaching with content learning, eliminating the artificial separation of learning the language from learning content [5]. CBI takes the top-down approach of learning the language from the starting point of understanding the meaning. The learners are encouraged to discover the meaning and form of the new language items in the course of learning the content [6]. In this study, the learners interviewed revealed that CBI made language

learning experience more meaningful to them and they felt this learning process was motivation. The second reason is the interesting content which are relevant to the learners' needs. In the interview with the students, the researcher was informed that they were eager to learn about the culture of the English speaking countries when they took the course Comprehensive English I. They were well aware that their learning task was not only limited to learning the language pattern drills; they would spend more time and effort on learning the subject knowledge rather than the language. The third reason is the learning tasks in this CBI program. The students were required to comprehend the contents (by listening and reading) and evaluate them (by speaking and writing). When challenged, they were encouraged to overcome the language problems and understand the contents via the target language. They were found to read widely and persistently for completion of a learning task. In addition, the students were pushed to speak and write in a longer discourse in order to clarify their point of view on a certain topic. Tasks that were intrinsically interesting and cognitively demanding would enhance students' motivation and lead to more and better opportunities for second language acquisition [7]. In this CBI program, students were exposed to complex information and were involved in challenging activities which can generate intrinsic motivation. Therefore, CBI had the strength of helping learners to improve their motivation to learn English.

Second, this CBI program has positive effects on students' English proficiency. The students' English proficiency in CBI class is improved mainly because of the two following reasons. The first is the significant difference in motivation to learn English between the two groups of learners. The result is consistent with the former researchers' findings [8]. The CBI program encourages students to learn the language and continue their efforts even after the language course. It helps foster autonomy and self-confidence in the learners by teaching them the skills and knowledge that can be applied in other discipline. In the classroom, the learners would volunteer answers as much as possible. In addition, they would read English magazines and newspapers if they were offered the opportunity and knew enough English. Therefore, the learners in the content-based context would devote more time and efforts in their learning of English, which led to better achievement in their English proficiency. The second reason is CBI's learning context. Findings by Laura [9] indicated that learning context plays a very important role in foreign language learning. In this study, all the materials were prepared by the teacher and learners from the course books provided by American publishers, CNN programs, TED speeches, internet, reports on historical events and stories about English-speaking countries' culture and customs. The authentic materials fulfilled the needs of the learners in the CBI class, which led to increased motivation and better learning outcome. Moreover, learners acquired functional language skills that enabled them to use the language appropriately and effectively for the reason that authentic materials enabled learners to interact with the language of native speakers [10]. In addition to the authentic materials, the learners were provided with authentic learning experience of using English as a tool of communication in content-based instruction. Furthermore, CBI promoted experiential learning in this study through learning sustained content. The way of experiential learning in the CBI class made the learners practice using the target language more frequently than those in the regular

Comprehensive English class, which resulted in more English proficiency gains in the CBI class as compared with the control class.

**Acknowledgments.** This work was supported by JGJX2019D219 (a research project of Jilin province higher education titled *An Application Study of Content-based Instruction Program for English Majors in the Preliminary Stage*).

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# Advantages of Computer Information Technology in Physical Education Teaching Practice

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**Abstract.** With the development of education technology, information technology plays an increasingly important role. Physical education in higher vocational colleges plays an important role in students' psychological education. Physical education can organically combine psychological consciousness with psychological behavior. It can make students receive psychological education in the process of physical activities. Through theoretical analysis and practical analysis, this paper points out that there are some prominent problems in the application of physical education thought in physical education teaching of our country at the present stage, such as outdated education concept, shortage of funds, lack of teachers, and neglect of the main position of students. Through the research on the computer proficiency of teachers, it is found that there are 103 teachers who are very proficient in using computers in public compulsory courses (except computers), 96 teachers are very skilled in using computers in sports humanities and sociology, 101 teachers in physical education and training are not familiar with computers frequently, and 93 teachers in sports and human science are very skilled in using computers.

**Keywords:** Computer information technology · College physical education · Teaching practice · Network teaching platform

## 1 Introduction

As an effective way to obtain information resources, education in the 21st century is characterized by the wide application of information technology. It constitutes a real current teaching method, compared with the invention of printing. Its appearance makes us reflect on the teaching methods and strategies, teaching styles and teaching methods of higher physical education.

With the continuous progress of information technology, many experts have carried out in-depth research on computer information technology. For example, some teams in our country have studied the application status of the integration of information technology and physical education undergraduate courses, and then combined with the specific application, analyzed the user needs in detail, and proposed the development and implementation scheme of sports teaching network support system. Through interviews and mathematical statistics, this paper finds out the problems existing in the

integration of information technology and curriculum. Some experts have studied the blended learning of College Physical Education Based on network. Starting from the purpose of cultivating innovation ability and implementing quality education. Taking college sports blended learning as the research breakthrough point, through the definition and understanding of the related concepts of college sports blended learning, as well as the research on the evaluation of college sports blended learning, the purpose is to promote the reform of College Physical Education and improve the quality of College Physical Education Teaching [1, 2]. Some experts have studied the current situation of the integration of information technology and physical education undergraduate course, and draw on the positive suggestions put forward by predecessors, and put forward some ideas on any alliance between sports and information technology.

In order to study the advantages of computer information technology in physical education teaching practice, through the study of computer information technology, found the calculation algorithm, the results show that through the establishment of information technology-based teaching platform, relying on information technology to make dynamic courseware, the establishment of information management system and other ways, to better realize the application of information technology in college physical education.

## 2 Method

### 2.1 Computer Information Technology

With the progress and development of information technology, a lot of information is transmitted to the Internet in the form of network. It has certain security and can ensure the information security to run in the normal environment. Computer network information security covers a wide range, it covers all the contents of the computer network, so it is of great significance to ensure the security of information data. Network teaching platform is not only a dynamic development of network information technology concept, but also a rich connotation of network information technology concept [3–5]. At present, students generally lack the sense of active participation, deep and original problem awareness, due team cooperation consciousness, active learning feedback consciousness and multi-dimensional learning computer knowledge [6]. Most of the information technology classroom tasks are completed in the classroom, and the problem related to the submission of homework is the most troublesome. When the task is handed in, you can only see which students have handed in. If you want to know which students have not handed in, you have to check them one by one. It is difficult for the information technology teachers to teach in many classes, so it is difficult to match the names and people of students one by one, This kind of verification efficiency is low, and it is easy to cause some students to take the opportunity to escape. Anyway, the bell rings after class, and the teacher can't know that I didn't hand it in so soon, so it will be regarded as a good one [7]. Information technology refers to the combination of computer, network, radio and television and other hardware equipment, software tools and scientific methods to obtain, process, store, transmit and use various information of text, picture, audio and video. Information technology is a concept with extensive,

complex and dynamic changes. The bounden duty of information technology is to improve or expand human's information ability, which is the general term of methods and means to improve or expand human's information ability. The use of this technology has a positive incentive effect on students [8]. The technology provides video clips of students' performances in physical education classes and reviews them through feedback. It is a research on formative and nominative evaluation of digital video as an aid in physical education. This is very disadvantageous to the classroom implementation of information technology. Network technology has many technical characteristics that other teaching methods can't match. The use of network, which is a new and broad learning environment, provides students with a new learning environment which is different from traditional learning methods. In this brand-new learning environment, students can learn information technology knowledge with a new learning method of meaning construction [9]. If we can combine the computer teaching function with the information technology course, consider the particularity of the teaching objectives of the course, and consciously use the network, an advanced teaching method adapted to the information age, we can achieve twice the result with half the effort [10].

## 2.2 Calculation Algorithm

Firstly, block singular value decomposition is performed on the carrier image data matrix [11]. The process of embedding the two-dimensional code as a watermark is shown in Fig. 1. The two-dimensional code is embedded into the singular value of the original image. In the embedding process of the watermark, the original image is divided into blocks, and then each block ( $I = 1, 2\dots$ ) is divided into blocks Then, round  $\lfloor(m * n)/(M2 * N2)\rfloor$  is decomposed into two orthogonal matrices and a diagonal matrix  $S_i$ . The two-dimensional code is superimposed on the singular matrix  $S_i$  as watermark  $Wm2 * N2$ , and the newly generated matrix  $S_i + aw$  is decomposed by singular value decomposition to obtain  $u a$ ,  $s a$  and  $V A$  ( $S_i + aw = cassava$ , where the constant  $a > 0$  adjusts the embedding strength of the watermark, and then the processed image containing watermark is obtained by multiplying  $U I$ ,  $S A$  and  $V I T$ . Let  $a$  be a matrix of  $M1 \times N1$  size and  $w$  a matrix of  $M2 \times N2$  size. The above literal description algorithm can be expressed as follows:

$$A_i \rightarrow \text{block } A_i \quad (SIM = \frac{\sum \sum W(i,j)W^*(i,j)}{\sqrt{\sum \sum W^2(i,j)} \sqrt{\sum \sum W^{*2}(i,j)}}) \quad (1)$$

$$A_i \rightarrow ^{SVD} U_i S_i V_i^T \quad (2)$$

$$S_i + aW = U_a S_a V_a^T \quad (3)$$

$$U_i S_a V_i^T \Rightarrow A_i \quad (4)$$

By using the stability of singular values and singular values to show the intrinsic nature of the image, the two-dimensional code is embedded into all singular values of the carrier image as a watermark. The watermark has good concealment and

robustness, and the image encryption effect is good. In addition, the two-dimensional code can be extracted completely in the decryption process [12].

### 3 Experience

#### 3.1 Extraction of Experimental Objects

To investigate the situation of students using information technology in the learning process and the information technology courses that students need to learn urgently. The third year students of physical education major have taken most of the courses of physical education major, and know more about the information technology that the students of physical education major need to learn. Therefore, we randomly selected two classes of junior college students majoring in physical education to fill in the student questionnaire.

#### 3.2 Experimental Design

According to the research requirements, this paper sorts out and classifies the middle year curriculum of physical education major in a university. The courses are divided into public compulsory courses, professional compulsory courses and professional limited elective courses. Due to too many courses and limited personal energy, the research cannot be carried out one by one. According to the usual classification method, the compulsory courses and limited elective courses of physical education major are divided into three categories: Sports Humanities and sociology courses, sports training courses and sports humanities courses. There are three kinds of public compulsory courses: politics, English and computer. Because of the high level of computer teachers, and the teaching environment of computer course is different from other courses, it is a network classroom, so the computer course is discussed separately. On the premise of consulting a large number of documents and materials, the questionnaire was compiled by consulting experts for many times according to the research purpose and content, and following the principles and requirements of sports science research methods and sociology. In order to ensure the validity of the questionnaire, the school sports and Sports Statistics experts are invited to analyze the questionnaire logically and effectively, review the questionnaire content and make qualitative evaluation. According to the experts' opinions and evaluation results, some contents of the questionnaire are modified and supplemented.

### 4 Discussion

#### 4.1 Teachers' Proficiency in Using Computers

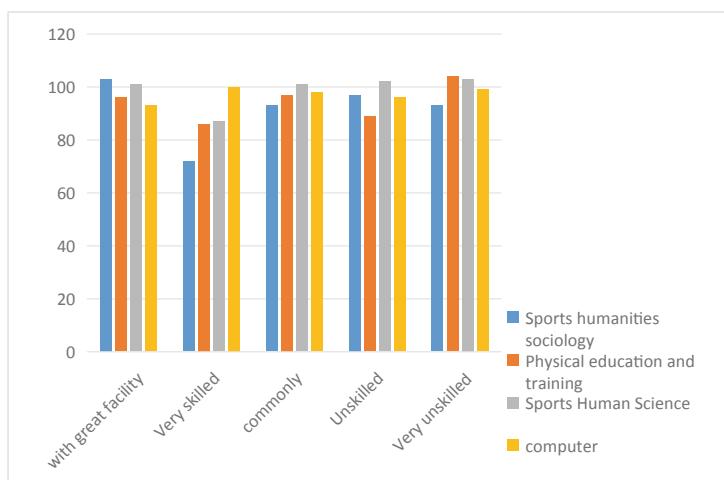
Sports training courses include track and field, swimming and other special training courses. The teaching environment is the training hall. Therefore, teachers do not choose computer environment, that is, professional training courses that do not involve information technology. Computer courses are in the network classroom, the rest of the

courses are in the teaching machine and projector environment for teaching. It shows that some schools have the basic hardware conditions for the integration of information technology and physical education curriculum, but the training hall lacks basic information technology facilities. The computer level of teachers is shown in Table 1.

**Table 1.** Teachers' computer proficiency

PUBLIC required course (except computer)	With great facility	Very skilled	Commonly	Unskilled	Very unskilled
Sports humanities sociology	103	72	93	97	93
Physical education and training	96	86	97	89	104
Sports Human Science	101	87	101	102	103
Computer	93	100	98	96	99

Teachers can use information technology to search for available teaching resources and materials on the Internet before or after class. There are 103 teachers of public compulsory courses (except computer) who are very skilled in using computers, 96 teachers of sports humanities and sociology, 101 teachers of physical education and training, and 93 teachers of sports and human science who are very proficient in using computers. The results are shown in Fig. 1.



**Fig. 1.** Teachers' computer proficiency

It can be seen from the above that teachers are very proficient in using computers in public compulsory courses (except computers). Teachers are very proficient in using computers in computer courses. Teachers generally use computers in sports human science courses. Teachers are not proficient in using computers in sports human science. Teachers are not proficient in using computers in sports education and training.

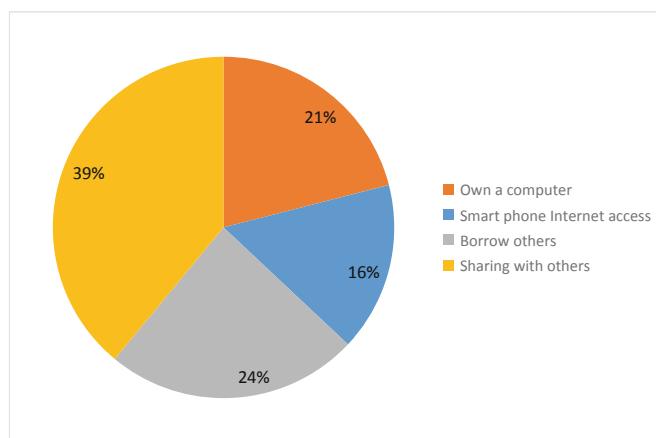
## 4.2 Investigation on Landing Frequency of Campus Network Teaching Platform

After the formal release of the course in the campus network, both the added students and the non-added students can learn and watch online. Students who have not been added can also leave a message on the front page of the course to put forward opinions and suggestions for the problems existing in the course. The course builders will accept and revise it with an open mind. As shown in Table 2.

**Table 2.** Statistics of students' access to campus network with computers or mobile phones

Type	Own a computer	Smart phone internet access	Borrow others	Sharing with others
Percentage	21%	16%	24%	39%

It can be seen from the above that 60% of the students have the conditions to easily log in to the campus network by using the computer, and 39% of the students have their own smart phones. They can log in to the campus network through the smart phones in class or after class. The results are shown in Fig. 2.



**Fig. 2.** Statistics of students' access to campus network with computers or mobile phones

It can be seen from the above that 21% of students have their own computers, 16% of them do not have the convenience to borrow others, 24% of them do not share it with others, and 39% of them use smart phones to access the internet.

## 5 Conclusion

With the development of quality education and information technology, the integration of information technology and physical education curriculum in higher vocational colleges is gradually taking shape. The integration of information technology and physical education teaching is a new teaching concept and model. This paper discusses the management system, laboratory construction and current situation of public college physical education, and analyzes the deficiencies in the construction of public sports laboratory and the teaching process of teachers. Using information technology, this paper constructs the course of testing students' interest before class, and puts forward the "Trinity" physical education practice teaching mode. By using the method of literature review and teaching experiment, this paper studies the application of modern technology in Physical Education in physical education colleges and universities. The students in the class study that the application of modern information technology in volleyball teaching should give full play to information technology the characteristics of operation. Starting from the purpose of cultivating innovation ability and implementing quality education, this paper studies the teaching mode and method of College Physical Education under the condition of modern information technology.

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# Application of Random Simulation Algorithm in Physical Education Teaching Evaluation

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**Abstract.** In the classical comprehensive evaluation theory, the information form of evaluation conclusion is usually absolute. In view of the absoluteness of judging the advantages and disadvantages of traditional physical education (PE) teaching evaluation and the inconsistency of multiple evaluation conclusions, this paper constructs an independent advantage evaluation method which highlights its own advantages, and puts forward a comprehensive evaluation mode of random simulation. In other words, by setting parameters, the traditional evaluation mode can be transformed into a random mode, and the possibility ranking conclusion of the comparison between the advantages and disadvantages of the schemes can be obtained. Because of the independence of the stochastic simulation solution method, this paper applies it to the evaluation model of PE, and constructs a new independent evaluation method to evaluate the advantages of the evaluation object by calculating the winning degree of each evaluation object. Finally, the random simulation comprehensive evaluation model was taken as the experimental group, and the traditional sports evaluation model as the control group. The results showed that each index of the experimental group was higher than that of the control group, and the comprehensive score was 0.83 higher than that of the control group. Thus, the random simulation evaluation model is an extension of the traditional evaluation model, providing a structural framework for various information forms and evaluators' preferences, so that the evaluation process is no longer limited by single or limited data form and information structure, and can further enhance the practical application scope of comprehensive evaluation method.

**Keywords:** Physical education teaching · Stochastic simulation algorithm · Independent evaluation · Probability characteristics

## 1 Introduction

The theory of PE teaching evaluation [1–3] has developed for many years in China. In view of this specific evaluation problem, even though the mechanism of the method is different and the solution is not the same, the conclusion form is mostly determined and consistent, which is manifested as “the absoluteness of distinguishing the advantages and disadvantages” and “the transmission of differences Strictness”. Usually, different evaluation methods will produce different evaluation conclusions for the same evaluation problem, resulting in the inconsistency of multiple evaluation conclusions. At present, it is generally believed that “combination evaluation” is an effective method to

solve the problem of Cuan, but in fact, it is only a compromise treatment, and does not understand the essence of the central problem from the root [4, 5].

The traditional PE teaching evaluation must be thoroughly reformed and a scientific, reasonable, fair, comprehensive and objective evaluation system of PE must be established. In order to really improve the health level of students. In order to achieve health first in PE teaching. To promote the healthy, comprehensive and coordinated development of students. How too accurately, timely, scientifically, reasonably and fairly reflect the health level of students and the effect of PE teaching is the reason why this paper explores the reform of the evaluation model of PE. Therefore, this paper constructs an “independent advantage evaluation method which highlights its own advantages”. In the evaluation, a probability based stochastic simulation algorithm [6–8] is used to evaluate the advantages of the evaluation object by calculating the winning degree among the evaluation objects. This method can produce the evaluation conclusion of probability form, and has stronger interpretability for practical problems. This method is proposed from the perspective of innovation the comprehensive evaluation method of “from base to top” has high independence. It adds evaluation link in the form of “component” to transform the evaluation data.

Therefore, this paper constructs an independent advantage evaluation method which highlights its own advantages, and puts forward a random simulation comprehensive evaluation mode. By calculating the winning degree of each evaluation object, a novel independent evaluation method is constructed to evaluate the advantages of evaluation objects. Finally, the conclusion of random simulation evaluation model is compared with that of absolute form evaluation [9, 10]. The research shows that the evaluation model is an extension of the traditional sports evaluation model and can further broaden the practical application scope of the comprehensive evaluation theory.

## 2 Basic Description of PE Teaching Evaluation

### 2.1 Description of PE Teaching Evaluation

#### 1. It is helpful to improve students' enthusiasm and initiative

As a result of the clear direction of efforts, there are more definite goals. Students' learning enthusiasm and initiative have been significantly improved. The specific performance is that the classroom teaching atmosphere is more active than before, and the students' initiative in practice is increased.

#### 2. It is helpful to improve students' exercise consciousness

Because exercise habit is one of the main contents of sports evaluation, the frequency of students' participation in physical exercise and the way of exercise is all the items of sports evaluation. In this way, we can effectively urge students to exercise consciously, and gradually develop good habits of exercise.

#### 3. It is helpful to improve students' psychological quality

To increase the evaluation of psychological quality in the evaluation system of PE requires students to pay attention to mental health while pursuing physical health. Students are required to know and accept themselves first. Whether they are tall or short, fat or thin, and whether their PE foundation is good or bad, we are all on the

same starting line. Because the new PE teaching evaluation takes into account the individual differences of students. The vast majority of students, including the original sports “poor students”, can have the successful experience of achieving the goal. In this way, students get positive and positive evaluation, and they are interested in physical exercise. Because of the fun from sports practice, fewer people are afraid of hardship and tired.

## 2.2 Random Simulation Algorithm

The random simulation comprehensive evaluation model is oriented to the relative evaluation problem, but it is still the information processing method based on the traditional comprehensive evaluation method. Therefore, the random simulation comprehensive evaluation mode can be regarded as a structured method framework. The framework consists of two parts: one is the randomization of traditional evaluation methods; the other is the solution of relative evaluation problem based on stochastic simulation algorithm.

The basic idea of stochastic simulation algorithm is to build a stochastic simulation model and carry out simulation solution.

1. The specific parameters in the comprehensive evaluation method are replaced by random variables with specific distribution.
2. Construct the probability discriminant for the comparison of the advantages and disadvantages between individuals.
3. Through simulation calculation, the superiority matrix  $s$  of  $N$  evaluated objects is obtained.

$$S = \begin{bmatrix} s_{11} & s_{12} & L & s_{1n} \\ s_{21} & s_{22} & L & s_{2n} \\ M & M & L & M \\ S_{n1} & S_{n2} & L & S_{nn} \end{bmatrix} \quad (1)$$

4. A sort with probability (reliability) information is derived from the dominance matrix. The possibility coefficient and stability coefficient of the sorting chain are expressed by  $P$  and  $t$  respectively

$$p = m \text{ in } \{s_{ij}\} \quad (2)$$

$$t = \prod_{i=1}^{n-1} \prod_{j=i+1}^n s_{ij} \quad (3)$$

Where  $s_{ij}$  is the probability that scheme  $o_i$  is better than  $o_j$ ;  $i = 1, 2, L n$ ,  $j = 2, 3, L n$ ;  $p \in (0, 1]$ ,  $t \in (0, 1]$ .

### 3 Experimental Thinking and Design

#### 3.1 Experimental Ideas

In this paper, the traditional evaluation mode can be transformed into a random mode by setting the parameters, and the possibility ranking conclusion of the comparison between the advantages and disadvantages of the schemes can be obtained. Because of the independence of the stochastic simulation solution method, this paper applies it to the evaluation model of PE, and constructs a new independent evaluation method to evaluate the advantages of the evaluation object by calculating the winning degree of each evaluation object. Finally, an example is given to illustrate the application of the random simulation evaluation model, and it is compared with the absolute form evaluation conclusion.

#### 3.2 Experimental Design

PE teaching should enable students to master sports skills, develop physical fitness, at the same time, enhance physical fitness, improve health, and develop a good habit of lifelong exercise. Therefore, the content of PE teaching evaluation should include health level, physical quality, sports ability, learning attitude and progress range, psychological development level, scientific exercise habits and so on. Therefore, PE teaching evaluation must change the concept, advocate the scientific and reasonable evaluation methods, evaluation objectives and evaluation means, so as to stimulate students' learning enthusiasm and initiative, and cultivate students' ability to correctly understand themselves and self-education.

In physical education teaching, the evaluation standard should adopt the principle of combining quantitative and qualitative methods, that is, the method of combining technical evaluation with reaching the standard. Teachers should first collect the original data of students and according to the specific situation of students, make short-term goal for students, and find the best reference value for different students. The standard of students' physical quality can be evaluated according to the standard of students' physical health. The evaluation of students' physical development should be based on the characteristics of the region to determine the best reference value. The evaluation standard of exercise habit should be at least 3 times a week. Each time the exercise time is not less than 40 min. In this paper, according to the exercise plan provided by the students, and then combined with the mutual evaluation of students to determine.

## 4 Discussion

#### 4.1 Experimental Analysis of Random Simulation Evaluation Model

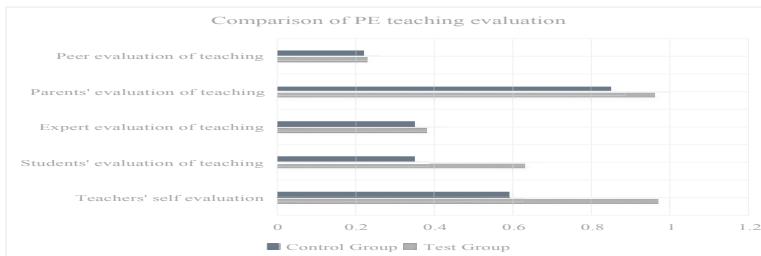
The collection of index information, the determination of weight coefficient and the selection of information aggregation model are the three main links in the traditional comprehensive evaluation operation process. In addition, there are also some links such as defining the evaluation purpose, determining the evaluation index, solving and

analyzing the evaluation conclusion, which is also the key to the transformation of the traditional comprehensive evaluation mode to the random simulation evaluation mode. In this paper, according to the idea of “from the classical multi criteria evaluation to its branch field expansion”, this paper introduces the random simulation evaluation mode and the traditional comprehensive evaluation mode, such as Table 1.

**Table 1.** Comparison between random simulation comprehensive evaluation mode and traditional comprehensive evaluation mode

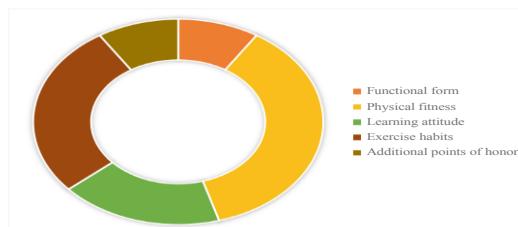
Traditional comprehensive evaluation	Random simulation comprehensive evaluation
Information collection	Information collection
Determination of weight coefficient	Determination of weight coefficient
Selection of information aggregation model	Selection of information aggregation model
Traditional comprehensive evaluation	Randomization of related parameters
Information collection	Programming of calculation simulation program
Determination of weight coefficient	Dominance matrix
	Possibility ranking between alternatives

The random simulation comprehensive evaluation model is oriented to the relative evaluation problem, but it is still the information processing method based on the traditional comprehensive evaluation method. Therefore, the random simulation comprehensive evaluation mode can be regarded as a structured method framework. The framework consists of two parts: one is the randomization of traditional evaluation methods; the other is the solution of relative evaluation problem based on stochastic simulation algorithm. In other words, the random simulation evaluation model is an extension of the traditional evaluation model and provides a structural framework for various information forms and evaluators’ preferences. Therefore, the evaluation process is no longer restricted by single or limited data form and information structure, which can further enhance the practical application range of comprehensive evaluation method. The conclusion of probability ranking with probability characteristics is more explanatory and more acceptable for relative evaluation problems. Specifically, the stochastic simulation evaluation method has the following three main characteristics: (1) fully solve the evaluation problem in the way of simulation, and avoid the situation that the solution is not sufficient by directly giving a conclusion through one evaluation. (2) In the process of simulation, the probability of pros and cons between alternatives is counted by the method of dominance matrix, which lays the foundation for the solution of the conclusion of possibility ranking. The conclusion of possibility ranking is an extension of the conclusion form of absolute ranking and avoids the “either or” conclusion state between alternatives. (3) By setting the relevant parameters, the traditional evaluation method is integrated into the solution process of stochastic simulation, which provides a convenient way for the comparison of various similar evaluation methods.



**Fig. 1.** Comparison of PE teaching evaluation between experimental group and control group

According to the indexes of teachers' self-evaluation, students' evaluation, experts' evaluation, parents' evaluation and peers' evaluation, the random simulation comprehensive evaluation model was taken as the experimental group, and the traditional sports evaluation model as the control group. According to Fig. 1, each index of the experimental group was higher than that of the control group, and the comprehensive score was 0.83 higher than that of the control group. It can be seen that the random simulation comprehensive evaluation model can contain a variety of absolute evaluation conclusions in a probabilistic evaluation conclusion, avoiding the subjective conjecture caused by the inconsistency of multiple evaluation conclusions.



**Fig. 2.** Scoring standard of PE teaching

According to Fig. 2, the PE teaching scoring standards include functional form, physical quality, learning attitude, exercise habits and honor additional points, among which physical quality accounts for the highest proportion. It can be seen that before conducting education evaluation, students' initial scores must be measured first, and then different short-term goals should be set for students according to the specific conditions of different students. Some evaluation contents are evaluated by teachers, while others can be evaluated by students themselves or each other.

#### 4.2 Suggestions on the Reform of PE Teaching Evaluation

1. Design and formulate scientific and reasonable, comprehensive, fair, objective and accurate evaluation scheme of PE teaching

The traditional PE teaching evaluation is often absolute and single, only the evaluation of students' physical quality and sports skills. Often do not pay attention to students' physical health and psychological quality, due to the neglect of the supervision of students' physical health. Therefore, comprehensive and reasonable evaluation of PE plays an important role in guiding students to pay attention to health. Quality education is the education of human development. The implementation of quality education, PE teaching must face all students. The health status of different students is different. Therefore, the evaluation of PE must take into account the individual differences of students under the condition of unified basic requirements. According to the students' different foundation and learning starting point, the corresponding learning objectives should be formulated.

2. PE teaching evaluation should focus on the guiding ideology of "health first" They are not limited to specific forms and constantly explore. Any evaluation standard can not be absolutely fair and comprehensive. Only according to the teaching guiding ideology of "the first of spring and Autumn", as long as the PE teaching evaluation is closely around the goals of "improving students' health; developing students' physique; cultivating psychological quality; laying the foundation of lifelong PE", and then constantly explore and enrich the corresponding evaluation contents, evaluation methods and evaluation standards according to the different situations of students in different grades in different regions and schools. It is possible to make a scientific and appropriate evaluation of students in PE teaching evaluation. Only in this way can PE teaching develop students' health and physique purposefully, urge students to form good habit of self-conscious exercise, and realize the goal of quality education and lifelong PE.

## 5 Conclusions

Because of the independence of the stochastic simulation solution method, this paper applies it to the PE teaching evaluation mode. By setting the parameters, the traditional PE evaluation mode is transformed into a random mode. The relationship between the advantages and disadvantages of the schemes is obtained, and the superiority of each evaluation object is calculated. A novel independent evaluation method is constructed to evaluate the advantages of the evaluation object. Finally, the random simulation comprehensive evaluation model was taken as the experimental group, and the traditional sports evaluation model as the control group. The results show that the stochastic simulation algorithm can solve the evaluation problem in the way of simulation, avoiding the situation that the solution is not sufficient due to the conclusion directly given by one evaluation, which can further enhance the practical application range of the comprehensive evaluation method.

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# Development Mode of Digital Media Art Specialty Based on Big Data

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**Abstract.** In the era of big data, many colleges and universities have put our courses on the network platform, and art education is also actively developing online open courses. Take advantage of the global synchronous learning advantages of these courses. We believe that researchers need to consider whether the analysis of large amounts of data is theoretically reasonable, because it may be limited in effectiveness and scope, and small-scale analysis of dissemination content or user behavior. 9.57 million students were enrolled in music major, and 9.57 million students were enrolled in music and dance major. The results show that there are 9.57 million students majoring in music and music.

**Keywords:** Digital media · Big data · Art · Development

## 1 Introduction

With the continuous progress of science and technology, big data technology has become an indispensable part of our life. In a short period of time, the amount of data generated in the world has increased. Therefore, the rapid growth of data brings many challenges. Digital media and art are growing at an unprecedented rate, driven by the dual need to reduce operating costs and generate more revenue from an increasingly competitive and uncertain market [1].

Due to the continuous progress of Internet technology, many experts have studied digital media technology. For example, some domestic teams have studied the development of environmental design education in the digital media era, and explored the diversified coexistence development mode of environmental design education with the digital media era as the time node. It is realized that its teaching is mainly a system which takes into account the interior design and landscape design, interdisciplinary and multi-element coexistence. Through understanding the different understanding of the field of environmental design education at home and abroad, and comparative study of its disciplinary connotation. The graphic and Chinese and English static logo design forms are established, and the application display design of different display devices is carried out. This paper studies the definition, characteristics and development trend of dynamic logo design, and discusses the development trend of dynamic logo design. This paper discusses and demonstrates the design of dynamic logo in a standardized and systematic way, discusses the theory and practice of dynamic logo design, analyzes

the typical dynamic logo design at home and abroad, and analyzes the brand type, extended type and interactive type performance type of dynamic logo [2]. Some experts have studied the new characteristics of display space design in the digital media era. They integrate digital learning materials into media format and use tool or object space as a direct part of physics. Taking digital technology as the research background, taking the new characteristics of display space design in the new era as the research direction, through the analysis of the essential characteristics of display space design in the digital media era, this paper deeply studies the characteristics and application scope of the concept of “experience” and “interaction” elements, which is the new trend of contemporary display design under the support of digital technology. This paper analyzes several characteristics of interactive display art, emphasizes the important role of design theme, analyzes how the design elements are constructed around the theme, discusses the interactive strategy with audience as the core, and studies how to carry out interactive exhibition design audience under the premise of respecting demand [3]. Although the research results of big data digital media technology are quite abundant, the development mode of big data digital media art is still insufficient.

In order to study the development mode of big data digital media art major, this paper studies the big data digital media, and the results show that big data digital media technology is conducive to the development of art major.

## 2 Method

### 2.1 Big Data Digital Media

#### (1) Big data

There are many computing modes for big data processing; the most common are batch processing and stream computing. In batch mode, the data to be processed is first collected and stored, and then processed in batch through the computing framework. Batch computing has the characteristics of high throughput, high fault tolerance and flexible expansion. It is the main processing mode used in offline computing scenarios. Map reduce is a typical batch computing framework. In stream computing mode, data is regarded as a continuous stream, and new data stream needs to be processed immediately [4–6].

#### (2) Digital media

The definition of digital media is only a narrow summary from the transformation of communication forms and the introduction of modern science and technology. Digital technology is the basis of digital media, which can form a special mode of communication organization, realize the exchange of information and the mode with communication characteristics. From the above point of view, digital media is not only a new technical means, but also a new form of media communication, which depends on the development of new hardware, software and service forms. At the same time, while promoting the development and innovation of

environmental design education and teaching in the digital media era, this dynamic is also reflected in the interaction.

### (3) Digital media interaction design

With the integration of digital media and traditional culture more and more closely, digital media, especially interactive media, has been widely used in cultural and educational digital works, museums, art galleries and other fields [7]. The application of digital media interaction technology promotes the digital process of new cultural works. More and more digital works are supported by new technology, bringing spiritual and emotional impact to users.

### (4) Digital media art

Digital media art is a new art form based on digital technology and modern media technology, which integrates people's rational thinking and artistic perceptual thinking. The biggest difference between digital media art and other art forms is that digital technology must be applied to all or part of its creation and realization.

## 2.2 Bloom Filter Principle

Bloomfield is a data structure used to detect whether an element belongs to a collection. Bloom filter has the advantage of low space cost. For the data set with n records, when the size of bit array is m and the number of hash functions is k, the error rate P can be calculated as follows:

$$p = (1 - (1 - \frac{1}{m})^{kn})^k \approx (1 - e^{\frac{-kn}{m}})^k \quad (1)$$

The data size that meets the connection criteria is:

$$a \times c \times p_b + b \times c \times p_b \quad (2)$$

$$a \times c \times p(1 - p_a) + b \times c \times p(1 - p_b) \quad (3)$$

$$O(a \times c(p_a + p(1 - p_a)) + b \times c(p_b + p(1 - p_b))) \quad (4)$$

Bloom filter filtering algorithm uses bloom filter data structure to filter out the elements that do not belong to the set. It is used in many fields, including join operation between data sets. Various application scenarios of Bloom filter are studied. Bloom filter data structure is used for join operation of map reduce.

## 3 Experience

### 3.1 Experimental Object Extraction

In order to fully grasp the current middle school students and middle school art teachers' cognition of new media art and the actual situation of middle school art new media art curriculum and teaching, this paper adopts the method of questionnaire

survey to investigate D area and its surrounding eastern coastal economic developed areas, with high economic level, leading scientific and Technological Development and advanced educational concept.

### 3.2 Experimental Analysis

In the design of the questionnaire, in addition to the text selection and open question and answer, how to choose the degree of liking and how to judge the teaching feasibility of new media digital images and virtual works (including digital photography, digital photography [8], digital painting, digital animation, online games, etc.), it creatively adds 3D printing and other forms of new media art works. The first is the investigation of students and school art teachers' cognition of new media art; the second is the investigation of students' and school art teachers' ability to create new media art works; among them, the investigation of students' current situation and demand willingness to learn new media art in art classroom; the fourth is the discussion of art teaching in New Media Art Curriculum and school art curriculum.

## 4 Discussion

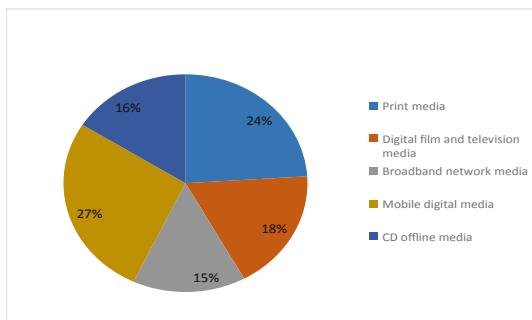
### 4.1 The Media of Digital Media Art Communication

It spreads more widely and faster. Then it can click and browse. However, from the perspective of artistic creativity, it can not be ignored because of the participation of technology, because it is realized through the human brain, technology can not replace artistic creation, and the cultivation of innovation is still the most important content. The media of digital media art communication is shown in Table 1.

**Table 1.** Media of digital media art

Type	Percentage
Print media	24%
Digital film and television media	18%
Broadband network media	15%
Mobile digital media	27%
CD offline media	16%

It can be seen from the above that the percentage of print media is 24%, that of digital film and television media is 18%, that of broadband network media is 15%, that of mobile digital media is 27%, and that of optical disc offline media is 16%. The results are shown in Fig. 1.



**Fig. 1.** Media of digital media art

It can be seen from the above that the percentage of mobile digital media is the largest, that of broadband network media is the smallest, and that of digital media printing is more than that of optical disc offline media [9, 10].

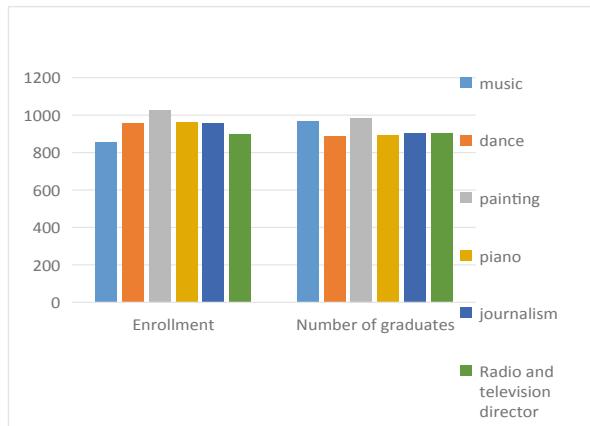
#### 4.2 Analysis of the Present Situation of Broadcasting and Hosting Art Education

According to statistics, in 2017, there were 38467348347 college students; in 2018, 32781679536; in 2019, 75.38 million college students, 20 times higher than 2015; 38.65 million college students, 54% of the enrollment rate; in the context of media convergence, 38.65 million college students, the enrollment rate was 54%, traditional news, dance, music, piano, painting, radio and television At present, the addition of media art major and the enrollment scale in successive years are also expanding. The number of students is shown in Table 2.

**Table 2.** Statistics of the number of Art Majors in the school (Unit: ten thousand)

Major	Enrollment	Number of graduates
Music	853	965
Dance	957	887
Painting	1027	984
Piano	962	892
Journalism	957	904
Radio and television director	897	902

It can be seen from the above that there are 8.53 million students majoring in music, 9.57 million in dance, 9.84 million in piano, 9.57 million in journalism, and 897 in radio and television broadcasting. The results are shown in Fig. 2.



**Fig. 2.** Statistics of the number of art majors in the school (Unit: ten thousand)

It can be seen from the above that the enrollment of music major is less than the number of graduates, the enrollment of dance major is larger than the number of graduates; the enrollment of piano major is larger than the number of graduates [11].

## 5 Conclusion

With the emergence of huge digital data sets and digital corpora, we often encounter a large number of data, which challenges the existing research methods and expectations, especially in the research of art history and creative process. This paper reviews the similar concepts and literature related to the protection of comparable research fields (including crowd-sourcing Art), interactive virtual world and digital cinema. This paper discusses the methodology of big data analysis, and discusses their applicability and usefulness in digital media research.

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# Modern Apprenticeship Talent Training Mechanism System Based on Cloud and Network Integration

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**Abstract.** The cloud network environment is a brand new computing environment with strong comprehensiveness. It is the product of the integration and mutual penetration of advanced technologies such as distributed processing technology, network computing technology, virtualization technology, and load balancing technology. In the cloud network environment, various data and information can be shared, and network resource utilization can be improved. On this basis, it has important practical significance to carry out research on the modern apprenticeship training mechanism system under the cloud network environment. In exploring the system of talent training mechanism, cloud network technology emerging in the Internet era plays an important role. Integrating the cloud network into the modern apprenticeship talent training mechanism system can build a connecting platform for students' theoretical study and practice, so that students have places and opportunities to use what they learn. The development direction of the company is closely linked with the training of talents in higher vocational colleges. The content of students' learning is determined by the needs of the company. After students learn theoretical knowledge, they need to be verified in practice, so the company provides students with a practice space. The purpose of the research in this article is to study the talent training mechanism based on the modern apprenticeship based on the integration and application of the cloud network, and to make innovative development of the traditional talent training mechanism. This article starts from the perspective of cloud network technology, takes the current Internet era as the background, and on the relevant realistic background and theoretical basis, takes the innovation and development of the development of talent training mechanism as the specific research object, and makes full use of the current fast-developing cloud network technology Breakthrough and innovative development of modern apprenticeship The experimental results show that cloud network technology can make new developments in the process of traditional talent training system, and build a new model of modern apprenticeship talent training system.

**Keywords:** Cloud network environment · Modern apprenticeship · Talent training · Higher vocational colleges

## 1 Introduction

Cloud network is one of the main products of the development of Internet technology, and is currently the most advanced, cutting-edge, and most scientific computing technology. Use the shared advantages of the super-large-scale distributed computing environment to realize the storage and interaction of various information. The cloud network environment contains thousands or even tens of thousands of computers, but ordinary users can only perform simple operations on the interactive interface and extract data that is valuable to them. This is also the cloud network environment is widely favored by people from all walks of life. The main reason [1]. Compared with traditional information collection methods, real-time interaction of information and data can be realized in the cloud network environment, and user work efficiency can be improved. Various information and data can be accessed, extracted, called, and stored through a computer, which greatly improves the utilization of information and data [2].

With the continuous development of computer and network technology, cloud network technology has been widely used in various industries with its advantages of virtualization, high reliability, and on-demand services. In recent years, cloud network technology has been used in modern apprenticeships. It has been combined and used in the talent training system [3]. The research object of this article is to explore the talent training mechanism based on modern apprenticeship based on the integration of cloud network. In order to break the predicament of the traditional talent training system, we have found a direction for the implementation of deepening school-enterprise cooperation in higher vocational education in our country and innovating the modern apprenticeship talent training model [4]. The modern apprenticeship talent training model in higher vocational education in the new Internet era makes the relationship between higher vocational colleges and enterprises closer, and strengthens and deepens school-enterprise cooperation [5]. Under the development requirements of enterprises, higher vocational colleges have a clearer education direction and educational goals, and they are more organized in the education and training of talents. There is no need to search for students' practical test points, which saves a lot of troublesome links [6].

With the rapid development of the current cloud network technology, it is of great help to the key talent information data of the modern apprenticeship talent training system, and its system can have new development and innovation in the modern apprenticeship talent training model in higher vocational education. It is directly connected with the school, and the connection between students and the enterprise is through the school as an intermediary party. The enterprise not only provides space for students to practice. The combined application of the modern apprenticeship training model in higher vocational education under the cloud network environment can reduce the employment troubles of students. The combination of theory and practice will alleviate the employment problems of students and alleviate the employment pressure of the society. And in the cloud network environment, companies are more willing to trust and choose high-quality colleges and universities when choosing partners for cooperation. The results of talent training in vocational colleges are brilliant, the popularity of the school will also increase, and the recognition of parents of vocational colleges will increase. Then parents will invisibly promote the education model of

vocational colleges, and vocational colleges will also become the object of competition among many parents, students and enterprises. Therefore, it is necessary to carry out the innovative development of the modern apprenticeship training mechanism system integrated with the cloud and network.

## 2 Method

### 2.1 The Use of Cloud Network to Analyze and Study the Modern Apprenticeship Talent Training Mechanism System

First, establish a cloud network BP model to establish a layered talent training mechanism, and conduct data analysis on multiple sample variables. Through BP's adjustment of the weights and thresholds of each level in the forward and reverse transmission, the direct impact of cloud computing on the talent training mechanism is measured, and the feedback error is measured whether it meets the requirements, and dynamic variable adjustment is required, that is, multiple iterations.

Quoting the classic algorithm BP model, given the Euclidean distance between the forward and backward nodes as  $d$ , the energy consumed by the node sending and receiving 1 bit of cloud computing data information is measured, as shown in the following equation:

$$E_{\text{send}}(l, d) = \begin{cases} l E_{\text{elec}} + l \varepsilon_{\text{fx}} d^2, & d \leq r \\ l E_{\text{receive}}(l) = l E_{\text{elec}}, & d > r \end{cases} \quad (1)$$

$$E_{\text{receive}}(l) = l E_{\text{elec}} \quad (2)$$

### 2.2 Em is the Error Between the Estimated Value and the Actual Value, Reflecting the Overall Error of the Result; The Error Percentage of a Single Sample is Shown in the Following Formula

$$E_m \frac{\left[ \sum_{i=1}^{n-1} (d_i - o_i)^2 \right]}{N - 1} \quad (3)$$

$$E_c = \frac{o_i - d_i}{d_i} \times 100\% \quad (4)$$

To sum up, the improved BP cloud network model first determines the range value through the scale coefficient, and divides the sample index into ascending nodes, and then divides it into different levels. The central sample of each level is the core point of the level. Among them, it represents the energy of each level of computing node that transmits or receives a unit of data information; and represents the energy consumed by each unit of time to transmit data information. It must be noted that when the cloud computing network is computing the diagnosis algorithm, the conduction range

between nodes is within its communication radius  $r$ , thus constructing the information computing model of  $d, r$  in this paper.

### **2.3 The Talent Training Model that Adopts School-Enterprise Cooperation for Practical Teaching**

Through the rapid development of cloud network technology, we strive to build a new school-enterprise education platform, complete the process from enrolling freshmen to the professional apprentice, then becoming the prospective employee of the company, and finally becoming the official employee of the company. This kind of modern apprenticeship talent training mechanism system path, It is a three-stage training system for talents. The modern apprenticeship talent training system is to form a long-term system of school-enterprise division of labor, teaching and educating people, and lifelong learning. Moreover, conditional school-enterprise cooperation should sign a cooperation agreement to regulate the apprenticeship training objectives and training period in legal form, Training models and other regulations, formulate and improve various talent training mechanisms. The entry and learning mechanism should be standardized during the training process, and the modern apprenticeship system should be improved through the use of cloud network technology to relieve some worries about the connection between students and enterprises.

### **2.4 School-Enterprise Development Cooperation Courses**

According to the training goals of the target positions of the modern apprentice class, with the production project as the guide, the talent training plan is deconstructed around the professional professional skills standards, and the professional quality is integrated, and the professional courses are jointly constructed and shared with reference to the industry professional skills certificate standards, and the curriculum is revised and improved. Standards, typical project cases and electronic courseware, development of supporting work guide manuals and training instruction materials. The co-construction and sharing courses are mainly related to the processing and creation of cloud network knowledge, timely adjustment of teaching strategies, active development of problem-based or project-based teaching activities, establishing friendships, obtaining teaching pleasure, and maintaining long-term enthusiasm for the cloud network learning space. The teaching community performs its duties in the online learning space, forming a clear talent training system, and improving the efficiency of using the cloud online learning space.

## **3 Methods and Experimental Research Design**

### **3.1 Give Full Play to the Advantages of the Modern Apprenticeship Training Model Under the Cloud Network**

Through the modern apprenticeship talent training mechanism system integrated with the cloud and network, we must first determine the goal, decompose the standard

content of the post, formulate professional teaching standards, reform the professional talent training model, and analyze the prediction and training system based on productive projects. Students develop a three-stage training model. Make full use of cloud network technology in terms of feasibility, make the most appropriate and clear personal plan for the direction of talent training, screen big data on the network, perform cloud network computing, develop a modern apprentice system that is conducive to cultivating talents, and pass the society to schools and enterprises. Demand for better supply of more suitable outstanding talents for the whole range.

### 3.2 Experimental Investigation Object

In order to be able to analyze the current targeted research on the use of cloud networks in a more in-depth manner, this article conducts a special investigation on the talent training mechanism system of modern apprenticeship by cloud network technology in the Internet era. First, the investigation and research method is adopted, and the specific case will be carried out. Detailed and in-depth investigation and research, research data, research rules, and refine and summarize first-hand information. This study selected the talent training mechanism system of a number of domestic higher vocational colleges to investigate the impact of factors such as student professional level, school education level and talent policy on the modern apprenticeship training mechanism system based on the cloud network environment Practical investigation and research.

**Table 1.** Questionnaire survey report

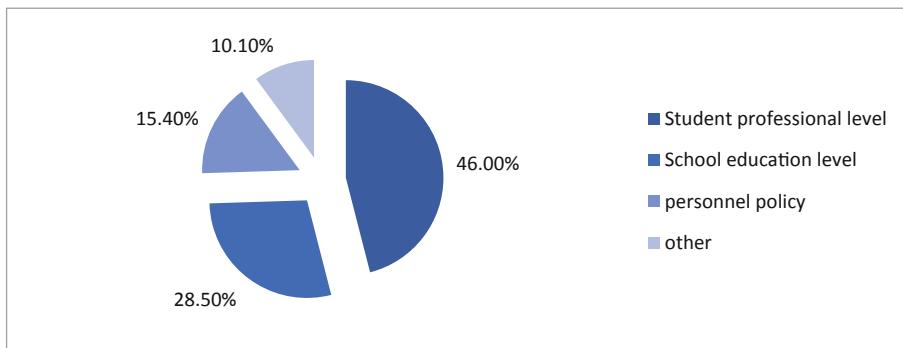
Questionnaire issuance and recovery	Undergraduate higher vocational colleges	Vocational college	Total
Issue	18	32	50
Recycle	18	31	80
Effective	18	31	79
Efficient	100%	96.9%	98.45%

In the investigation report link for this experiment, this article issued a total of 50 experimental investigation reports, and conducted a survey of talent training in 50 higher vocational colleges (as shown in Table 1) to determine the professional level of the college students and the school. The influence of factors such as education level and talent policy on the modern apprenticeship training mechanism system based on cloud network environment. First of all, the investigation and research method is adopted, and detailed investigation and research, research data, research rules, master first-hand information, and refine and summarize the specific case must be carried out. Secondly, using the case analysis method, this article analyzes the current situation of the talent training model of each college and its advantages and disadvantages, which requires multiple sample data to support. On the basis of the data analysis in this article, the comparative analysis method is used to analyze and compare at different levels; specific to the talent training

model of domestic vocational colleges, as well as the professional level of students, school education and talent policies, etc. A comparative analysis.

## 4 Results

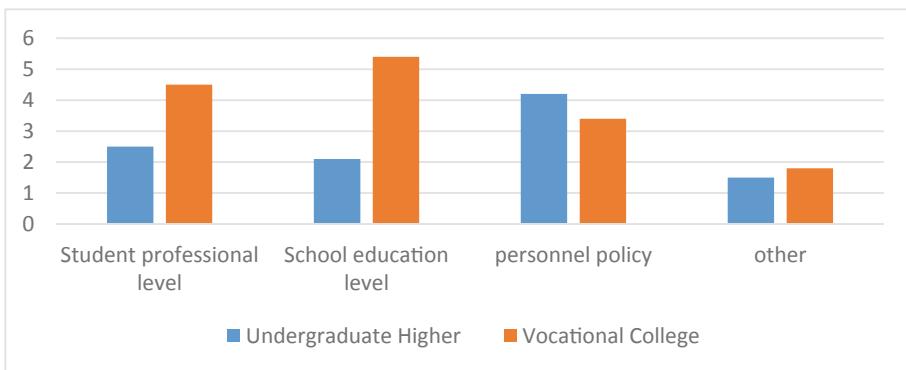
### 4.1 Traditional Vocational Colleges' Talent Training Model is Difficult to Achieve



**Fig. 1.** Investigating the impact of domestic higher vocational colleges on the talent training system

The data shown in Fig. 1, from the data shown in the figure, we can understand that the current biggest impact on the talent training system is that the “student professional level” accounts for 46.0%, while the “school education level” and “talent policy” The total proportion is 43.9%. Under the current mature cloud network technology, colleges and universities should fully integrate into the modern apprenticeship talent training system to contribute to the personal development of each talent. This shows that there are still problems in the talent training system of higher vocational colleges. First of all, the orientation of talent training is not clear. According to the current investigation, most of the higher vocational colleges still focus on imparting unilateral theoretical knowledge, which leads to students' low practical operation and unable to meet the requirements of the corresponding positions in the enterprise. Secondly, the choice and direction of professional courses in higher vocational colleges are relatively random. For example, in the same direction, some are set in the Department of Information Management, some are set in the Department of Economic Management, and some are set in the Department of Commerce. Cause great obstacles.

## 4.2 Awareness of Modern Apprenticeship Needs to Be Improved



**Fig. 2.** Investigation of the comparison of the influence of talent training factors between undergraduate vocational colleges and vocational colleges

It can be seen from Fig. 2 that the current domestic undergraduate vocational colleges' students are less restricted by the "student professional level" and "school education level". However, in the "talent policy", the undergraduate vocational college students are affected Greater impact. On the contrary, due to the limitation of the nature of colleges, colleges and vocational colleges are greatly influenced by the "students' professional level" and "school education level", but the "talent policy" favors college students. This status quo not only depends on the nature of the higher vocational colleges themselves, but also shows the lack of the current traditional talent training mechanism system. And now, in the development of the popularization of modern apprenticeship, there are still many colleges and universities that use this talent training system as a gimmick for enrollment, just as a superficial form, and there is no real standard talent system construction in the college system. In enterprises, because many enterprises only care about immediate benefits, they do not take long-term talent development seriously, and lack the understanding of modern apprenticeship talent training system.

## 5 Conclusions

In the era of rapid development of cloud network, it is necessary for the modern apprenticeship talent training mechanism system in higher vocational education to carry out new innovative development, but the development process of modern apprenticeship talent training model is not smooth sailing, and the advantages and problems coexist in higher vocational education. The apprenticeship training model still needs time and practice to continuously test. It is necessary to enable students at school to communicate directly with companies, so as to directly face the needs of work and make the content of learning more professional. Therefore, the modern

apprenticeship training mechanism system has advantages and some problems to be solved urgently. We need to further explore and study to solve these problems. The modern apprenticeship talent training mechanism system based on the integration of cloud and network should determine the target position, decompose the standard content of the post, formulate professional teaching standards, reform the professional talent training model, optimize the curriculum system based on productive projects, and build efficient and accurate The modern apprenticeship talent training mechanism system.

**Acknowledgements.** Fund project: Research Project of Vocational Education in China 00058ZC20061051103: Research on the Cultivation of “Craftsman Spirit” under modern Apprenticeship – Based on the Enlightenment of Huang Peiyan’s vocational Education thought, Research on the Collaborative Cultivation Path of contemporary 19YQ04: “Craftsman Spirit” under the New Normal of economy – Based on the Thinking of modern Apprenticeship in Higher vocational Colleges.

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# Exploration of the Blended Teaching Mode of Colleges and Universities English on Unipus from the Perspective of “Internet +”

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**Abstract.** At present, with the widespread popularization of “Internet +” technology in the field of higher education, colleges and universities English teaching is facing unprecedented challenges. The effective combination of English teaching as an important part of higher education and “Internet +” technology has always been a frontier issue in education, the exploration of its teaching methods and teaching models has always been the focus of research. This article mainly uses “Internet +” as the research medium to discuss the colleges and universities English blended teaching model based on the Unipus smart teaching cloud platform. The article proposes to make full use of the advantages of modern teaching methods and stimulate students’ interest in English learning, make students’ learning from passive to active, and truly cultivate their independent learning ability.

**Keywords:** Internet + · Unipus · Blended Teaching

## 1 Introduction

The era of mobile Internet is approaching. Internet thinking is quietly making decisive changes in people’s lives. Relevant Chinese government departments have stated clearly on different occasions: “Higher education institutions should make full use of modern information technology, especially “Internet +” technology. Adopt a computer-based and classroom-based English teaching model to improve a single teaching model based on teacher lectures. The new teaching model should be supported by modern information technology, especially network technology, so that English teaching and learning can be achieved to a certain extent without being restricted by time and place, it is developing towards individualization and independent learning.”

In order to adapt to the new development situation of China’s higher education, deepen teaching reform, improve teaching quality, consolidate the foundation of talent training, and meet the needs of the country and society for talent training in the new era, implement the “University English Course Teaching Requirements” of the Ministry of Education, and higher education institutions continue to deepen the reform of English teaching, many colleges and universities have introduced Unipus University English Digital Teaching Platform and Unipus College English Teaching APP,

collectively referred to as Unipus English Teaching Management Platform[1]. This article uses “Internet + ” as the research medium, and strives to give full play to the advantages of modern teaching methods, while stimulating students’ interest in English learning, while making students’ learning from passive to active, and truly cultivating their independent learning ability [2].

## 2 “Internet + ” Development Trend and Prospects

“Internet + ” is the core engine to promote the rapid development of the world economy in the 21st century. The Internet economy is an indispensable social model in this era. It is conceivable that if there is no Internet, the fastest way of information exchange is telephone contact, and news and information can only be understood through fiber optic television. Consumer shopping can only be done in offline physical stores, not in the express industry. Such a world is too terrifying for us now, and it also explains how much the Internet has changed our lives, but many people do not fully understand the Internet. The integration of the manufacturing industry has been further deepened, the digitalization, networking, and intelligence of the manufacturing industry have been significantly improved, and multiple action plans for the development of industries such as intelligent manufacturing and next-generation information infrastructure have been launched. From the active guidance of national policies, it is not difficult to see that “Internet + ” has played an important role in various industries. With “Internet + ” as the starting point, it actively integrates with various industries and fields, not only can realize the exchange of information in the industry digitalization, the digitization of demand resources, and the intelligence of intermediary platforms can promote the transformation and upgrading of related industries, laying a foundation for the development of related fields in the direction of digitization, intelligence, and technology. It can be seen that the development prospects of “Internet + ” are very impressive.

## 3 Introduction to the University English Blended Teaching Model on Unipus

### 3.1 The Concept of Blended Teaching Mode

Blending Learning is to combine the advantages of traditional learning methods with the advantages of E-Learning; that is to say, in the teaching process, teachers must not only play a leading role in guiding, enlightening, and monitoring the teaching process, but also fully embody students as the learning process, the initiative, enthusiasm and creativity of the subject [3]. In traditional classrooms, teachers mainly rely on textbooks to carry out teaching, which leads to the emergence of “one-word classroom”, and the teaching effect is sometimes poor. The difference between blended teaching and traditional classrooms is that they use modern teaching methods to make online learning online [4]. It is organically combined with offline face-to-face teaching. In this process, students become the main body in the teaching process under the guidance of teachers.

Teachers can enable students to master effective learning methods and strategies through correct teaching guidance and inspiration.

### 3.2 Introduction to Unipus Smart Teaching Cloud Platform

With the maturity of “Internet +” technology, the rapid development of mobile terminals has provided new opportunities for college English listening teaching. “Unipus” is a smart teaching cloud platform jointly created by Online and Foreign Language Teaching Research Press and released in September 2017. It aims to provide a one-stop solution through high-quality and rich teaching content and convenient and fast teaching tools [5]. There are many needs in teaching, learning, testing and evaluation in college English teaching. Up to now, there are more than 500 colleges and universities, more than 4,900 teachers, and more than 680,000 students have completed their academic tasks and self-improvement through the “Unipus”. Among them, learning platforms such as the itest testing platform, iwrite intelligent review engine, and utalk audio-visual training intelligence used by “Unipus” provide extremely important auxiliary platforms and learning resources for college students’ English learning, listening, speaking, reading and writing basic skills training. The development and use of the “Unipus” teaching platform demonstrates a smart foreign language teaching model driven by big data and artificial intelligence, and explores a new path for the formation of a new normal in Chinese college English informatization teaching [6]. Students only need to rely on the course verification code attached to the textbook to log in to the system to learn. Teachers can also download Unipus (teacher) mobile client management or make full use of teaching resources through the PC terminal, and can set up course teaching tasks and activities. Unipus not only provides learners with a personalized learning path, but also provides teachers with data-based learning prediction and analysis, and also provides good suggestions for teaching, and truly realizes smart teaching and smart learning. Shown in Fig. 1.



**Fig. 1.** Unipus smart teaching cloud platform interface

## 4 Practical Exploration of College English Blended Teaching Mode on Unipus

### 4.1 Relying on Teaching Materials, Setting Teaching Goals by Classification

The current English textbooks commonly used by colleges and universities are basically composed of four parts, namely vocabulary, translation, text reading and writing exercises. The translation theme of each unit is not directly related to the reading text, and mainly involves Chinese and Western culture. When students complete this part, they mainly lack the ability to expand and apply the core vocabulary [7]. Therefore, the vocabulary and translation are combined into an “online autonomous learning task list-vocabulary and culture” and a “cultural micro video”. The main goal is to make students use the auxiliary learning materials on the platform to complete vocabulary understanding and expand their vocabulary independently. The writing exercises in each unit are based on reading text. The textbook designer hopes to improve students’ writing ability through the study of reading text, and at the same time further enhance students’ ability to analyze and understand different texts. Therefore, the reading and writing are combined an “online self-learning task list-reading and writing” and a “writing micro-video”, the main goal is to allow students to use the auxiliary learning materials on the platform to independently complete the basic understanding of the reading text and ask questions; at the same time, the research hope that students can initially perceive the genre and structure of reading text. “Offline teaching tasks” should be designed based on “online learning goals” [8]. The main goal of “Offline Teaching Task-Vocabulary and Culture” is to detect students’ learning and understanding of vocabulary and culture; let students use vocabulary to complete tasks to consolidate students’ understanding of vocabulary and culture. The main goal of “Offline Teaching Task-Reading and Writing” is to test students’ basic understanding of reading text; through inquiry-based learning, students are guided to dig deeper into reading texts, summarize texts, and improve critical thinking and writing skills.

### 4.2 Effectively Link the Content of the Course and Improve the Effect of College English Blended Learning

Teachers publish the designed “self-learning tasks before class” and micro videos to the online learning platform before class. Students log on to the online teaching platform to view learning resources, watch micro-videos to complete the “pre-class self-learning task”, and submit questions to the exchange community. Teachers collect common problems that students have not solved each other as the basis for offline teaching design. In the teaching process, teachers design “face-to-face teaching tasks” according to the completion of students’ autonomous learning tasks and collected questions. In offline teaching, groups are mainly used to complete the tasks designed by the teacher in the form of inquiry. On the one hand, it detects and consolidates the learning results of the “self-learning task before class”; on the other hand, it expands students’ thinking and cultivates criticality for thinking ability and cooperative communication ability, teachers often act as guides, observers, and helpers. After class teaching is over,

teachers comment on and share students' "self-learning tasks before class" on the network platform, and design hierarchically to consolidate tasks and expand tasks. Students who have the ability to learn can choose to complete the expansion tasks. With the help of Unipus online teaching platform, online teaching and offline courses have been integrated, and impressive results are continuously being achieved. The i-Test online foreign language testing platform used with it has also played an important role. This platform has the inherent advantages of the same account and the same platform management as the Unipus platform, so it can organize grade tests and school-level tests of various scales comprehensively and quickly in the usual teaching and final exam stages.

#### **4.3 Multiple Learning Effectiveness is Superimposed to Establish an Objective and Fair Teaching Evaluation System**

Traditional college English teaching focuses on summative evaluation. This evaluation method can easily lead to one-sided understanding of students, which is not conducive to the overall development of students, and it is also easy to mislead teachers in the next stage of teaching design. Under the background of the new era, colleges and universities should implement the "people-oriented" educational philosophy, attach importance to the development of all students and the overall development of students, focus on students, transform from "teaching well" to "learning well", and attach importance to students' language ability, thinking quality, cultural awareness, learning ability and other key competences in English subjects such as the evaluation of key abilities such as supporting lifelong development and adapting to the requirements of the times [9]. Therefore, college English courses should adopt a formative and summative evaluation system. Summative evaluation is a summative evaluation carried out at the end of a teaching phase, while formative evaluation is a procedural and developmental evaluation carried out in the teaching process. The evaluation system that combines formative evaluation and summative evaluation can observe, supervise and evaluate students' English learning in an all-round, multi-method, and multi-dimensional manner, making the evaluation objective, authentic and comprehensive, and helping to promote students study effectively, cultivate their independent learning ability, and improve their English proficiency.

#### **4.4 Switch Role Positioning and Improve Teachers' Comprehensive Quality**

The actual implementation of the "online + offline" hybrid teaching model and the effect of the implementation depend on many factors, such as school policies, hardware facilities, students' autonomous learning situation, and relevant preliminary foundations of teaching reform. Among them, the role and role of teachers are particularly important to the implementation of the mixed teaching model. The implementation of the mixed teaching mode must be based on the teacher's teaching wisdom and teaching practice. Teachers should learn advanced teaching concepts at home and abroad with a broad mind, and participate in the curriculum teaching reform with an active and open mind, so as to improve their professionalism, and become an advanced teaching

concept, excellent teaching ability, courage to reform and innovation, unity and progress, a new era teacher full of dedication and cooperation. To this end, colleges and universities should improve the comprehensive ability of college English teachers through the following channels [10]. First, under the organization and leadership of educational experts, the foreign language teaching departments of various colleges and universities should carry out special training camps for teachers. The training content includes the teaching requirements of college English courses, various teaching methods and modern educational technology methods, and also includes introduction the use of the “Unipus” platform helps teachers familiarize themselves with some of the functions of the “Unipus” cloud platform, students’ academic conditions, assignments and score calculations, etc., to help teachers improve their professional abilities in a comprehensive and multi-level manner. Second, the foreign language teaching department of each university cooperates with the research publishing house to organize English teachers to “based on the university under the ‘Unipus’ wisdom cloud platform” through classroom teaching, on-site observation, micro-grid practice, expert guidance and seminars. Experience sharing of English listening and speaking teaching allows teachers to discuss the actual use experience of the “Unipus” platform, so as to enhance the comprehensive ability of English teachers and ensure the true implementation of the mixed teaching model.

## 5 Conclusions

Under the background of the development of the “Internet + ” era, college English courses should adapt to the development of the information age, with the help of advanced smart teaching platforms, break through the traditional college English teaching barriers centered on “classrooms, teachers, and textbooks”, and expand the classroom to the cloud platform space, to implement networked, digital, intelligent, and personalized college English teaching, with the help of Unipus smart cloud platform, give full play to the innovation of teachers, take students as the center, make full use of networked resources, stimulate students’ interest in learning, and improve classroom teaching efficiency and student participation in learning, broaden the channels for students’ individualized and autonomous learning, and effectively improve students’ comprehensive English ability. Through curriculum reform and teaching practice, the ideas and concepts of college English teaching reform and curriculum construction in the new era are implemented, continuously optimize the teaching effect of college English courses.

**Acknowledgements.** This work was supported by the tenth batch of China Foreign Language Education Fund Project (ZGWYJYJJ10B033).

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# Construction and Practice of Resource Sharing Service Platform for Stadiums and Gymnasiums from the Perspective of “Internet +”

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**Abstract.** As a new social form, “Internet +” technology has been applied in various fields, greatly saving human capital and social costs, and has achieved satisfactory practical results. This article takes “Internet +” as the starting point for research, adopts literature research methods and logical analysis research methods to sort out sports venues and resource sharing related materials, and uses resource sharing system models as the research framework to build sports venues Lay the foundation for the resource sharing service platform. The results show that the construction of the resource sharing service platform provides a communication platform for sports fans, improves the utilization rate of idle stadiums, promotes the development of the sports training market, accelerates the upgrade and transformation of the sports industry, and becomes a resource management model for stadiums provide a reference for innovation.

**Keywords:** Internet + · Stadiums · Service Platforms

## 1 Introduction

Through the development in recent years, “Internet +” relies on cloud computing, Internet of Things, big data, etc., to integrate and innovate new generation information technology with modern manufacturing, production service industry, etc., and provide the intelligent development of various industries support. With the gradual maturity of physical chips, communication technology, cloud computing and other technologies, the development of intelligent hardware has certain basic conditions. Through an objective analysis of the “Internet +” sports industry, the development prospects of the “Internet +” sports industry are very impressive. As the foundation of sports, stadiums play an important role in the development of sports, providing a platform for the development of competitive games, sports and leisure, and national fitness. Since most of the current stadium management models are relatively traditional and their operating models are relatively single, resulting in low utilization of stadium resources, it is necessary to innovate the management and operating models of stadiums and use shared resource system models and related theories to build sports stadium resource sharing service platform to promote the sustainable development of stadium resource sharing [1].

## 2 The Necessity of Constructing a Sports Stadium Resource Sharing Service Platform

### 2.1 Low Utilization Rate of Venue Resources

With the deepening of the concept of national fitness and the improvement of public sports service facilities, the resources of sports venues are increasing year by year. As of the end of 2019, there are more than 3.545 million sports venues in my country, with a per capita sports venue area of  $2.08m^2$  [2]. The increase in the number of stadiums has provided a platform for the development of national fitness and school sports, but the low utilization rate of stadium resources is still an urgent problem to be solved in the optimization of stadium resources. At present, large-scale sports stadiums in China are mostly government-invested and constructed, which are mainly used to meet the basic supporting facilities for the development of urban sports. There are problems such as emphasis on craftsmanship, emphasis on competition functions, neglect of supporting services and post-match operations [3]. Therefore, relevant management departments and managers of public sports venues should change traditional ideas and outdated operating models, so that more sports venues can be effectively operated and put into the use of national fitness to improve the openness and utilization rate, so that stadiums can better realize resource sharing.

### 2.2 The Operating Model is Relatively Single

Regardless of whether it is a government stadium or a school stadium, its operating mode is still dominated by a public institution, and only a small part is operated by a company. This mode is also one of the most traditional and oldest operating modes [4]. The public institution model mainly relies on the management of the public institutions under the Sports Bureau or the logistics department of the school. This model limits the enthusiasm of the operators and lacks incentive mechanisms. Especially the stadium operation is still in the exploratory stage and has not yet formed digital and intelligent, a networked communication platform is not conducive to the sustainable development of resource sharing in sports venues. The exploration and innovation of the operation model has a positive role in promoting the development of related industries of sports venues, not only can increase the utilization rate of venues, but also lay a foundation for the development of mass sports. Therefore, the management department should start with stadium construction, sports event operation, sports training, etc., and explore a comprehensively developed industrial system, so as to promote the upgrading and transformation of stadium resource sharing, broaden the channels for stadium resource sharing, and enrich stadium resource sharing business model.

### 2.3 The Contradiction Between Supply and Demand

Sports stadium resources are a social public demand. With the improvement of people's living standards and the public's pursuit of health, more and more public groups begin to devote their leisure time to physical exercises. The increase in the sports population will inevitably lead to an increase in market demand. When there is a gap

between supply and demand when the balance is broken, it will lead to contradictions. The increase in demand for stadium resources is not only restricted by the number of venues, but is also closely related to the area where the public is located and the degree of openness of the stadium [5]. Therefore, effective integration of stadium resources in adjacent areas, and scientific and reasonable planning of the development direction of stadiums, make the layout and structure of stadium resources more reasonable, and allow fitness groups to experience the benefits of stadium resources. Welfare and improve the efficiency of the balanced allocation of stadium resources can promote the shared development of stadium resources.

## 2.4 Lack of Professional Service Platform

In daily physical exercise, sports people and social fitness groups have diverse needs for sports venues. The diversified needs and the development of network technology have brought opportunities and challenges to the resource sharing of sports venues. Although the increase in the number of mobile APP applications and the increase in WeChat and QQ group chats have provided convenience to sports enthusiasts, there is a lack of professional communication service platforms for the masses [6]. Due to the lack of professional communication service platforms, the different sports needs of the mass fitness group cannot be fully met, which restricts the development of national fitness. Therefore, it is necessary to establish a network service platform for community and school sports stadium resource sharing, based on mobile Internet, big data, etc., gradually improve the basic database and electronic map data of stadium resources, and build a comprehensive and multi-functional sports stadium resource the network service platform improves the level of intelligent management of stadium resources and the scientific level of balanced allocation, and promotes the green development of stadium resource sharing.

## 3 The Logical Framework of the Stadium Resource Sharing Service Platform

With the advent of the Internet era, the sustainable development of stadiums and stadiums is facing new opportunities. The development of “Internet +” provides new channels and means for resource sharing of stadiums and stadiums, which is conducive to maximizing the socialization of stadium resource sharing. Applying “Internet +” to the management and operation of stadiums and sports facilities can not only achieve the balance and effectiveness of the use of sports resources, but also the effective integration of the two is also an important measure for the development of “Internet + sports” one [7]. The framework design of the stadium resource sharing service platform is based on resource demanders and resource providers, combined with cloud computing and Internet technology, to provide fitness consulting and guidance, equipment purchases, venue reservations, sports cultural exchanges, and personalized sports needs and other service items. The ultimate goal is to achieve the development goal of a high degree of participation by all people in physical exercise.

### 3.1 Personal Information System

It is not difficult to see from the sports stadium resource demand group that the participating groups targeting individuals, families, units and small groups are becoming more and more popular. The increase in the number of participating sports groups requires standardized management of the participating groups, which requires the use of individuals the role of information systems. The personal information system mainly focuses on entering, identifying and managing personal information; the group participating in sports fills in personal information truthfully through the resource sharing service platform or enters fingerprints and facial information, and stores basic personal information in the storage device of the service platform for sports hobbies the person is automatically identified in the later login. The personal information system not only saves sports fans' time by storing users' personal information, but also improves the operating efficiency of the stadium resource sharing service platform, effectively alleviating the emergence of evening peaks and weekend peaks, and reducing stadium staff the pressure has met the basic requirements of the majority of fitness groups and laid the foundation for the intelligent development of stadiums.

### 3.2 GPS Positioning System

In recent years, with the continuous development and improvement of global positioning system software and hardware, this system has been used in many fields such as national economic construction and science and technology, and has gradually penetrated into people's lives [8]. At the same time, various industries are positioning GPS the demand for the system is getting stronger. Different from traditional APP software, the introduction of GPS positioning system makes the operation of the stadium resource sharing service platform more convenient and efficient. Thanks to the GPS positioning system, sports enthusiasts can enjoy browsing nearby venues without leaving home, and can make venue reservations in any area of the city, and the GPS positioning system can locate the location of sports participants. According to users' different sports needs, reasonable planning routes and travel plans nearby, so that sports enthusiasts can experience the speed and convenience brought by networked and intelligent service platforms.

### 3.3 Resource Control System

Through the establishment of a data model, the analysis, integration, verification and processing of existing data can be realized to form an effective database. Finally, through data management, storage management, security management and link management, a stable resource sharing service platform is built, so that all sports resource information and social public information can flow in an orderly manner on this platform. Users can find and use relevant information through the platform, and the platform can also provide customized sports items according to the needs of users to meet the diverse exercise needs of different users. In addition to the storage of user information and venue resource information, the resource control system is most important to effectively control related data and information through the shared service

platform, especially the operation and charging of stadiums, and strictly charge uniform prices in the region, and intelligently classify the reservation and use of stadiums, so as to improve the efficiency of the use of stadiums.

### 3.4 Resource Management System

The resource management system is mainly to manage sports resource information, including social sports instructor information, professional sports instructor information, stadium facility information, information on various events, national fitness activities, information on regional sports associations, sports industry information, traffic and weather information, etc. On the resource management system page, users can not only browse social sports instructors and coaches' related information and sports grades, but also keep abreast of the dynamics of stadiums, including sports event information, sports cultural exchange information, and stadium rental information, etc. The phenomenon of empty or full stadiums is avoided, the utilization rate of stadium resources is improved, the effective rotation of resources is realized, so as to meet the maximum utilization of the required resources by the demand side, and realize the double "win" of the resource management system and all participants.

### 3.5 Resource Feedback System

The resource feedback system not only has positive feedback functions such as event exchanges, cultural and entertainment activities, and stadium operations, but also can provide negative feedback on problems that occur during the resource sharing service process of stadiums and stadiums, thereby improving the entire resource sharing service platform and improving the operation of the service platform quality and efficiency. The main function of the resource feedback system is to allow users to feed back to the system according to the problems they encounter during physical exercise. The system will promptly feedback the problems existing in the operation of the stadiums to the operators, and the operators will respond to users' feedback. Information adjusts operation methods and charging standards to effectively safeguard users' consumption rights.

## 4 The Significance of Building a Resource Sharing Service Platform

### 4.1 Meet the Needs of Mass Fitness and Promote the Development of Mass Sports

The establishment of a sports stadium resource sharing service platform can effectively resolve the contradiction between the supply and demand of stadium resources, and provide a platform for sports enthusiasts to choose and communicate [9]. The general public can learn real-time sports event information and stadium information through the shared service platform, and can choose stadiums that suit their wishes according to their own time, location and sports preferences, and participate in their favorite sports

more conveniently and preferentially. The stadium resource sharing service platform uses the GPS positioning system to rationally plan routes based on the stadium resources and positioning provided by the resource provider, so that the majority of sports fans can experience the convenience brought by the service platform without leaving home. Fitness groups in different regions can choose nearby, which not only saves travel costs, but also saves time and improves the enthusiasm of the public to exercise. As the number of participating sports group increases, the sports groups will gradually grow, and the growth of sports groups will inevitably promote the development and improvement of mass sports.

## **4.2 Improve Resource Utilization and Optimize the Development Direction of Venues**

The utilization rate of stadium resources is an important indicator reflecting the utilization degree of stadiums. The service platform can not only provide sports stadium resource information to the public through the data processor, but also feedback demand information to the resource provider. This not only provides convenience to the public, but also avoids the emergence of peak periods and improves stadium resources utilization efficiency. Of course, the improvement of the utilization rate of stadium resources also requires the operators of stadiums to develop in the direction of modernization and multi-function in stadium planning. In different areas, the facilities and related services of the stadiums can be optimized according to the needs of the masses. With the passage of time and the improvement of living standards, it is necessary to build a part of the multi-functional venues and increase the construction of comprehensive stadiums on the basis of maintaining the original venues to meet the needs of modern mass fitness and the ability to undertake sports events. It can improve the utilization rate of venue resources and promote the better development of national fitness.

## **4.3 Standardize the Sports Training Market and Promote the Cultivation of Reserve Talents**

In the traditional sports training market, sports training institutions are neither managed by the sports department nor managed by the education department [10]. Due to the growing popularity of the sports training market and the lack of corresponding awareness of rights protection among the masses, there are many problems in the sports training market: the sports level and technical level of the coaches, the charging standards of the venues, the service quality of the training institutions, and there is no relevant department for these problems, it conducts supervision. The emergence of the service platform can act as a supervisory authority to provide timely feedback on problems existing in sports training and stadium operations, so as to promote the development of sports training in a standardized and intelligent direction. From the perspective of the development prospects of the youth sports training industry, youth sports training has expanded the selection range of sports reserve talents, enriched the training system of competitive sports reserve talents, and further promoted the development of competitive sports and the progress of sports power.

#### 4.4 Accelerate the Transformation of the Sports Industry and Improve the Public Service System

The structure of the sports industry refers to the technical and economic connections and quantitative ratios between the various production sectors in the sports industry. It not only reflects the interdependence and mutual restriction of production technology between various sports physical products and service production departments, but also reflects the distribution of various economic resources in various sectors and the distribution of the total value of the sports industry in various sectors. The resource sharing of stadiums and gymnasiums should seize the general environment for the development of the sports industry, comply with the sports industry policy and system, explore the sports industry supervision system, solve the problems faced by the sports industry stakeholders in a timely manner, promote the interconnection of the components of the sports industry system, and promote mass participation. Market cultivation and operation, and improvement of the public sports service system, so as to promote the sustainable development of the sports training industry and lay the foundation for the transformation of the sports industry.

### 5 Conclusion

Since the “Internet +” was proposed, it has brought unprecedented historical opportunities for the reform, innovation and development of various industries. Through the “Internet + stadiums” to explore the resource sharing of stadiums, the emergence of this phenomenon has brought reform and innovation challenge. The emergence of a resource sharing service platform has provided convenience for the general public to inquire about stadium information, plan travel routes, participate in sports events, and make appointments for fitness services. Under the influence of “Internet + sports”, operators should adjust the operating mechanism of stadiums and stadiums in a timely manner based on the feedback of the service platform, improve the management system of stadiums, integrate stadium resources, and optimize the investment direction of stadiums. This is not only beneficial to stadiums. The effective use and integration of resources can better promote the further development of mass sports.

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# Research on the Innovation and Reform of Art Education and Teaching in the Era of Big Data

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**Abstract.** With the continuous development of contemporary social economy, the Internet is widely used in various industries, which provides a strong basis for all walks of life in the new era. At the same time, the field of education industry has also received great attention, the most important of which is the art education industry. In the field of fine arts, art teachers need to give up the traditional art teaching mode taught in the past. As a relatively basic industry of education industry, art education major will meet the new development under the situation of big data information and data. For example, the creation of fine arts focuses on the public aesthetic and observation objects; more unique and independent artistic creation concepts such as projection, photography and copying need to be re-created; The improvement of the teaching mode of traditional historical concept makes the new art form and the field of information data mode integrate, and then shows the advantages of information-based data art education, which lays a good foundation for the cultivation of high-quality talents in China's art education. In the era of big data information technology, we can find the method suitable for the current art education field, change the original traditional teaching mode, open up a new road for the art education industry, and make great progress in the field of art education. This paper gives some suggestions to the art education industry in the information age, and explores the relationship between the information age and art education from the two aspects of the characteristics of the art education field in the information age.

**Keywords:** Big data · Art education · Innovation and reform · Teaching research

## 1 Introduction

Under the premise of the continuous development of social economy, the advent of the era of data information has a huge impact on the art education industry and promoted the development of the art education industry [1]. The work painting produced under the art education is an art. The art painting teaching in Colleges and universities should not only show its unique artistry, but also highlight its own educational nature, focusing on improving the high-quality painting works of Art Education [2]. To give full play to the differences and uniqueness of Art Painting Teaching in Colleges and universities, stimulate the potential of each student, based on the requirements of modern

information society for art professionals, change the original teaching mode, and formulate new plans. In the implementation of art education, we should take students as the main body and carry out art painting education according to local conditions, so as to enhance students' interest in learning art and painting [3]. However, because most of the current art painting teaching in Colleges and universities adopts the traditional education concept, it is difficult to show the fundamental value of art painting, which leads to the slow process of teaching reform of art painting in Colleges and universities, which cannot meet the requirements of contemporary society for art education [4]. Therefore, the teaching methods of fine arts painting in Colleges and universities should be changed and innovated from the grass-roots level, starting with the innovation of basic concepts, adopting the way to meet the requirements of students, and carrying out diversified art painting teaching activities, so as to meet the new requirements of the education department for China's college art education [5].

Art is a kind of art creation, which is based on the knowledge of art. Because the traditional art teaching was not paid attention to by people at that time, the course was often occupied by other major disciplines, resulting in a serious shortage of the total length of art teaching courses, and also affected students' understanding and understanding of the course of Art Education [6]. However, most teachers still use the traditional "cramming teaching" teaching method, just blindly transferring theoretical knowledge and painting works to students, ignoring the students' real understanding of art. Art homework only requires students to draw the teacher's requirements, and does not pay attention to the development of their artistic creativity [7]. On the other hand, the imperfection of teaching resources and the lack of relevant art teaching resources make it impossible for teachers to show more art works and artistic charm to students, which also results in students' incomplete understanding of the art industry and the lack of self-creation process and environment, and eventually gradually lose their interest in art learning [8].

The strengthening of innovation education will obviously change the promotion of students' innovation consciousness. Therefore, the innovation education should be implemented in the guidance of teachers. Change the original teaching concept, promote the teaching method of autonomous learning and exploration, let students actively find problems and seek solutions, so as to develop and exercise students' creative thinking ability. Please rely on students' independent exploration, not rely on others' help [9]. In the experiment of art design course, the generation of creative inspiration of design and painting is the main aspect of the creation of works, and also the key factor for the creation of works, and also a reflection of students' innovation ability [10]. In the process of art education, we should also pay attention to the students' original unique personality, and let them play what they want to create their own art paintings.

## 2 Method

### 2.1 SVM Algorithm

Define the objective function formula:

$$f(\omega) = \min_{\omega} \frac{\lambda}{2} \|\omega\|^2 + \frac{1}{m} \sum l(\omega, (x, y)) \quad (1)$$

Under unconstrained conditions, a sample  $t$  is randomly selected, where  $I$  represents the internal attribute of the sample, and  $f$  represents the external activity (iteration number) of the sample, which are brought into formula (1):

$$f(\omega, i_t) = \frac{\lambda}{2} \|\omega\|^2 + l(\omega, (x_i, y_i)) \quad (2)$$

#### (2) Subgradient

$$v_t = \lambda \omega_t - I[y_{i_t} \{\omega_t, x_{i_t}\} < 1] y_{i_t} x_{i_t} \quad (3)$$

$$\omega_{t+1} \leq \omega_t - \beta_t v_t \quad (4)$$

Formula (3) is carried into formula (4)

$$\omega_{t+1} \leq \omega_t - \beta_t \omega_t - I[y_{i_t} \{\omega_t, x_{i_t}\} < 1] y_{i_t} x_{i_t} \quad (5)$$

Simplified derivation:

$$\omega_{t+1} \leq (1 - \frac{1}{t}) \omega_t + \beta_t I[y_{i_t} \{\omega_t, x_{i_t}\} < 1] y_{i_t} x_{i_t} \quad (6)$$

### 2.2 Cultivate Students' Interest in Art

As the saying goes, interest is our best teacher. In the process of actual teaching, teachers should consciously cultivate students' interest in the subject of fine arts, let students like this painting art from the heart, and independently complete the teaching tasks and additional creation, through the experience in the painting process, improve their own relevant artistic taste ability and visual views. Thus, in the art teaching, it is important to cultivate students' interest in learning art. In principle, students' interest in art learning cannot be separated from teachers' education and training. In the process of actual teaching, teachers should hold a moderate attitude, teach patiently, actively communicate with students, narrow the distance between themselves and students, and have a closer relationship. At the same time, teachers should also abide by the teaching concept of step by step to let students learn. Students have a clearer understanding of the connotation of the concept of art, so that he can enjoy the art learning from the heart, and eliminate the students' resistance to art learning. In addition, in the actual teaching process, teachers should not only pay attention to the teaching of skills, but also pay

attention to the detailed introduction of the story behind the art works and the background of the times, so that students can have a deeper understanding of the connotation of each art work and experience the emotion contained in the works. Only when students are interested in art learning can they be willing to participate in specific learning and training, and always maintain enthusiasm and confidence in art learning.

### 2.3 Improving Traditional Teaching Methods

Improve the way of classroom teaching to ensure that the process of art teaching is more in line with the requirements of quality education for art education. Fully realize that beauty is the main core of aesthetic education, if people do not have aesthetic ability, then they cannot realize the beauty of life and the noble emotion. In art teaching, cultivating students' aesthetic ability can make students better feel the beauty in life and nature. By appreciating the beauty of natural original ecology, they can know how to create their own beauty. Art teaching has a strong image, in school education; the classroom is the place where teachers impart knowledge, but also the main place for students to accept knowledge. If teachers can adopt more visualized teaching methods, they can more effectively improve students' aesthetic ability. Especially when learning some more abstract works of art, such as porcelain, old pictures and so on, these works of art reflect the unique craftsmanship of ancient people at that time. In the process of teaching practice, teachers should guide students to find beauty and find the embodiment of beauty, and on this basis, experience the unique charm of these works of art. In order to innovate teaching methods, we should start from various angles to mobilize the enthusiasm of students in the process of learning art knowledge, explore their potential and expand their thinking. For example, multimedia teaching technology can be introduced into the process of art teaching, using multimedia sounds, words, images, etc. to create a real situation for students, so that students can perceive works through multiple senses. Generally speaking, compared with other subjects teaching, art teaching has strong visualization characteristics. Only by making students better perceive the beauty of nature, art and life, can students' aesthetic ability be effectively improved.

## 3 Experiment

### 3.1 Investigation Objects

This paper takes the innovation of art education in the era of big data digitization as the research category, and puts forward the significance and importance of art creation. As far as the current situation of art education in domestic colleges and universities is concerned, the focus of art education lies in the implementation of methods and the new cognition of art. Through detailed data support and example analysis, this paper emphasizes the living conditions of art education creation skills in the contemporary era and the necessity of re-emphasizing the existence of art education and creation. In order to obtain the information related to the research questions, the author selected some representative schools from a city as the research samples, and all the art teachers and related personnel in the school were the distribution objects of the questionnaire. In each school, two art educations

related teachers were selected as the objects of questionnaire interview in different grades, and one class was selected as the observation object for each age class.

### 3.2 Experimental Research Methods

- (1) Literature research method: through the collection, transmission and collation of art education related information to improve the ability and efficiency of this paper. From the perspective of art, combining theory with practice, art education status and information age, and then from the improvement of the analysis and elaboration, combing out the research context, to establish the basic point of view of research.
- (2) Induction and summary method: the data collected through literature and network and the experience information obtained from interviews with junior high school art teachers are summarized to form a suitable theoretical system.
- (3) Curriculum survey method: through random survey of some junior high school art teachers and students, we can understand the current situation of junior high school art teaching and the level of Internet application in the curriculum, and carry out the research on junior high school art teaching based on this.

## 4 Results

### 4.1 Investigation and Analysis of Experimental Data

At present, to change the current situation of art education and break the traditional “pure art” teaching mode, the most important thing is to reform and innovate the teaching mode of art education, create an open and diversified art teaching situation, use modern teaching technology, actively develop teaching resources outside school, and reform the traditional teaching evaluation mode. Combining traditional knowledge and skills learning with students’ daily life and emotional experience, the ultimate goal is to cultivate students’ perception and creativity of beauty through art education, so as to make students develop in an all-round way and make them become people with thinking, personality, vitality and innovation ability.

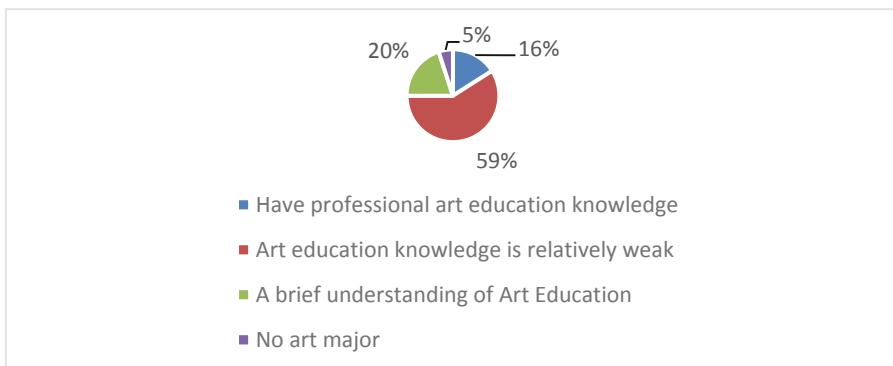
### 4.2 Investigation Results of Experimental Data

**Table 1.** Statistics of teachers’ educational background

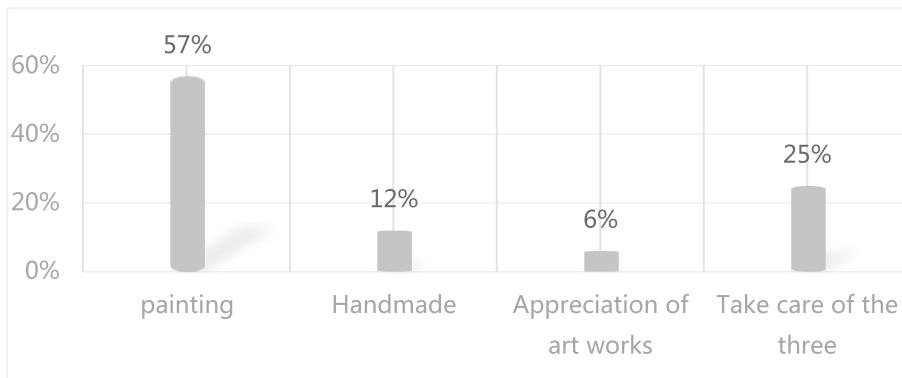
A. Secondary vocational or junior high school education	B. High school	C. Junior College	D. Undergraduate	E. Master’s degree
8%	0%	36%	56%	0%

It is obvious from the data in Table 1 that 56% of the teachers graduated from the University, 36% of the teachers with the highest degree of junior college, and only 8%

of the teachers have a secondary school or vocational school education. From the perspective of teachers' educational background, 92% of the school's teachers have a college degree or above. According to the exchange records of field interviews and teachers, kindergarten art teachers believe that with the improvement of government education departments and the society's attention to art education, in the next few years, the construction of the city's fine arts education teachers, both academic level and teaching level, will be improved to a new level.



**Fig. 1.** Knowledge level of art education



**Fig. 2.** Implementation of art education content

From the chart is about the proportion of art education chart, from the percentage of data in the table, we can clearly see that the awareness of art education content knowledge is less, the lack of understanding of the concept of art, leading to the occurrence of this situation. From the data in Fig. 1, we can see that 59% of people have relatively weak knowledge of art education, only 20% of them have professional knowledge of art education, 16% of people have only a simple understanding of art

education, and 5% of people have no knowledge of art education at all. From the data in Fig. 2, it can be seen that the education level of teachers in this school has been greatly improved, and their knowledge level is also relatively comprehensive. However, the equipment of education related equipment for art education major is not perfect and needs to be further improved. From the data in the table, it can be seen that painting and handwork are the first choice for teachers in art education course, and there are more class hours arranged. Most of the education content is for students to draw by themselves, without giving students too much appreciation of art works, so as to lack the cognition of art feeling. In this regard, only the combination of painting, handicraft and art appreciation courses is a relatively perfect art education.

To sum up, we can draw a conclusion: the main purpose of art teaching is to improve students' aesthetic ability, cultivate students' aesthetic quality, help students establish correct values, and truly achieve the goal of quality education. Art teachers must master the correct teaching direction in teaching work, so that students can cultivate a soul good at discovering beauty, so as to stimulate students' love of life, nature and motherland. Plant a beautiful seed in the students' hearts. With the seed rooting and sprouting, students' aesthetic quality will be effectively improved.

## 5 Conclusion

In the information age, Internet application has been transformed into "Internet plus" mode, which has raised higher requirements for art education. In addition to cultivating students' personal quality, modeling consciousness and modeling skills, we should pay more attention to the cultivation of students' innovative ability and make contributions to the society consciously. In the information age, art education should update teaching content and teaching methods, which will help students face the challenges in modern social life in the future. In the exploration of life education concept in junior high school art classroom, there are many ways and methods to explore the life education resources in the teaching materials. Through a variety of ways, we should adopt the way that conforms to the law of middle school students' physical and mental development, and take the cultivation of students' value source as the core, and promote students' life education concept in a spiral way. From the perspective of student orientation, this paper explores the approaches and methods suitable for students' physical and mental development stage. At the same time, we should not abandon the essence of teaching art basic knowledge in art class, so as to realize students' acquisition of life education concept in a relaxed and pleasant environment.

**Acknowledgements.** Jilin Province Educational Science "Thirteenth Five-Year Plan" Key Project in 2019 "Research on the Development of National Education Modernization under the Guidance of Conceptual Modernization" Project Approval Number: ZD19150.

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# Aided Teaching Platform of Fashion Design Course Based on Cloud Computing

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**Abstract.** It is the core technology of the next generation network computing platform. It provides reliable and safe data storage, convenient and fast Internet services and powerful computing power. In the field of education, cloud computing provides an environment and platform for online learning, which will positively affect the construction of learners' personal online learning environment, the construction of school network resources and the development of educational information system. The auxiliary teaching platform of fashion design course based on cloud computing has the functions of interaction and cooperation between teachers and students, teaching resource management, curriculum arrangement and management, and user's personal information management. By using the information technology socialization service provided by "cloud computing", schools can save funds, manpower and server equipment investment equivalent to fixed asset costs, reduce the cost and threshold of teachers' information technology training, facilitate the school's educational information management, and improve the security of information and data.

**Keywords:** Cloud computing · Assistant teaching platform · Fashion design

## 1 Introduction

The characteristic of fashion design course is that the teaching means must be rich and diversified. The course of fashion design includes all relevant courses of fashion design and fashion engineering design. In the course of fashion design, a large number of pictures and materials should be exchanged and different types of drawing software should be used. On the basis of completing the basic teaching, teachers need to set up simulation or practical research projects, as well as practical projects combining production and learning, so as to enrich teaching methods [1].

## 2 The Concept of Network Assisted Instruction

Network assisted teaching mainly includes the following aspects of content ship:

1. Network assisted teaching is a teaching method through the network.

In this process, the network exists as the carrier of knowledge and information, which can be seen as the natural extension of educational media such as books,

audio-visual and media. The difference is that the network has higher information capacity and inherits the characteristics of some educational media. It can not only replace the traditional education media, but also has stronger function and efficiency as a teaching tool or media [2].

2. Network assisted instruction is a process of developing and utilizing network knowledge and information resources.

Network assisted instruction is an open and remote teaching system based on network and multimedia information. In this sense, the network becomes a learning resource, and network teaching is the development, utilization and regeneration of this resource.

3. Network assisted instruction also means taking network as an environment of teaching.

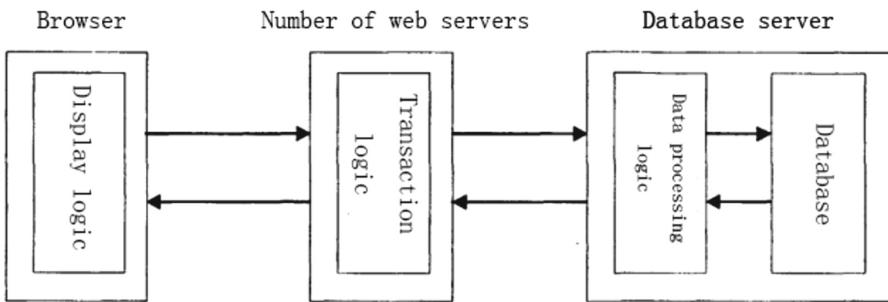
Just as the traditional teaching takes place in the classroom, network teaching regards the network as a large classroom, but this classroom has gone beyond the boundaries of time and space, and can cover the whole world. There is no distinction between teachers and students, and there is no distinction between region and time. Because of learning from anyone at any time, any place, you can also become the teacher of others. Therefore, network assisted instruction can be summarized as follows: network as an auxiliary teaching tool, network as auxiliary teaching resources, network as auxiliary teaching environment.

### 3 Web Based Network Aided Teaching Platform

In teaching, the common teaching auxiliary platform is established by applying computer application technology and network, adopting B/S structure, based on Web technology, using the unique information database management technology and two-way interactive function of computer network, and using the important characteristics of active and controllable communication of network.

#### B/S Mode

Low cost, simple and easy to use customer browser can access to the web site anytime and anywhere to find the data they need. The consistency of client operation interface overcomes the inconsistency of website information caused by various client programs in two-tier C/S mode. The open server and standard based connection scheme greatly strengthen the connection between the website and the outside. At the same time, the dynamic and interactive information release improves the service quality of the website to customers and increases the business opportunities of the website. In B/S three-tier structure mode, it distributes the system processing load on Web server, application server and database server respectively. The B/S architecture is shown in Fig. 1.



**Fig. 1.** B/S architecture

Using B/S development mode, although the application server architecture is used, the shortcomings of C/S mode are well solved. The system processing load is distributed on Web server, application server and database server. The number of web servers and application servers can be expanded according to the number of visits, so that when the number of users increases, the performance will not significantly decline.

#### 4 Realization of Teaching Assistant Platform for Fashion Design

Clothing design course needs a large number of teaching auxiliary materials, and the network construction of teaching aids of thematic teaching activities is also very necessary. It can not only realize the sharing of teaching auxiliary materials, but also have a good communication platform, especially in the aspects of enterprise practice, international teaching and student communication. Through nearly two years of study, focusing on the study and research of network professional knowledge, understanding of the emergence and development of “cloud computing”, we realize that cloud computing has a huge impact on education, teaching resource construction and teaching methods because of its low requirements for hardware and software. Therefore, we try to establish an auxiliary teaching platform for fashion design course based on cloud computing. It can not only set up the network aided teaching of individual courses, but also expand the whole teaching system of fashion design to the management of network teaching and communication, especially the establishment of project teaching, theme design, and so on. The development and extension of the thematic characteristic teaching activities and research-based teaching of “practical teaching” can effectively strengthen the platform of fashion design teaching, school enterprise and international teaching exchange [3].

Using 6009le doc to build the auxiliary teaching platform module structure of fashion design, teachers set up a variety of design courses, including “Syllabus”, “teaching calendar”, “Basic Courses”, “professional courses”, “project teaching”, “theme design”, “practice teaching”, “student works display” and other main teaching contents. The content of this part can be the subject content taught by the teacher himself or the whole course of fashion design. Through the network, students can

understand the basic learning progress, specific course schedule, and course requirements in advance, obtain the required course picture information, and have a complete curriculum system concept.

#### 4.1 Interactive Communication Module

The module is mainly completed by two tools: Gmail as shown in Fig. 2 and Gtalk as shown in Fig. 3.

The main function of teaching assistant platform is to establish and maintain the three-way communication relationship between teachers and students (teacher's life, teacher's first teacher's life and student's life). Email (Gmail) can not only provide users with free e-mail service with more than 7g storage space, but also realize the "one-stop" management of contacts in Google's various services through "address book". In order to facilitate the use of Google service to communicate with students, the teacher adopts the following steps to manage the communication system of the teaching auxiliary platform: ① according to the specific situation of the teaching class, guide each student or group leader to use the opportunity of computer experiment, register Google account with personal e-mail, and send e-mail to the teacher's email; ② send e-mail to each other among teachers in the course group; ③ teachers will Students and colleagues write letters to guide the address book, and establish different groups according to the class for classified management.

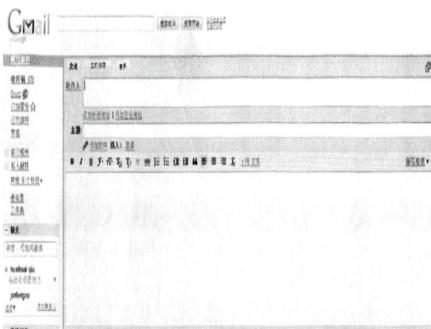


Fig. 2. Gmail interface

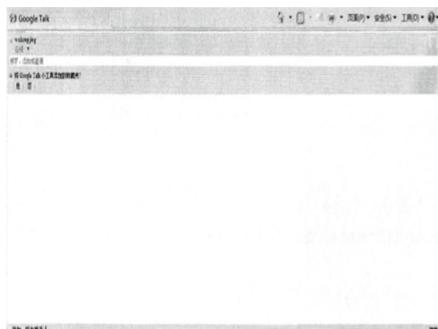


Fig. 3. Gtalk interface

#### 4.2 Teaching Process Management Module

In order to facilitate the management of teachers' teaching process, teachers can build an automatic notification system based on Google calendar on the teaching auxiliary platform. The specific methods are as follows [4]: ① teachers create Google calendar by using Google account, add daily teaching arrangements and work items, and set up e-mail, pop-up window and SMS for personal schedule management. ② Teachers import contact information from Gmail address book, and set different sharing

permissions for students and colleagues in the calendar. For example, students only have the right to view teaching arrangements, while colleagues have the right to view and modify work items. ③ For the student cadres who need to contact with the notice frequently, they are instructed to create Google Calendar and open SMS reminder. In this way, once the teaching schedule adjustment and homework arrangement are encountered, the teacher only needs to modify the schedule content in the calendar, and Google Calendar can automatically send reminder messages to the sharing users in advance, realizing the automatic notification function. ④ For work items such as meetings that require colleagues to participate in collaboration, teachers can send invitation notice to relevant personnel in advance through “send to a friend”. After receiving the confirmation message, Gmail email will automatically update the calendar content, which is convenient for teachers to arrange their daily work.

## 5 Conclusions

Through the use of the campus network aided teaching platform, this paper analyzes the current situation of the clothing design network course development, such as the high cost, the high requirements for teachers' information technology, the massive image storage and other practical reasons. Compared with the network services provided by many cloud computing service providers, Google Apps is selected as the basis of this study. A series of network services of Google Apps, such as Google doc, Gmail, Gtalk and Google Calendar.

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# Program Design of Electrical Network Course for Remote Virtual Instrument

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**Abstract.** With the development of computer simulation technology and virtual reality technology, virtual experiment, as a new experimental method, has incomparable advantages compared with traditional experimental methods because it is not limited by time and space. It is the trend of modern teaching to apply remote virtual instrument technology in Electrotechnics Teaching. Based on the theory of network environment teaching design, combined with remote virtual instrument technology, this paper realizes the reform, optimization and resource sharing of electronic technology course teaching from multiple angles, which reduces the maintenance of instruments and saves equipment expenses. With the help of virtual technology and network technology, this mode creates a new situation of network course teaching.

**Keywords:** Electrotechnics · Network course · Remote virtual instrument

## 1 Introduction

Electrotechnics is a compulsory basic course for students majoring in science and engineering. However, the course itself has a wide range of contents and less class hours. The course contains many circuit symbols, electronic components and circuit diagrams. For the abstract teaching link, it is difficult for students to understand it in a short time. It needs to be materialized through specific experimental equipment, so that students can form a concept and understand it deeply. However, with the progress of electronic technology, electronic circuits become more complex and scale is expanding. With the deepening of the course and the lack of class hours, it is difficult to teach. In order to improve the teaching effect and improve the experimental teaching means, the introduction of virtual instrument technology in the process of experimental teaching has become a trend, so as to improve the utilization of experimental equipment and reduce the cost of experimental equipment. 1, 2, 3 virtual instrument (virtual instrument) technology is the use of high-performance modular hardware, combined with efficient and flexible software to complete a variety of testing, measurement and automation applications. “Virtual” can go deep into the experimental teaching process from two aspects: 1) part of the traditional experimental equipment is replaced by the simulation software, but the function will not change; 2) changing the function of the

experimental device can be realized by changing the simulation software, thus truly reflecting the new concept that software is instrument.

## 2 Analysis of Learning Characteristics of Contemporary College Students

With the rapid development of science and technology and culture, college students' psychological maturity lags behind, and their physical characteristics, psychological characteristics and behavioral characteristics are not synchronized, to a certain extent, they are contradictory. The society and family have high expectations for them, which makes them have strong learning motivation and great learning pressure, which leads to some students' learning weariness. Their thinking mode changes from empirical to logical thinking, and they are more and more interested in exploring the regularity of causality. They are more independent and critical, and like to doubt and argue. Their thinking is creative, but it is easy to be subjective and one-sided.

The course of electrotechnics is usually set up in the second and third year of college students [1]. During this period, college students have systematically studied the relevant basic physics knowledge, have certain network operation skills, and can establish a certain sense of cooperation. However, as soon as they enter the University, their acceptance of knowledge is still more inclined to visualization, and the learning methods such as charts, pictures, videos, animations can effectively stimulate students' interest in learning. They have a good interest in distance virtual instrument teaching, but they are difficult to remember the specific text information, lack of theoretical and practical knowledge of circuit principles and analysis methods, and lack of understanding of semiconductor device knowledge.

According to the learning characteristics of college students, colleges and universities have developed various teaching methods to improve the teaching effect and the effectiveness of education, such as classroom animation demonstration, classroom video assisted teaching, excellent course website construction, network counseling, etc. to achieve better teaching effect, and promote the development of higher education and teaching. In this paper, the Electrotechnics network course not only integrates classroom animation demonstration, classroom audio-visual technology and network counseling, but also uses remote virtual instrument technology to improve students' learning interest, show the regularity of the course, and cultivate students' innovation and practice ability, which has a wider application prospect.

## 3 Remote Virtual Instrument Technology

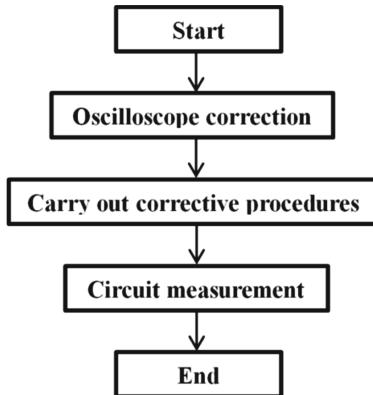
### 3.1 Technical Function of Remote Virtual Instrument

LabVIEW technology is used to develop experimental instruments. Firstly, dynamic web page technology is used to publish web pages, so that students can operate through the network, and MySQL database is used for background data management. The design of the remote experiment system is to design various experimental devices with

EDA experimental board. The data signals of EDA experimental board are received and collected by the serial port of PC, and the data signals are input into the lab view technology of the upper computer, and the remote operation is carried out. The model has the characteristics of visualization and easy operation. In the process of network virtual experiment, students follow the experimental steps and write the experimental data and results into the file of local machine in real time [2]. All kinds of signal data are stored in the form of chart or text, and then students can submit the experimental results and original data to the server of the laboratory through the remote experimental system, and teachers can query the progress of students' experiments through the network, provide guidance in time, and interact with students in real time. So as to effectively prevent students from reporting plagiarism and other bad habits in the process of experiment, teachers can give students reasonable experimental results more justly, and encourage students to take the experimental link seriously. The whole network learning process is vivid and vivid, which has good interest and strong expansibility.

### 3.2 Impedance Analysis of Detection Process

If the impedance R1 and R2 of the detection platform are not regarded as fixed in each measurement, the voltage on the impedance will change linearly with the continuous change of the input voltage value of the upper computer. The influence of the two impedances is that the oscilloscope fails to reach the voltage value set by the user. For example, waveform voltage correction is shown in Fig. 1:



**Fig. 1.** Correction process

On the contrary, if there is no influence of error, the amplitude displayed by the oscilloscope is the same as the input voltage value of the host computer. Taking sine wave transmission as an example, the voltage RMS value of impedance is calculated after the upper computer sends the waveform command. The function generator outputs a sine wave  $U(T)$  whose amplitude is  $u_m$ , angular frequency is  $\omega$  and initial phase

is  $\varphi$  according to the instruction of upper computer. The effective value of oscilloscope circuit voltage is  $u$ , the amplitude value is  $um_1$ , and the voltage on impedance  $R_1$  and  $R_2$  is  $u_{22}$ . By the circuit voltage relation has:

$$u(t) = U_m \cdot \sin(\omega t + \varphi) \quad (1)$$

$$R = R_1 + R_2 \quad (2)$$

$$U_1 = \frac{U_{m1}}{\sqrt{2}} = \frac{R_3}{R + R_3} \times \frac{U_m}{\sqrt{2}} \quad (3)$$

## 4 The Formulation of Teaching Strategies

### 4.1 Build the Network Teaching Platform of Electrotechnics Course to Meet the Diversified Needs of Students

According to the characteristics of students' learning, the network course comprehensively uses a variety of media, combined with remote virtual instrument technology, presents the course content to learners in rich forms. The specific syllabus and handouts are the main basis for compiling textbooks and teachers' teaching. Therefore, the presentation mode is mainly static images and texts, focusing on the combination of scientific and ideological, with relative stability and continuous updating. This method is suitable for students with strong self-study ability. Nowadays, multimedia is widely used in teaching, and there is a large amount of information in the classroom, so students usually have no time to take complete notes. PowerPoint Presentation in class is based on chapters, which integrates text, pictures, tables, animation and music. The teaching content gradually presents the teacher's teaching ideas [3]. The presentation focuses on the structure of information, which is suitable for students to preview the course content and grasp the key points, Review classroom teaching knowledge so as to understand difficulties 12. Carefully design classroom teaching and record teaching videos, record classroom teaching process of experienced teachers, and present them in the form of streaming media. For students who miss classroom teaching links and like to accept knowledge through explanation, online courses also have corresponding learning areas.

### 4.2 Take Students as the Main Body and Carry Out Collaborative Learning

"Message board" is specially opened in the network course, so that teachers and students can exchange and discuss with each other, students and teachers, and students and students can communicate with each other, so as to achieve the purpose of more profound understanding and mastery of teaching content [4]. The content of Electrotechnics network course can stimulate students' learning interest, encourage them to participate and explore actively, and improve their ability to analyze and solve problems by designing problem situations, taking problems as the center and task as driving force.

## 5 Conclusion

This paper analyzes the characteristics of students as learners, including learning needs, learning objectives, learning strategies, and the design process of electrical engineering remote network course. Combined with virtual instrument technology, students are the main body, teachers are the teaching mode, and the interactive mode is interactive. It has various characteristics such as the combination of theory and experiment, simulation and hands-on training, and the innovation ability and practical ability of all students. The reform of electronic technology course teaching and resource sharing are realized from multiple perspectives. The network course has good practicability and generality. It has applied for ip address and is practicing through the network to make the course more excellent.

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# Research on Chinese International Education Flip Classroom Based on Ant Colony Algorithm

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**Abstract.** With the rise of educational technology, the flipped classroom mode is booming. Students watch teaching videos after class, complete homework and internalize knowledge in class, which makes both teachers and students benefit a lot. For students, the autonomy of learning has been greatly strengthened, the learning time after class is flexible, and the limited time is maximized in class; for teachers, although the workload increases, it is conducive to their own strict requirements, and teachers should ensure that they can answer students' questions at any time. It can be seen that both teachers and students in the flipped classroom are being pushed forward. In order to ensure the efficient learning of students after class, the application of learning management system is essential. Through the combination of flipped classroom teaching mode and network learning management system, the learning time after class is freely grasped by students, which is flexible and efficient. Classroom time is more applied to the interaction and cooperation between teachers and students. In this way, we can increase the classroom capacity and help Chinese teachers to become real preachers, educators and puzzlers.

The main research questions are as follows: first, in the flipped classroom based on canvas, what are the students' attitudes towards language and knowledge acquisition? Second, what learning strategies do students adopt in the learning process? Third, what are the new gains of flipped classroom experience compared with the traditional classroom? The survey results show that the flipped classroom teaching mode can indeed improve the traditional teaching mode - some questions Question. In this mode, students interact with each other more intensively and the classroom is more humanized. Students' communication skills, self-confidence and knowledge acquisition are all improved. However, different students have different understanding of the validity of this teaching method due to their different understanding of the certainty, authority, source of knowledge, the real meaning of learning content and the measurability and importance of learning results.

**Keywords:** Flipped classroom · Learning management system · Teaching design

## 1 Introduction

Flipped classroom is a relatively new teaching mode, which was officially launched in woodland high school, Colorado in 2007. Flipped courses require students to learn the relevant courses at home and after class, complete their homework, and discuss with

teachers and students. The flipped classroom has changed the traditional cramming teaching to a certain extent. Students have changed from passive learning to active learning, and completed the construction of knowledge system in the interaction with teachers and other students. The teacher changes from a teacher of knowledge to a midwife, and becomes a guide and organizer of students' knowledge construction. It can be seen that students' autonomous acquisition before class plays an important role in the construction of classroom knowledge, and the pre class materials provided by teachers should not be limited to video materials [1]. Therefore, the application of network learning management system is very important for flipped classroom. In the flipped classroom teaching mode, learning management system is an important promotion condition. Making full use of its supporting role is conducive to promoting personalized learning and group collaborative learning.

LMS (learning management system) or CMS (course management system) is a network-based learning management platform. The network learning management system is one of the platforms for the interaction between teachers and students under the network environment, which ensures and promotes the smooth progress of online learning. According to statistics, there are more than 270 online learning management systems at home and abroad. These include blackboard, Moodle and Sakai commonly used in China, and canvas, Google classroom and edmodo commonly used abroad.

## 2 Canvas Learning Management System and Flipped Classroom

### 2.1 The Introduction of Canvas Learning Management System

Nowadays, technology has become an important part of education and teaching. Teachers all over the world feel the difficulty of integrating technology into teaching, and this invisible pressure urges teachers to re evaluate and improve their teaching methods to some extent. The impact of science and technology has puzzled Chinese teachers, especially native Chinese teachers, who have adapted to the traditional teaching methods for many years. It is undeniable that our teaching methods and teaching styles are more or less influenced by the traditional education models [2]. However, the students in Chinese class come from all over the world with different cultural backgrounds and learning styles. It would be a disaster to teach in a way that is recognized but not enjoyed by students. The opportunities that technology provides and creates in education are infinite and boundless. Teachers should find ways to integrate modern technology into the classroom, use its advantages to achieve learning objectives, and create better learning opportunities and choices for students.

### 2.2 Functions and Features of Canvas Platform

Canvas is a new type of LMS in the 21st century, which adapts to the current world higher education learning environment. Canvas data is reliable, powerful and easy to

use. Each interface is intuitive and concise, which makes teaching easier and saves time for teachers and students. Canvas platform mainly consists of four modules: teaching resource management, online communication between teachers and students, assessment management and system management. Each module has its own functions and characteristics. All the figures below take my own TESOL course this semester as an example. As shown in Fig. 1, the main interface of the platform displays all the courses of this semester for students in the middle, and the agent items are displayed on the right, which are mainly used to remind students to hand in their homework and prevent them from being deducted for overdue work.

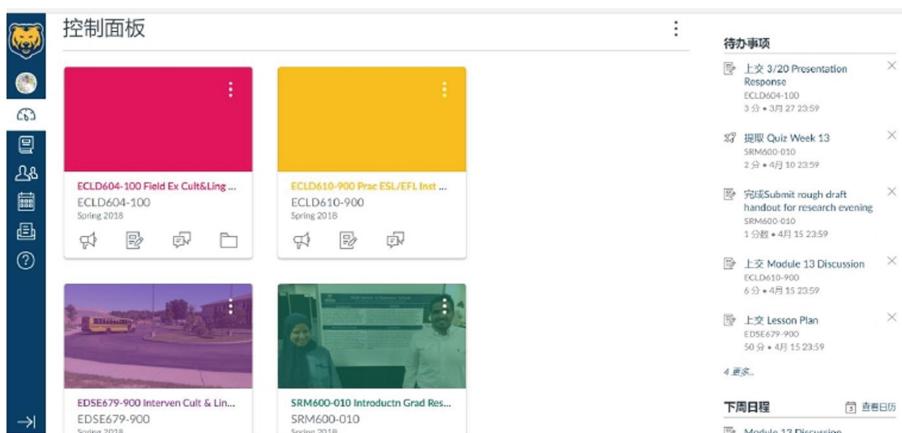


Fig. 1. Control panel

In the course resources section, teachers upload the courseware, video, text and other reference materials related to the teaching content for students to download and study; The role of the course assignment module is to urge students to complete and submit assignments, so as to find their own problems and make the classroom more targeted; in other relevant information, students can expand their knowledge according to the actual situation [3]. In Fig. 2, students can click to view the syllabus of this semester, and click to view the unit tasks of each week through the tasks released by teachers.

The screenshot shows the course homepage on a Canvas platform. On the left, there's a vertical sidebar with icons for a lion logo, syllabus, announcements, questions, University Libraries, Office 365, Zoom Meetings, and a calendar. The main content area has a header with the course title and navigation links for syllabus, announcements, and questions. Below this is a yellow "Start Here" button and a "Learn about our Canvas class" link. The main content is organized into five weeks:

- Week 1:** What is Special Education? The basics.
- Week 2:** Special Education Basics Part 2- Access to the General Education Curriculum
- Week 3:** Introduction to the struggling linguistically diverse learner: Second Language Basics, WIDA Assessments for CLDE, and Long Term English Learners
- Week 4:** Current models of assessment and intervention in Special Education and General Education- MTSS, RTI and PBIS
- Week 5:** Issues of disproportionality of ELs in special education and the continuum of services framework

Fig. 2. Course home

### 3 Flipped Classroom

Recently, flipped teaching has attracted more and more attention in teaching and research fields. The vigorous development of flipped teaching and learning is mainly due to its integration of two existing research directions online teaching and active learning technology, which has achieved the effect of one plus one more than two. The essence of flipped teaching is to learn new materials before class, so as to reduce the time of teaching by students' active learning, so as to obtain more practice and effective use of knowledge. This reorganization of teaching and learning order is named “flipped” teaching, which is in sharp contrast to the traditional form of lecture seat. In the form of lectures, teachers usually introduce new content in class, and then students review the new content, carry out exercises and tests to evaluate learning results.

#### 3.1 Characteristics of Flipped Classroom

##### 1. Help students develop individually

The traditional classroom mainly focuses on teachers, which conflicts with the constructivism teaching theory which emphasizes learners' initiative. Flipped classroom is reasonable in teaching, because it conforms to the principle of individualized difference learning, and it is also individualized, because each student can flexibly learn at his own pace.

##### 2. Diversified classroom for students

A flipped classroom can save teachers' classroom time and provide students with learning options, rather than just listening and instilling. Through this mode, teachers can not only create their own teaching videos, but also plan video courses from trusted Internet sites to convey this guidance.

### 3. Strengthen students' effective learning

Flipped classroom can eliminate the ineffectiveness of face-to-face teaching. Students have their own characteristics. Some students have strong hearing ability and can remember new words when they hear them. While some students rely on visual input and can't remember a new word after hearing it for many times, but they can remember it after seeing it. The author is the latter kind of learner.

## 4 Chinese Flipped Classroom Teaching in North Corolla University

In the overseas Chinese class, which aims to cultivate the communicative ability, how to make the students master Chinese more efficiently under the limited time and conditions has been widely concerned. In this semester, the author has observed primary and intermediate Chinese classes in Northern Colorado for many times, trying to understand how teachers and students can combine the learning management system, namely canvas, class time arrangement and curriculum setting to create as many Chinese learning opportunities as possible under limited conditions. Instructor Dr. Low Mr. Liu is a native speaker of English. He was born in California in Guangdong Province. There are 11 middle class students, 2 white students, and the rest are Asian. Nearly one third of them are fluent in expression but weak in writing. Their vocabulary is about 2000 in this class. There are 28 primary class students, four Asian students. The students in this class can communicate in Chinese with a vocabulary of about 500.

In the primary Chinese class, except where it is necessary to pronounce in Chinese, Mr. Liu teaches in English; in the intermediate class, the teacher tries to express more in Chinese, but sometimes unconsciously speaks back to English, or the words and sounds are inappropriate, which is probably influenced by Cantonese and English pronunciation. Different from native Chinese teachers, Liu has a solid knowledge of Chinese and the ability to communicate with American students without obstacles. For students in the native language environment, such a teacher is the best choice one.

The textbook is compiled by Mr. Liu himself with reference to many textbooks in the world. The courses of this semester's intermediate class involve history, geography, classical Chinese and other difficult contents. On canvas, Mr. Liu creates an independent module for each unit, uploads his own electronic textbook, updates the module content every week, including videos, audio, pictures and extended reading materials for students' self-study. After class, students need to complete assignments or tests independently, participate in discussions initiated by the teacher, give their own opinions and share the same with others on the online discussion board Learn to discuss. Teachers and students can log in at the same time for real-time interaction at a pre-set time. Teachers and teaching assistants can provide real-time feedback on the sentence structure, intonation, pronunciation and other communication problems. In addition to the twice weekly class time, Mr. Liu also organizes a 15 min video conference between the two classes to let students use the language in the real context. In English environment, this kind of teaching mode helps Chinese learners to get maximum practice. The benefits of online courses are obvious in the classroom. When

students prepare for the preview and prepare for the new lessons, the efficiency is greatly improved. Miss Liu said that she was frustrated because she explained vocabulary and sentence patterns most of the time in the classroom. But now it only takes 25–30 min to evaluate, and you can release the following tasks and organize students to practice.

## 5 Teaching Effectiveness

The level of students in the class is bound to be high or low. The traditional classroom teaching is oriented to the whole class, which is easy to cause the phenomenon of high-level students “not enough to eat” and unbalanced development students “not enough to eat”. According to the above two levels of teaching objectives, the author gives solutions in class and after class. First of all, the use of teaching platform before class can solve this problem better. In this teaching design, the author did not set a limit for students’ learning time, and set some selected questions, such as Quizlet, which is used to assist in word learning. If students feel that they are not learning new words in place, they can log in to continue learning independently; It is also an optional item to publish information on the discussion board. Students can not only post questions, but also view and reply to others’ questions to help understand and master them; The first mock exam is that the Internet learning platform is a convenient medium. Students can move their fingers to get what they do not share in their textbooks, such as learning about culture. If they are interested in the content provided by teachers, they can continue to read and watch more in-depth contents. If they are not interested, they will continue to carry out the next module content and time flexibly. At the same time, you can also communicate with the teacher alone, make an appointment online, ask for advice on problems that you don’t want to say in class or need to be solved before class. Both parties don’t have to run errands, saving time and effort.

## 6 Conclusion

Flipped classroom teaching activities change the roles of teachers and students. Students’ autonomy is reflected, and they really become the master of learning, which solves the problem that project-based teaching cannot be completed according to the teaching schedule in traditional teaching.

In Wilson’s study, students who participated in flipped classes were not guaranteed to complete the assigned readings on time every time. Due to the lack of classroom teaching and the increasing expectation of personal responsibility, it is unfair for some students to think that they are paying the same or more tuition fees, but they cannot get the corresponding education, and even have to spend time on self-study. The current research also observed that some learners have similar ideas. Therefore, future research can continue to explore the individual differences and learning styles of learners. In addition, the teachers in the study play the role of facilitator, and they need considerable teaching ability to guide students in the whole process. Therefore, the impact of different roles of teachers on learning outcomes is worth further investigation to find out

how they affect students' learning in flipped classroom. In addition, how learners with different cultural backgrounds, learning styles, learning strategies and learning beliefs respond to teachers' guidance is also of great research value.

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# Construction of Evaluation System Platform of University Work in Data Mining Technology

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**Abstract.** As an important aspect of the overall evaluation of education, teaching quality evaluation in Colleges and universities is not only the main body and foundation of education evaluation, but also an indispensable part in teaching activities. The development of information technology on the Internet has accumulated a lot of data for teaching and management, and created a prerequisite for the construction. Still in the primary stage of data backup, query and simple statistics, and the mining and analysis of evaluation data is still in the stage of manual processing, which makes these data unable to give full play its due value. Nowadays, “survival by quality” has become the inevitable choice of every university. Whether the teaching quality can be guaranteed or not depends on the teaching quality and teaching level of teachers. Therefore, we must have a scientific evaluation system to monitor the teaching quality of teachers. In this paper, how to make more scientific and reasonable use rationally analyze and guide teachers’ teaching is deeply studied.

**Keywords:** Big data · Data mining technology · Ideological and political · Work evaluation

## 1 Introduction

More qualitative components and less quantitative components involved in teaching quality evaluation, generally speaking, only qualitative standards can be given, and the standards are flexible. In addition, the evaluators have bias in grasping standards and subjective cognition, which makes it will be more difficult to analyze the teaching quality in this way. First of all, the analytic method is used to establish the teaching area. The analytic hierarchy process can get more accurate data to reflect the existing problems [1].

At present, the domestic research on this kind of evaluation is relatively lack of experience, especially for the funny science and technology innovation performance evaluation system, especially lack of research. There are mainly three aspects. The first is the research side of science and technology innovation platform. The performance evaluation methods of University Science and technology innovation platform mainly include index system factor set design method, weight set design method, information processing technology method and evaluation result interpretation analysis method. Second, At present, colleges and universities are still lack of such innovative performance evaluation policy. The Ministry of science and technology of the people's

Republic of China has made an in-depth discussion on the evaluation content, evaluation mechanism, performance evaluation policies and regulations of the platform construction. Third, the performance evaluation of science innovation platform.

## 2 Data Mining Algorithm Based on k-Means

The size of E is directly proportional to the distance between objects, and the smaller the E, the higher the similarity. The larger the data object, the higher the efficiency of the algorithm in general.

## 3 Application of Clustering Analysis and Data Mining Technology in Ideological and Political Work of College Students

### 3.1 Data Collection

This paper selects 50 quantitative assessment forms of counselors' work in a college of liberal arts, which includes the following three aspects: first, management attitude. It includes clear rewards and punishments in work, treating students sincerely, getting along well with students, speaking tactfully, being honest and self disciplined. Second, management ability. It includes work organization ability, organizing students to actively participate in school activities; doing a good job in helping poor students in class and work study program; dealing with students' problems fairly; doing a good job in student evaluation; and actively helping students. The third is management strategy. They went to the dormitory three times a week, checked the dormitory sanitation once, talked with about 40% of the students every semester, paid scholarships seriously, and paid attention to the students' ideological situation [2].

### 3.2 Data Transformation

According to the above four problems, first calculate the attribute value. So, it involves data conversion. Using ordinal variables to transform data, we mainly transform the methods that are difficult to objectively evaluate and only use grade score to objectively evaluate attributes. In this way, the above-mentioned attribute values are divided into excellent, good, qualified, poor and poor, and projected into the interval [0, 1] by value range mapping, and their values are "1.2, 0.65, 0.45, 0.2, 0". Average knowledge of each assessment objective. For example, management energy efficiency = (attending class meeting + understanding).

### 3.3 Data Mining

Clean and preprocess the data, and then get the data mining samples, as shown in the Fig. 1.

Management attitude	Management ability	Managing energy efficiency	Management strategy
<b>0.55</b>	<b>0.5</b>	<b>0.46</b>	<b>0.47</b>
<b>0.55</b>	<b>0.5</b>	<b>0.46</b>	<b>0.47</b>
<b>0.45</b>	<b>0.45</b>	<b>0.29</b>	<b>0.31</b>
<b>0.68</b>	<b>0.68</b>	<b>0.59</b>	<b>0.62</b>
<b>0.7</b>	<b>0.7</b>	<b>0.72</b>	<b>0.73</b>

**Fig. 1.** Data mining sample

### 3.4 Clustering Results

Cluster 1 (good) 15 clusters 2 (medium) 31 clusters 3 (poor) 4 clusters can be obtained by analyzing 50 samples. In addition to one sample data, there are 34 samples in cluster 1, so  $14/50 = 28\%$ ; similarly, cluster 2 is  $30/50 = 60\%$ ; cluster 3 is  $3/50 = 6\%$ . Considering the centroid, the average score of management strategy is 0.548, and the average score of management efficiency is 0.575. After data mining, which belongs to the category of medium or slight. Among them, the attribute value of management attitude is the largest.

LabVIEW technology is used to develop experimental instruments. Firstly, dynamic web page technology is used to publish web pages, so that students can operate through the network, and MySQL database is used for background data management. The design of the remote experiment system is to design various experimental devices with EDA experimental board. The data signals of EDA experimental board are received and collected by the serial port of PC, and the data signals are input into the lab view technology of the upper computer, and the remote operation is carried out. The model has the characteristics of visualization and easy operation. In the process of network virtual experiment, students follow the experimental steps and write the experimental data and results into the file of local machine in real time. All kinds of signal data are stored in the form of chart or text, and then students can submit the experimental results and original data to the server of the laboratory through the remote experimental system, and teachers can query the progress of students' experiments through the network, provide guidance in time, and interact with students in real time. So as to effectively prevent students from reporting plagiarism and other bad habits in the process of experiment, teachers can give students reasonable experimental results more justly, and encourage students to take the experimental link seriously. The whole network learning process is vivid and vivid, which has good interest and strong expansibility.

## 4 Innovative Application of Big Data in the Quality Evaluation of Ideological and Political Work in Colleges and Universities

The utilization of data mining is not deep, so it is necessary to strengthen data modeling and practical application. “Data is different from tangible assets. The more tangible assets are shared, the less they own; the more data are shared, the more they are generated, and the more people use them, the greater the value. Therefore, data has natural commonality and value [3]. Data can not only be accumulated for a long time, but also be used repeatedly. The more organic reorganization and effective combination of data, the greater the value. The innovative application following three dimensions: first, the dimension of “evaluation object”, including the innovative application of individual data and group data, requires both individual targeted evaluation and overall evaluation; The second is the “evaluation time” dimension, including the innovative use of short-term data and long-term data, which requires both short-term phased evaluation and long-term tracking evaluation; the third is the “evaluation content” dimension, including the innovative application of single index data and comprehensive index data, which requires. Not only is the data accumulation not comprehensive, not diversified and not detailed, but also the mining and utilization of big data only stay at the level of shallow level analysis and local application, and there is no hierarchical and classified big data analysis and evaluation model, which needs further improvement Strengthen theoretical research and practical exploration [4].

## 5 Conclusions

In short, there should be relevant information product different data mining methods are used to find out more valuable information. Promote practice, innovation and application, and strengthen data security protection. If the data model of University Ideological and political work quality evaluation developed by relying on big data technology only stays in the theoretical analysis and modeling stage and does not put into practice and innovative colleges and universities, free and independent selection by functional departments and colleges, joint evaluation and inspection by peers and teachers and students, and collaborative promotion of innovation by society and market Data security protection not only stimulates the innovation.

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# Construction and Analysis of Teaching Evaluation Model of Chinese International Education Based on Web

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**Abstract.** This paper analyzes the knowledge requirements in the information processing of Web structured Chinese International Education and teaching evaluation, introduces the influential Chinese semantic resources and ontology knowledge at present, presents the composition model and construction method of Chinese knowledge base for web structured information processing, and verifies the model in deep web research. The purpose of this research is to make the computer process the web structured information in specific domain more comprehensively and effectively, and it has certain reference value for the in-depth study of ontology.

**Keywords:** Web structured information · Information processing · Education and teaching evaluation

## 1 Introduction

With the development of web, the structured information in web is increasing day by day. How to find and use the information has become the focus of attention. Information processing of education and teaching evaluation needs to rely on domain background knowledge and grammar semantic knowledge. At present, it is mainly realized by existing semantic resources and domain ontology. Based on the analysis of the requirements of domain knowledge and semantic resources for web structured information processing, combined with the characteristics of structured data, and integrating the existing semantic resource construction technology and ontology theory, this paper proposes a knowledge base composition model for web architecture education and teaching evaluation information processing in specific areas, and discusses the design, construction and construction methods of domain knowledge base, The feasibility and effectiveness of the model and method are tested with specific application [1].

## 2 Comparison and Evaluation of Task Based Teaching Models in Chinese International Education

In fact, the task-based Chinese international education method is only a teaching idea, not a specific teaching method. The operation process and teaching steps should be greatly adjusted according to the teaching needs. Scholars have discussed the

task-based teaching mode and put forward the specific operation procedures, including the common three-stage task-based teaching mode of Prahhu (1987), Skehan (1998), Ellis (2003), Willis (1996) and Nunan (2004). Prahhu (1987) segmented the implementation steps of task model, which is of pioneering significance. However, the implementation details of each step of the teaching mode are relatively vague, and the implementation conditions and objectives of each step have not been elaborated. At the task stage, the teacher's responsibilities were not explained. In addition, he thinks that the subject of feedback is the teacher, which is contrary to the requirements of learners' initiative in task-based teaching. Skehan, Ellis and Willis have similar implementation steps. In the second stage of the task, Skehan's description of the teacher's role is too simple, only mentioning the recording of the process of implementing the task for students; Ellis proposes the accessibility support and constraints for students to implement the task. Willis included part of the report (student summary, teacher led questioning, comment and record) in the second stage. In this stage, students' summary and evaluation are no longer completely based on their own ideas and judgments, and only share these ideas and judgments with classmates, but a process of discussion and summary among learners under the guidance of teachers. This reflects the subjectivity of students and the assistance of teachers. Nunan also analyzes the task-based teaching model, and believes that the implementation of the model is divided into six steps: increasing background knowledge, controlling practice, authentic listening, focusing on language components, more flexible exercises and introducing educational tasks. The model also shows the task designer's consideration of task difficulty gradient, which has great reference significance for the task design of Chinese international education. For example, the two stages of controlled practice and more flexible practice are introduced in the whole process. Due to the large span between the two stages, authentic listening and focused language elements are regarded as the transitional links. Teachers must decide the degree of "more flexible" according to the learners' mastery level and classroom conditions. It can be semi controlled practice or even open, that is, real communication activities [2, 3].

### 3 Construction of Teaching Evaluation System Based on Web

#### 3.1 Administrator Structure Module System

Since the computer basic course teaching evaluation system can provide services for multiple groups of teachers and students at the same time, the courses of each group are not the same, so there should be a certain isolation between teachers/students groups. For example, the teacher of a course has the right to manage his students, but he can not manage the students belonging to other teachers, and a student can only access his teacher's homework. Therefore, the system home page requires teachers or students to log in with account and password before accessing, so as to track the identity of students accessing system resources. The system administrator is responsible for the management of the opening and deletion of student accounts, the corresponding relationship between teachers and students, course name, number of students and so on.

Here, we open the system resource access account as the operating system account, and the student verification is conducted by Windows NT and web server is. The advantages of this way are: first, it can make full use of the security mechanism of the operating system, so that the operating system and database server can be integrated seamlessly; second, it can provide students with other auxiliary services, such as e-mail, personal home page.tp service, etc. The application of the system is closely combined with the course content, and students can further deepen their understanding of the course content in the process of using the application system [4].

### 3.2 Teacher Structure Module System

The teacher module contains all kinds of functions needed by teachers. Such as: online real-time teaching broadcast, homework assignment, homework marking, test paper marking, statistical analysis of test results, online Q & A, course material (material) production, student account management (change of student password), online conference setting, etc. The system uses component object model and office automation technology to automatically mark and register the homework of computer application foundation course. Teachers can query and count the results of homework. Teachers can use outlook to request online meeting to answer questions, group or individual counseling.

### 3.3 Student Structure Module System

The student module includes viewing the homework assigned by teachers, doing homework, testing (examination), watching video broadcast of teachers' teaching, on-demand, answering questions on the Internet, browsing course resources, auxiliary services, etc. [4, 5]. When students use the browser to access the system home page, they need to provide an account/password for student verification. After passing the verification, before the browser is closed, they will access the system resources as the account. "Computer application foundation > course assignments can be completed and submitted directly in the browser. For C language course assignments, it provides students with a web interface to complete the editing, compiling, linking and running of the homework program. The remote examination function not only provides the traditional written examination questions in the form of multiple-choice questions, but also provides the examination questions in the form of practical operation. The test is conducted through the WW interface, with time limit. When students complete the test before the specified time limit, they can submit the test paper through the "hand in" button; if the students have not handed in the test paper when the test time limit reaches, the system will automatically submit the current test results of the candidates. The marking of test papers and the statistics of examination results are automatically completed by the program. The self-test function provides the test results, unlimited time, which is carried out by the students themselves. After the test, the system immediately evaluates the test paper and gives the comparison table of students' test results and correct answers, so that students can refer to it. In order to improve students' application ability of network and enhance their interest in teaching content, the system provides email FTP. Personal homepage. BBS, online meeting (online chat, application

sharing, whiteboard), etc. for each student and teacher who use the computer public course teaching evaluation system. Let the students improve the understanding of the course content and the interest in the course learning. In addition, the system is also equipped with resource library, built-in multimedia materials related to teaching content or network application, for students to browse and learn after class [5].

## 4 Data Analysis of Web Architecture System

In traditional wds, there are two ways to realize the connection and application of Web database system. One is to provide middleware on the web server to connect the web server and the database server, and the other is to download the application program to the client and directly access the database in the client. Middleware is responsible for managing the communication between web server and database server and providing application service. It can directly call external program or script code to access database, so it can provide dynamic HTML page related to database, or execute user query, and format query result into HTML page, and return it to web browser through web server. There are two kinds of common interface technology.

When multiple users send requests at the same time, the bottleneck of information query and publishing will be formed in the web server. 1. CGI applications need to open and close the database connection every time, which is inefficient and time-consuming. 2. CGI applications cannot be shared by multiple clients. Even if CGI programs are running when new requests arrive, another CGI application will be started. With the increasing number of parallel requests, more and more processes will be generated on the server. Generating a process for each request is time-consuming and requires a large amount of memory, which affects the efficiency of resource utilization, resulting in performance degradation and increased waiting time; 3. Due to the great difference between SQL and HTML, the conversion code in CGI program is tedious and difficult to maintain; 4. Poor security and lack of user access control.

## 5 Conclusions

Java server + 2000 is a web-based teaching evaluation system based on Java Server + 2000. The system interacts with users through web interface, provides information for users and accepts their operations, and stores information data through database management system. Through the use of this system, teaching and learning in Chinese international teaching has a more perfect teaching quality evaluation system. Both students and teachers can browse, query, edit and manage the Chinese international teaching information data through the system, which facilitates students' more systematic learning and self-evaluation of learning effect. On the other hand, it also enables teachers to get timely feedback on teaching effect, understand the strengths and weaknesses of their own teaching, and provide valuable data for future teaching work.

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# Application of Improved Random Forest Algorithm in Physical Training

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**Abstract.** Aiming at the static property of random forest algorithm and easy to fall into local optimum, a random forest algorithm for bee mating optimization is proposed and applied to human posture recognition based on acceleration sensor. A data acquisition system based on the combination of three-axis acceleration sensor MMA7260 and wireless communication module CC2430 is designed. Five kinds of daily behavior and one abnormal behavior are collected. Five kinds of characteristic vectors, such as near slope, difference before and after, mean value, root mean square and signal amplitude area, are extracted from acceleration value. The behavior model is trained and classified by improved random forest algorithm. The experimental results show that: the algorithm can effectively identify six kinds of behaviors, has high classification prediction accuracy and behavior recognition rate, and has strong stability, robustness, global optimization and anti noise ability.

**Keywords:** Summary · Virtual reality technology · Simulation teaching · Physical education teaching and training · Application

## 1 Definition of Virtual Reality

Gu Yawei and Chen Chang thought in 2017 that virtual reality technology is a three-dimensional environment generated by computers, which highly replicates the environment in the real world or the imaginary world, and enables users to experience and interact with things in the environment, including perceiving and manipulating objects in the environment, communicating with people in the environment, etc. [1].

Many scholars' articles on virtual technology described that virtual reality, users can obtain visual, tactile, auditory and other sensory experience through the simulation of real situation and control of virtual environment, so that they have a sense of immersive.

At present, there are many methods to study the human posture recognition, the main two methods are: the recognition based on image analysis and the recognition based on motion sensor. The recognition method based on image analysis can clearly see the movement posture of people, with high accuracy, but it has high requirements for equipment, special application scenarios and inconvenient to carry. Another method is to use the portable collector to obtain the acceleration signal of human motion and identify it.

## 2 The Development of Virtual Reality and Its Application in Teaching

In the learning process of anatomy, students can learn more intuitively by dissecting corpses, but there are few opportunities, and many can not be operated repeatedly, especially for the study of anatomy of small parts, a little mistake may lead to failure. Chicago University has built a virtual human anatomy computer, which has a complete human body solution system, in which students can simulate the operation, improve their practical ability, and quickly grasp the essentials.

When students receive the relevant nursing professional knowledge in nursing colleges, they usually study in the form of textbooks, specimens, watching videos and so on, which is easy to generate boredom. Xi'an Medical College has introduced virtual reality technology into nursing teaching and established three-dimensional model, which is conducive to improving students' learning ability, analysis and problem-solving ability [2].

## 3 Advantages and Application Value of Virtual Reality Technology in Physical Education

In the traditional physical education classroom teaching process, the acquisition of movement skills is mainly through pictures, sounds, and teacher demonstration. In the complex situation, it is difficult for teachers to express the key points and difficulties clearly in language. Because of the different understanding of each student, the level of memory and mastery of the movements will be different. Using virtual reality technology to organize teaching can make knowledge three-dimensional and present it in three-dimensional form, which is helpful for students' understanding and memory of action skills.

In virtual reality system, students can use virtual environment to study independently. In the process of virtual teaching, if students fail to master a certain skill, they can focus on learning the unfamiliar part and increase their proficiency. In addition, if students fail to learn in class due to special reasons, they can also learn autonomously in the virtual system after class, and carry out targeted teaching according to their own characteristics, which is conducive to the reform of traditional teaching mode [3].

### 3.1 Promote the Balance of Teachers and Teaching Resources

It is obvious that there is an uneven distribution of teaching resources between the north and the south of China. By comparing the teachers' strength, the software and hardware facilities of each school and the education level of students, we can find that the current education situation still needs to be improved. The application of virtual reality technology is conducive to alleviate the polarization of educational resources, and let the high-quality teachers in the developed areas enter the village school through the virtual reality classroom network platform.

### 3.2 The Application Value of Virtual Reality Technology in Physical Education

In the traditional physical education classroom teaching mode, the teacher according to the development of the school, students are taught selectively in accordance with the new curriculum standards. The way of movement is to learn the skill of movement. Introducing virtual reality technology into physical education, In the process of learning, we can teach students according to their aptitude, realize one-to-one teaching, interact with teachers in virtual environment, and stimulate students' learning motivation [4].

## 4 The Realization of Virtual Reality Technology in Physical Education Programming Mode of Cloud Computing

The application of virtual reality technology in PE class is mainly reflected in:

First, virtual information system. Physical education classroom teaching has a strong professionalism, especially volleyball, basketball, table tennis and other professional courses, virtual reality technology, technology is to put students in a virtual environment, so that students can get real feelings and experience, at the same time, through the system feedback to teachers and students of relevant technical data and perception information, and storage and related technical analysis.

Second, analyze the motion data. The advantage of virtual reality technology is that it can capture the most real data of students' body in the course of class, and ensure the scientificity of teaching and practice. In addition, it can also analyze the functional indicators of the students' body system, and teachers can arrange the curriculum load according to these indicators, and formulate scientific and Graphic design pipeline optimization of virtual reality technology.

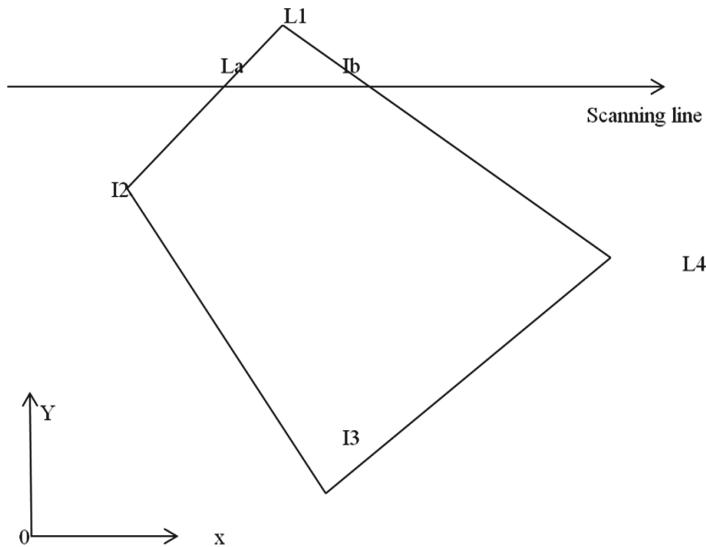
1. Reduce the number of virtual light sources in simulation
2. adopt simple shading mode
3. adopt simple surface polygon type

The bilinear light intensity interpolation of Gouraud shading model was proposed by Gouraud in 1971, also known as Gouraud shading. It first calculates the light intensity of each vertex of the polygon on the surface of the object, and then uses bilinear interpolation to calculate the light intensity of each point in the interior area of the polygon.

Its basic algorithm is described as follows:

- a) Calculates the average normal direction of polygon vertices.
- b) The average light intensity of vertices is calculated by Phong light illumination model.
- c) The light intensity of each point on the discrete edge is calculated by interpolation.

- d) The light intensity of each point in the polygon is calculated by interpolation.



The formula of bilinear light intensity interpolation:

$$L_a = -\frac{1}{y_1 - y_2} [L_1(y_s - y_2) + L_2(y_1 - y_s)]$$

$$L_b = -\frac{1}{y_1 - y_4} [L_1(y_s - y_1) + L_4(y_1 - y_s)]$$

$$L_s = -\frac{1}{x_b - x_a} [L_b(x_b - x_s) + L_a(x_s - x_a)]$$

## 5 The Challenge of Virtual Reality Technology in the Application of Physical Education

At present, the virtual reality industry has just started, the software and hardware facilities are not perfect, the system has holes, the technical strength of developers is insufficient, many college teachers have only heard about virtual reality technology, but they have not fully understood what virtual reality technology is, how to apply it to the classroom, let alone how to develop the teaching source of virtual reality.

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# An Analysis of English Listening and Speaking Teaching Mode Based on ID3 Algorithm

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**Abstract.** This paper analyzes some problems in the process of College Students' Autonomous English learning, improves the ID3 algorithm in the field of data mining, and applies the traditional ID3 algorithm and the improved ID3 algorithm to the study of College Students' Autonomous English learning.

**Keywords:** College Students' Autonomous English learning · Data mining · ID3 algorithm

## 1 The Introduction of Data Mining

The Data mining is to discover unknown rules and connections in advance. The process of selecting, exploring, and modeling data to obtain a database. The results are clear and useful to the owner of. Data mining is from the database. The core technology of knowledge discovery is developed from machine learning of artificial intelligence. Come, combine the traditional statistical analysis method, fuzzy mathematics method and scientific plan. The visualization technology of computation, taking database as the research object, forms the data mining method. And technology.

Data mining methods include decision tree method, set theory method, neural network method, genetic algorithm and so on. Decision tree method is to establish decision tree by using the principle of information theory [1]. The application effect of this method is good and the influence is great. The expression form of knowledge obtained by this method is decision tree.

## 2 ID3 Algorithm

The earliest and most influential decision tree method in the world is ID3 algorithm, whose basic algorithm is greedy algorithm. It constructs decision tree by top-down recursion.

Pi is the probability that any sample belongs to CI, then the expected information for a given sample classification is:

$$I(s_1, s_2, \dots, s_m) = - \sum_{i=1}^m P_i \log_2(P_i), \quad (1)$$

where  $S_i/S$  is used to estimate.

If attribute  $a$  has  $V$  different values  $\{A_1, A_2, \dots, A_V\}$ , we can use attribute  $a$  to divide  $s$  into  $V$  subsets  $\{S_1, S_2, \dots, S_V\}$ , where  $S_j$  contains such samples in  $s$ , and they have them on  $A$ . If  $a$  is selected as the test attribute, these subsets correspond to the branches growing from the nodes containing set  $s$ . If  $s$  is the number of CI like samples in subset  $S_i$ , then it can be divided into the entropy or expected information of subset according to attribute  $a$ .

The interest is:

$$E(A) = \sum_{i=1}^V \frac{S_{1i} + \dots + S_{mi}}{S} I(S_{1j}, \dots, S_{mj}) \quad (2)$$

The lower the entropy, the higher the degree of subset division. Then, the information gain obtained by branching on  $a$  is:

$$G(A) = I(s_1, s_2, \dots, s_m) - E(A) \quad (3)$$

### 3 Improved ID3 Algorithm

If  $a$  is a selection attribute,  $a$  has  $V$  attribute values, and the corresponding weight is  $\omega_1, \omega_2, \dots, \omega_V$ . And attribute  $a$  is extended according to ID3 algorithm, and the corresponding information entropy is  $E(B_1), E(B_2), \dots, E(B_V)$ , then the weighted entropy is defined as:

$$E(A)^* = \sum_{i=1}^V \omega_i \times E(B_i) \quad (4)$$

Where  $(B_1, B_2, \dots, B_V)$  is the attribute selected by  $V$  nodes, and  $\omega_i$  refers to the weight of the branching subset. The weight is calculated by the proportion of the branching subset  $B_i$  in the whole set, and then the weighted entropy is calculated. The attribute is selected by comparing the weighted entropy [2].

In addition, aiming at the improvement of information computing in ID3 algorithm, the complexity of information computing is simplified.

First, we study the basic properties of the  $\log P$  function. After research, we can prove that the formula of information quantity is a form of convex function, so we can use the special properties of convex function. The calculation formula of information quantity is improved correspondingly.

Among the functions used in the formula of information quantity,  $P$  represents the percentage of a certain type of records in the total records, and its definition field is  $[0, 1]$ . When any two points  $P_1$  and  $P_2$  on  $[0, 1]$  satisfy  $P_1 - P_2 = \Delta P \rightarrow \alpha(0)$ , the functions of  $\log P$  are continuous on the  $[0, 1]$  interval, and the concavity and convexity of the functions of  $\log P$  can be tested according to theorem 1.

It is proved that  $I \circ G P$  function is a convex function on  $[0, 1]$  interval.

Because  $(\log P) = \frac{1}{P \times \ln 2}$ ,  $(\log P) = \frac{1}{P^2 \times \ln 2} < 0$ , according to the definite theory, the LGP function is a convex function on the interval  $[0,1]$ . Property 1: for any  $\alpha, \beta \in [a, b], t \in (0, 1)$ , if  $f(x)$  is a convex function on  $[a, b]$ , then there is  $t f(x) + (1-t)f(\beta) \leq f[t\alpha + (1-t)\beta]$ .

According to the properties of convex function 1:  $I(P_1, P_2) = (P_1 \log P_1 + P_2 \log P_2) \geq -\log(P_1^2 + P_2^2 + \dots)$ .

According to the property 2 of the convex function, the formula for calculating the information quantity of the main attribute of multivalued class is as follows:

$$-\sum_{i=1}^m P_i \log 2(P_i) \geq -\log(P_1 + P_2 + \dots + P_m)$$

So here we change formula (1) to

$$I(s_1, s_2, \dots, s_m) = \log(P_1 + P_2 + \dots + P_m) \quad (5)$$

When calculating the information gain of classification attributes, all the contents related to the calculation of information amount are carried out according to the above methods, so that the approximate value of information amount can be obtained, and the cost of calculating information gain can be reduced, so as to improve the efficiency of decision-making tree construction.

```

Begin
S = example // eit tt Ai N
if S all belong to category C then
    back N as leaf_code and mark it category C
    if attribute_list = NULL then
        back N asleaf code
    for S do
        Each attribute d0 in for category C uses formula (5), formula (2), and
        Formula (3) i s used to calculate the attribute with the maximum information gain in
        attribute_list
        max_list
        T = max//Sample set with maximum information gain
        Using formula (4) to calculate the weighted entropy E(A)
    End for
    End for
    for each max _ list known value ai do in grows a branch from node N
    end for
    if T = Null then
        Add a leaf
    else recursive execution algorithm Procedure Algorithm_tree
    End

```

## 4 Using Table Method to Study College Students' Autonomous English Learning

By selecting the longest login time and tiredness of college students in the process of Autonomous English learning Count online time, access to learning resources network times, questions and posts, and self-learning The five attributes of progress are candidate attributes and self-learning results are class label attributes To analyze and study college students' Autonomous English learning[3]. The data records are from the College English learning database, which contains the undergraduate courses of the College of foreign languages for the past two years Grade general arts, science and Engineering College English learning records.

The explanation of 5 candidate attributes and 1 class label attribute is shown in Table 1.

**Table 1.** Attribute explanation

Property name	Defining properties	Property value is 0	Property value is 1
X	Results of autonomous learning	qualified	unqualified
A	Maximum login time	Maximum login time $\geq 1.5$ h	Maximum landing time $< 1.5$ h
B	Cumulative online time	Total online time $\geq 28$ h	Total online time $< 28$ h
C	Times of access to learning resource network	Access to learning resource network $\geq 20$ times	Access to learning resource network $< 20$ times
D	Time of question posting	Posts $\geq 5$ times	Posts $< 5$ times
E	Autonomous learning progress	Learning progress is normal or ahead of schedule	Slow learning

Through the table generated by ID3 algorithm, it can be found that if a student's number of questions and posts reaches or exceeds 5 times, it means that the communication between the student and the teacher is more active, and the number of visits to the learning resource network reaches or exceeds 20 times. If the autonomous learning progress is normal or ahead of schedule, and the cumulative online time reaches or exceeds 28 h, then the student The student can upgrade and be qualified for the next College English course [4].

## 5 Conclusion

By applying ID3 algorithm and improved ID3 algorithm to college students' English respectively In the study of autonomous language learning, the root node of the two decision trees is "question making", University The network communication between students and College English teachers is very important It is necessary for students to have a better network infrastructure in the process of Autonomous English learning, and the teaching role of College English teachers cannot be attributed to autonomous learning Practice and be ignored. It should be paid more attention and applied. So that it can be better To guide college students to learn English autonomously, monitor and master the situation of College Students' English autonomic learning, improve the efficiency of College Students' English autonomic learning, and achieve the expected college students' English The effect of autonomous learning can ensure.

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# Design and Application of English Chinese Translation System Based on Feature Extraction Algorithm

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**Abstract.** English Chinese translation is a common network tool, but as a tool, it must get satisfactory results. However, in reality, most English Chinese translation tools' translation results are not accurate, and there are always problems of words not expressing the meaning, and even grammatical errors. It shows that English Chinese translation tools need to be improved. At this time, in order to achieve the purpose of improvement, this paper will design an English Chinese translation system based on the feature extraction algorithm. At the same time, the system will be applied with an example to test the application effect of the system and evaluate the accuracy of the translation results.

**Keywords:** Feature extraction algorithm · English Chinese translation system · Accuracy of translation results

## 1 Introduction

English Chinese translation tools have high application value in modern society and are needed by most people. However, the value of tools lies in the fact that the output of the tools should meet the requirements of users. This requires that the translation results of English Chinese translation tools should be reasonable and at least the correct meaning should be output accurately. However, most modern English Chinese translation tools do not do well in this regard. The result of translation is often that the words do not express the meaning, so its instrumental value is not high. Under this condition, in order to improve the quality of English Chinese translation tools and make them truly meet the needs of people's life or learning, it is necessary to carry out relevant research and use feature extraction algorithm to improve the accuracy of translation results of English Chinese translation tools [1, 2].

English Chinese translation tool refers to a kind of tool relying on the network or software to provide users with semantic conversion services between English and Chinese. It can translate English into Chinese with the same or similar idiom meaning, or translate Chinese into English with the same or similar idiom meaning. In this way, users who only master any one of English or Chinese can know that English or Chinese are in the other's language environment. How to express it can not only help users understand the language, but also help people with language barrier to communicate. According to the needs of most users, the ideal translation results of English Chinese

translation tools should not only have the same or similar semantics, but also have smooth grammar, which is relatively low. However, the actual situation is not satisfactory. Most English Chinese translation tools can only achieve the same or similar translation results, but there are obvious defects in grammar fluency. Taking Baidu online translation tool as an example, when users input English or Chinese sentences, they can only get a poor translation result. This phenomenon is found in other English Chinese translation tools. Translation tools are also very common, which shows that modern English Chinese translation tools can not fully meet the needs of users, making their tool value decline [3, 4].

In modern cognition, any form of information has its own characteristics, which is no exception in the written expression of English or Chinese. Therefore, when we can obtain the information in the written expression of English or Chinese, we can know its specific meaning. In this way, we can not only communicate, but also design English Chinese translation tools in this logic. However, it is worth noting that feature extraction has two sets of indicators: vertical and horizontal. Among them, the horizontal index set is to obtain the characteristics of characters and words in the expressions of English or Chinese characters, and then translate them according to the dictionaries and dictionaries containing databases. On this index set, most modern English Chinese translation tools do well, and individual words can be translated into English or Chinese with the same or similar meaning. The vertical index set is the word order arrangement in the English or Chinese language expression, which is related to grammar. If we can accurately obtain the grammatical features and make clear the subject, object and predicate in the English or Chinese language expression, we can carry out the conversion according to the grammatical rules. However, most English Chinese translation tools have defects in the vertical indicators, which is not very good. The main reason for this phenomenon is that there are differences in grammar and words between English and Chinese. For example, in English, surname is placed after the first name, while in Chinese, surname is put before the first name. At the same time, some idioms, rare words and words in Chinese do not even have similar meaning in English, which makes English Chinese translation tools not effective in vertical index set. Therefore, in order to improve English Chinese translation tools, it is necessary to strengthen the feature extraction ability on the vertical index set, which is the only way to achieve the purpose of improvement [5–7].

## 2 Feature Extraction Algorithm

In order to better improve the English Chinese translation tools, this paper will choose the feature extraction algorithm. The algorithm selection mainly revolves around LDA Algorithm.

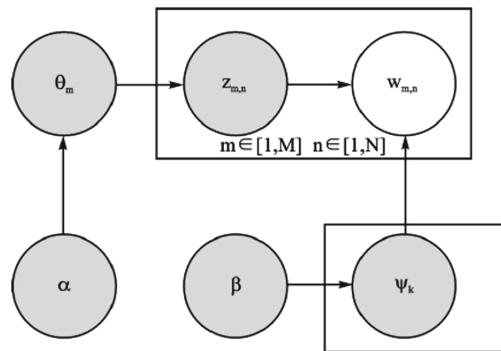
LDA is equivalent to an unsupervised learning tool, which can learn and analyze large-scale document sets and corpus data, and learn the hidden information. Here, LDA uses a method called word bag, which will treat each document as a word vector, so that the text information can be easily converted into digital information. At this time, modeling will become simple. Although the one-step method can make the word order more simple, it can not make the word order more simple. Fortunately, in the later

development research, LDA algorithm makes up for this defect. In the new LDA Algorithm, each document represents the distribution probability of a topic. At the same time, each topic has the probability of word formation. As long as it is supported by the standard logic, the probability will be greatly increased and the grammar arrangement can be realized. Therefore, LDA Algorithm is also a feature extraction algorithm, but it is quite different from TF-IDF algorithm, that is, LDA Algorithm is mainly based on documents, and takes the input document as the vector of a word, and does not consider the order of words in the document temporarily, so as to construct a document set. The method is: when the document is generated, the Dirichlet distribution is used to realize the topic distribution, and then the words are distributed in the documents with the same subject. In this case, the order of words in the document is considered, and the word order can be arranged according to the number of words and the attributes of words. LDA Algorithm is special among many feature extraction algorithms. It has no fixed formula, but it has operation logic. Table 1 and Fig. 1 will introduce the operation logic of LDA Algorithm. In addition, the most important step in LDA Algorithm is to obtain the parameters of  $\alpha$  and  $\beta$ , which needs to be completed through four steps: (1) text initialization, random processing of a document to obtain random subject number; (2) scanning, using Gibbs sampling method to collect each word; (3) iteration, when Gibbs sampling begins to converge, the current value is both  $\alpha$  and  $\beta$ ; (4) statistics, according to According to the order of document → subject → word, the frequency statistics of the matrix in the database is carried out.

**Table 1.** The algorithm of operation of LDA

Representation of algorithm elements	Algorithm element interpretation
$\theta_m$	Indication of document set topic distribution
$\alpha$	Topic distribution of document set
$\alpha - z_m$	Production process of document m
$z_{m,n}$	Subject number to which the word belongs
$\Psi_k$	Word distribution under the theme
K	Number of words
$W_{m,n}$	Word number in document
$\beta - W_{m, n}$	Select the word distribution under the topic distribution
m	File

The LDA algorithm can arrange the word order according to the number of words and the attributes of words, which shows that the LDA Algorithm has the ability to extract the features of the vertical index set. Therefore, this paper will choose this algorithm to optimize the English Chinese translation tools.



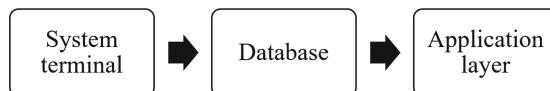
**Fig. 1.** Operation logic of LDA Algorithm

### 3 Design of English Chinese Translation System

#### 3.1 System Environment and Framework Design

**System Environment Design.** Referring to most of the current English Chinese translation tool styles, most of these tools are online tools, and their environment is web environment, so the system will be designed in this environment. Web is a web page, which can provide users with real-time online services. This feature will also be reflected in the English Chinese translation tool system designed in this paper.

**Design of the Basic Framework of the System.** Based on the web environment, the basic framework of the system is shown in Fig. 2.



**Fig. 2.** Basic framework of the system

#### 3.2 System Implementation Method

The system implementation method is as follows.

**System terminal.** Page design scheme is mainly used to form the initial interface of the system terminal, and the functional layout design is done well in the interface, such as the layout of function buttons, including “translation” and “pronunciation” buttons. This is not the key point, so there is no more details. In order to better adapt the system to most of the current English Chinese translation tool styles, the terminal design is integrated with hyperlink technology, which enables users to enter similar keywords such as “English Chinese translation” in the Internet to obtain the system, and then click the hyperlink to enter the initial interface to start translation.

**Database.** Cloud storage technology is mainly used to realize the database. After completion, common English, Chinese dictionaries, dictionaries and grammar logic of English and Chinese are imported into the database. These data are original data; **Application layer.** After entering the initial interface, the user can input key words in the information column. After the “translate” button of classics, the system will identify the language and output the translation results.

### 3.3 System Operation Process

First of all, the user can find the system through the Internet and click the hyperlink to jump to the initial interface. There are information input fields and related function buttons in the interface. Users can input the information they want to translate in the information input column. Secondly, when the user input the information and click the translate button, the system will identify the language according to the original data, find the words with similar semantics in other languages in the original data, and arrange the words according to LDA Algorithm. Finally, the translation results with smooth grammar and accurate semantics are output.

## 4 Application and Results

### 4.1 Application

In order to verify whether the application of the system is effective and whether the purpose of tool improvement is achieved, the following will be the actual application test, the specific content is as follows.

### 4.2 Parameter Setting

It mainly sets the application test parameters, including the amount of phrase translation, short text translation, translation speed, semantic recognition speed and grammar recognition speed. The setting results are shown in Table 2.

**Table 2.** Parameter setting results

Parameter	Set the result
The quantity of phrase translation	400 character
Translation quantity of short articles	500 character
Translation speed	10 kbps
Speed of semantic recognition	15 kbps
Grammar recognition speed	20 kbps

### 4.3 Test Plan

In this system, input phrases, short texts in English or Chinese, the input amount does not exceed the corresponding set parameters, let the system for translation. By the output of translation results, the translation speed, semantic recognition speed and grammar recognition speed of the system are counted, and the recall rate, accuracy rate and accuracy rate of the translation results are detected manually. If the translation speed, semantic recognition speed and grammar recognition speed of the system meet the requirements of parameter setting, and the recall rate, accuracy rate and accuracy rate are excellent, then the application of the system is effective. To achieve the purpose of improvement. The above scheme will be cycled 20 times, each time for statistics, and then the statistical results will be comprehensively calculated, taking the average value as the final result.

### 4.4 Results

According to the test scheme, the final average value is obtained by comprehensive calculation. See Table 3 for details.

**Table 3.** Test results of the system

Test indicators	Test result
Translation speed	8–10 kbps
Speed of semantic recognition	12–15 kbps
Grammar recognition speed	17–20 kbps
Recall	89.7%
Correct	97.3%
Accuracy	91.5%

According to the data in Table 3, firstly, the translation speed, semantic recognition speed and grammar recognition speed of the system meet the parameter setting requirements, so the system efficiency is guaranteed. Secondly, the recall rate, accuracy rate and accuracy rate of the system are basically above 90%, especially the accuracy rate is as high as 97.3%, which shows that the system is effective and achieves the purpose of improvement.

## 5 Conclusion

In conclusion, this paper analyzes the design and application of English Chinese translation system based on feature extraction algorithm. LDA Algorithm is selected for system design. Through the design, a theoretical English Chinese translation system is obtained, which is superior to the previous English Chinese translation system. It has good translation performance in both horizontal and vertical index sets. Then, the

system is tested and the results show that the system is better than the previous system, and it can output the translation results with accurate semantics and smooth grammar.

**Acknowledgement.** This article is supported by the 2020 Humanities and Social Science Key Project of the Department of Education of Anhui Province (SK2020A0677). In 2019, Anhui Province School-Enterprise Cooperation Demonstration Training Center “Ma’anshan Teachers College Hefei Shamanla E-Commerce Co., Ltd. School-Enterprise Cooperation Demonstration Training Center” (2019xqszx04). The 2019 Anhui Province boutique offline open course “English Interpretation and Translation” (2019kfkc184). The 2020 school-level teaching and research key project (2020xjzdy03).

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# Research on the Application of Data Mining Techniques in the Construction of Sports Training Models

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**Abstract.** As China is a major sporting nation, the daily training is the primary way to improve the level of sports skills, scientific and reasonable organization of targeted training is of great significance to athletes. Regardless of the type of sport, the development of technical and tactical training requires scientific data as a reference standard, and the data is integrated and analysed in depth for the development of training programmes. The emergence of data mining technology allows the results to be used directly in the training process and to develop individualised training programmes based on the actual requirements of the sport. This approach thus effectively solves the problem of training guidance due to the lack of traditional training data support and provides a new direction for training model optimisation.

**Keywords:** Data mining techniques · Sports training models · Applications

## 1 Introduction

Strengthening sports training, for improving the athletes' special technical level and sports quality, plays an outstanding role. In order to achieve the ideal training effect and effectively ensure the economic quality of the athletes, needs to organise the athletes to conduct scientific and reasonable training, and carry out comprehensive control of the whole training process. However, as the traditional training mode still occupies a large proportion at this stage, more often than not, it is only by virtue of the coaches' experience that they formulate programmes and carry out uniform physical training such as strength endurance and speed. Based on the perspective of data analysis, if the data analysis is not deep enough, and the system will not be able to derive the regular information of the sports process, thus making the information feedback speed can not meet the fast-paced training game process, which has a negative impact on the athletes' game performance improvement. This is one of the main reasons why data mining techniques are being used in an integrated way.

## 2 Relevant Rules and Algorithms for Data Mining Techniques

Data mining techniques have been a popular area of database research since the 1980s and are now understood to be based on extracting information and knowledge from large amounts of complex random data that is not known in advance. For example, if we want to count the scores of athletes in a particular game, we need to use the data to analyse the statistics and rely on algorithms to mine the potential connections between different data. From a task perspective, based on their own experience and data analysis systems can “actively” access certain hidden correlations, and these potential relationships can be very useful information to help decision makers make appropriate decisions on the one hand, and to build a larger system knowledge base on the other [1]. The technical training quality monitoring and tactical statistics system, as the main data collection tool, is able to extract key information from past data, integrate and analyse a large number of matches, provide a more scientific and effective data base for later data mining, and also undertake the corresponding functions of information maintenance and simple analysis.

The relational database is the main object of data mining. Each two-dimensional table consists of rows and columns, reflecting the relationship between the various rows and columns in the table, and the query function that comes with the system is used to obtain the corresponding information and the degree of association of the information, etc. If data mining is carried out on this basis, we can obtain more in-depth content [2]. In addition transaction database or data warehouse etc. can also be used as the main object of data mining, and the steps of data mining are shown in Table 1 below.

**Table 1.** Main steps in data mining

Data mining steps	Description
Data preparation	Data integration, data selection and pre-processing
Data mining	Natural analysis of data
The results indicate	Draw conclusions

As can be seen, in the data preparation step, several pieces of data are first combined and formed into a unified data from the cleaning and filtering process, i.e. the collection of data to be analysed is selected according to the general direction to be mined and then pre-processed to transform it into a different form suitable for mining. In addition, the preparation of the data is the most crucial step, as we use different algorithms in data mining (clustering algorithms), etc. to analyse and process the data generated in the first phase. In the presentation and interpretation of the results, once the conclusions have been described in natural language, they can be applied to the solution of specific problems, looking for potential connections between things. In fact, database tables and fields are all linked in some way, and we can use statistical data analysis methods to process the records in order to locate the data and find the desired pattern. In a common decision tree approach.

### 3 Related Rules and Algorithms for Correlation

The specific rules of association are as follows.

$$\text{confidence}(A \Rightarrow B) = \frac{\text{support}(A \cup B)}{N} \times 100\%$$

Whereas the classification of association rules is more diverse, if the type of data to be analysed is non-nasty data, then the association rules to be adhered to between these data are Boolean association rules. And if the data to be analysed is numeric data, then these association rules with specific data are known as numeric association rules. It is important to note that if the data to be analysed is only considered existential in terms of the values taken, without regard to hierarchical requirements and realistic needs, then the association rules that are to reveal the association between the data are known as single-level association rules. From an algorithmic point of view, there are a variety of targeted algorithms, and there are two main types of algorithm in common use today. One is the Apriori algorithm, as an iterative algorithm, the core content of which lies in the use of candidate sets to find frequent sets of items, the main purpose is to find the highest frequency of occurrence of the value, after finding all combinations in turn count the number of times each combination occurs, and then after all combinations below a set threshold are eliminated, the remaining combinations continue to correlation statistics can be expressed as a Boolean type of relationship, until finally The remaining combinations can then be correlated as Boolean relationships until the final combination is found. In essence, this algorithm is also a process of continuous concatenation and subtraction, producing results by scanning the data [3]. The main drawback of this method, however, is that it requires multiple scans of the database and can therefore produce a relatively large set of candidates.

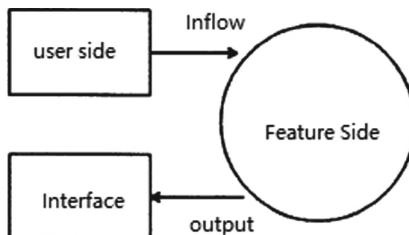
In contrast, the FP-growth algorithm uses a tree structure, the FP-tree, to select a set of data that is greater than a certain domain value after the data has been recorded first, and this algorithm scans the data to obtain the corresponding multiple paths. Compared to apriori, this method is faster and the selection of branching strategies reduces the number of irrelevant sets, but still requires a larger space to construct the corresponding FP-tree [4].

### 4 Sports Training Model Construction and Statistical System Design

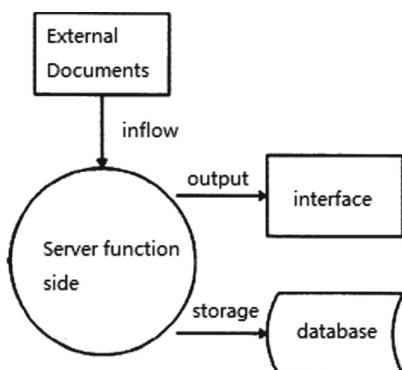
As the sports training quality monitoring and clinical tactics statistics system can exist as a corresponding collection tool, we can collect a large amount of actual training and game data from athletes after quality monitoring and tactics statistics through this method, providing more scientific and effective data support for data mining [5]. It is worth mentioning that the whole system also allows the data to be statistically analysed and information maintained. In terms of the overall requirements of the system, there are certain problems with the current quality monitoring and sports data collection, mainly in terms of the subjective nature of the quality evaluation in daily training and

competition. Over the years, this data is difficult to manage in a unified manner and is not easy to carry and find. This is compounded by the fact that the training and competition data is statistical in nature and in the absence of in-depth analysis, many key data cannot be fully utilised. The whole system can be used directly as a data collection tool using mobile devices, which on the one hand overcomes the shortcomings of paper materials and on the other hand allows the daily training situation to be directly stored in the mobile terminal for simple and intuitive data presentation. In addition, the server side can extract and integrate the coaches' match data and store them together in the database on the server side. After the establishment of a comprehensive platform on the server side, the use value of the data for mining and analysis will be more prominent [6].

Data flow analysis, on the other hand, is dedicated to studying the operation of data within the system. If we consider sports technical training, quality management and tactical statistics as two physical parts of the system, then it can be divided based on the different functional ends to determine the flow of data [7]. Specifically looking at the mobile user side entering the training data, to the mobile functional side, it is possible to show the user simple results through the interface, and then the match data or training data than is uploaded into, the server functional side and stored in the server side database, Fig. 1 and Fig. 2 represent the working model of the two different functional sides respectively.



**Fig. 1.** Data flow on the mobile function side



**Fig. 2.** Data flow on the functional side of the server

On top of the data flow analysis, the mobile terminal and the server terminal will assume different functional requirements. The mobile terminal empowers the program to collect the daily training data of the athletes, which facilitates the coaches' comparative analysis and technical and tactical statistics; the coaches determine the training plan within the mobile terminal and store the various collected data in the database cure, which is the main object of the auxiliary information management. With the convenience of the mobile terminal, the evaluation of the technical characteristics of the athletes helps to determine the future requirements of the game and to adjust and improve the current techniques and tactics in time. It is also possible to simulate a real playing field if necessary, dividing the field into several scoring and scoring loss areas, allowing the system to determine the techniques and tactics that athletes may use in order to carry out training plan management and process analysis on a comprehensive information processing platform [8].

After analysing the system according to its requirements, we can understand that the system for quality monitoring of technical training and tactical statistics has a large number of modules, with corresponding sub-modules on different modules. The mobile module will input information into the system based on the clinical performance of the athletes, and then derive key information about our own and the opponent's aggressive tactical situation, which will then help the athletes to make their own field commands and responses, changing the previous practice of making judgements based on perception. For example, the field monitoring and statistics module provides statistics on average game time and training rounds and carries out preliminary analysis. The Tactics Demo Board module simulates sporting strategies in both single and multi-player modes, examining the technical and tactical aspects of the game and the defensive and attacking requirements of the field. The training plan module includes a Monday to Sunday work cycle, which contains a large amount of data on the technical and tactical scoring of training matches, as well as information from the platform and other supporting content that can be extracted and integrated in the web management system [9].

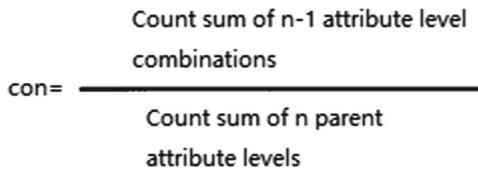
The first step in data mining is to pre-process the data and integrate the attributes in the table in a hierarchical way, without duplicating values between the levels of each attribute. In the case of table tennis, for example, the data in Table 2 is a concrete representation of the data.

**Table 2.** Table tennis data types

Data number	Data types
1	Points scored, points lost
2	Failure
3	Serve direct to score
4	Big score

The analysis of the data steps allows the frequent item set to be obtained, after which the algorithm for the strong association rule improvement is output in the form of a scan of the database, which will only perform a single read operation on the

database, allowing each record to be counted for different levels of values for the same attribute [10]. This is shown in Fig. 3.



**Fig. 3.** Output strong association rules

After pre-processing the sports according to the needs of data mining and improvement algorithms, the corresponding attributes can be determined according to the different technical categories in the different sports, and then the database can be scanned according to the numerical size and algorithmic rules to obtain the connection between the calculation book characteristics and the root of the gains and losses of each athlete in the competition, which can eventually lead to the development of personalised and targeted training methods for the coaches.

Of course, in future practice, we can also strengthen the real-time statistics of techniques and tactics and the scientific monitoring of training quality. For example, to continue with the table tennis sporting ability I mentioned before, the coaches record the use of various techniques of the athletes and then provide them to the coach in a concise way to make adjustments for the strategic and tactical deployment of the game. At the same time, scientific and effective evaluation of training programmes in table tennis is crucial to improving the quality of training. AC Cloud allows for the input of various training data directly within the system, recording information corresponding to different technical characteristics for grid-based analysis and filtering out useful conclusions from the large amount of data. However, the current algorithm has certain shortcomings, the technical process is often limited to the target database is affected and the overall operational efficiency is hindered by the effect of the algorithm in practice, these are the specific issues that need to be addressed in the next step. For example, in future practice sessions how to effectively select the attributes to be analysed or how to optimise the training model in a targeted way, combining various aspects such as physical fitness or physiological indicators. These should be incorporated within future data mining systems. This is used to build a more scientific and effective framework for training guidance.

## 5 Conclusion

In the context of the changing rules of future sports, in order to ensure that training results are more scientific and effective in helping athletes to improve their game and technical and tactical abilities, we need to optimise the overall training, quality control and tactical statistics system for each sport, so that the daily training data can be collected and then collated. If necessary, a comprehensive database should also be

established to solve the problem of traditional data collection not being timely and comprehensive. Based on the results of data mining, the results can be applied to specific training content and competitions, allowing for the development of individualised training programmes for athletes and providing new ideas and insights to optimise training methods.

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# **Short Paper Posters**



# Design and Implementation of C# Minesweeper Game Software

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**Abstract.** Minesweeper game is a small game that is built in the Windows operating system. C# plays a significant advantage in the field of software development and design. In this paper, the overall operation framework of C# minesweeper software is designed, algorithm analysis and system design are proposed.

**Keywords:** C# · Minesweeper Game · Designing the Game

The main area of minesweeper game is made up of a large number of squares. After starting the game, the system will randomly place mines in a number of squares. The corresponding number will be presented by clicking on one of the squares at random, which means how many mines are buried in the eight squares around it. If the square block is displayed as a blank block (0), it means there are 0 mines around, and the surrounding square blocks will be opened automatically. If there is a blank block (0) around, there will be a chain reaction in the system. And if there is mine in the square block, right click can be made to mark it, and the mark symbol is inserted red flag, and the the mark will be canceled by clicking again. During the game, a counter is set above the minefield square to show how many mines are left in the current square. On the top of the square area, the smiling face in the middle indicates that you can start a new game, and on the right is the time spent in this game. If the user finds all minefree blocks and marks all blocks with mines, it means the the player succeeds in finishing the game; Otherwise, the player lose the game.

## 1 Random Function

In a C programming environment, the random function is the rand () function. After adding the <stdlib. h> file, random numbers will be generated through this function. However, the random number generated by the rand () function is not really a random number, but rather a pseudo-random number. Because by repeatedly calling the program, you can see that the random number you get all the time is the same number, there

is no randomness. Because rand () is based on the value of a random number seed, it is deduced by a formula. The value of the random number seed will be set to 1 by default, and the RAND () function will observe the value of the random number seed at call time. If the value of the random number seed is set to 1 by default without any change, the obtained seed will be repeated. Therefore, to get a different random number, the value of the random number seed should be changed before operating the program. Based on this, the rand () function is applied to set the value of random number seed, so that different random number seed values can be used to generate the random number required by the game software system when the rand () function is called [1].

To realize the randomness in minesweeper game, it is necessary to initialize the data at the beginning of the game, so as to complete the game interface without tiring, so that the mines can be arranged without repetition in this system each time. The application of random function in minesweeper game is mainly to initialize the game interface. Besides, the coordinates can be randomly generated in the game interface area through the random function to judge whether coordinates are blank or not and the coordinates are marked as mines. Before adopting random functions and starting the game, different game opening can be obtained to greatly improve the game interestingness and challenging feature, as a result, to increase the attractiveness of minesweeper game for players.

## 2 Analysis of Algorithm

### 2.1 Random Distribution of Mines

Minesweeper game needs to be randomly mined in the ROWS row, COLS column game area, and the number of mines is MineNum. C# can provide the random function rand () for random distribution of mines [2]. The minesweeper game can be regarded as a two-dimensional array Mine [ROWS\*COLS]. In this study, ROWS and COLS are set as 5, and then Mine is [5, 5]. See Table 1 below.

To randomly distribute MineNum mines in 25 (ROWS\*COLS), the program is carried with repetition for MineNum times, a random number valued 1 ~ 25 can be obtained for each repetition, and the corresponding region of this number is marked as mine. But as a random number from 1 to 25 is a bit space, the number needs to be converted into a table cell indicated by a two-dimensional array by a conversion algorithm. In addition, the random numbers obtained each time cannot be the same as the previous random numbers, so it is guaranteed that MineNum of non-repeating random numbers can be generated.

**Table 1.** Two-dimensional minefields

[0,0]	[0,1]	[0,2]	[0,3]	[0,4]
[1,0]	[1,1]	[1,2]	[1,3]	[1,4]
[2,0]	[2,1]	[2,2]	[2,3]	[2,4]
[3,0]	[3,1]	[3,2]	[3,3]	[3,4]
[4,0]	[4,1]	[4,2]	[4,3]	[4,4]

## 2.2 Calculation of the Number of Mines

During playing minesweeper game, after clicking on a cell without a class, the cell will display the number of mines in the vicinity, so the number of mines in surrounding 8 tale cells can be marked in the mine free area. Based on the abstract relation of mathematics, the locations around Mine[i, j] are shown in Table 2 below.

**Table 2.** Location around the Mine [i, j]

Mine[i-1, j-1]	Mine[i-1, j]	Mine[i-1, j + 1]
Mine[i, j-1]	[i, j]	Mine[i, j + 1]
Mine[i + 1, j-1]	Mine[i + 1, j]	Mine[i + 1, j + 1]

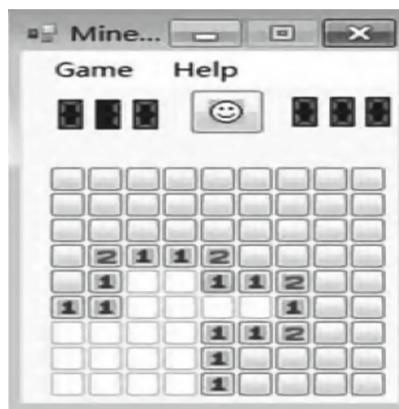
## 2.3 Automatic Displaying Mine Free Areas

In order to promote the efficiency of demining, when the player clicks on the white cell, the surrounding 8 areas will be automatically unfolded, and if there are blank cells in the 8 areas, it will continue to expand until the cell with the number is discovered, so recursive algorithm can be used for processing in this part [3].

# 3 System Design and Implementation

## 3.1 Design of Main Interface

The main game interface of minesweeper can be divided into information display area, menu area and game area. NET based development winForm program has a complete GUI library to call, which is more convenient to make the game interface. The mine display and time display section can be done with the Picturebox control, as shown in Fig. 1 below. The game area cell and the game start function are mainly realized by



**Fig. 1.** Design of main interface of minesweeper game

manipulating buttons. Besides that, NET can also provide a timer control for the minesweeper game, so that timing technology in the minesweeper game can be achieved [4].

### 3.2 Initialization

#### 3.2.1 Random Distribution of Mines

The size of game area in minesweeper game is mainly determined by ROWS and COLS and ROWS represents the number of rows. For example, COLS represents the number of columns. ROWS and COLS in Fig. 1 are both 9, and the size is ROWS\*COLS = 81. There are 10 mines in total. Therefore, after 10 times of repetition, randomNumber in the closed interval [0, 80] is generated by adopting random numbers, and the corresponding position of two-dimensional matrix is made clear based on the conversion algorithm. Meanwhile, different random numbers [5] are also to be generated by the algorithm.

#### 3.2.2 Configuration of Mine Free Area

After random mines are completed, the location of the non-minefield needs to be set, that is, the number of eight cell blocks around the non-mine cell is numbered on the non-mine cell. After all minefields are cycled on one side, if it is found that they are not mines, the number of mines around the block of the unit needs to be calculated. In the case of zero mines, the bIsEmpty needs to be set to true.

#### 3.2.3 Automatic Generation of Interface

After opening the game interface, players can select different ROWS rows and COLS columns and different number of mines according to their own situation, and then start the game. This step can be completed with the use of dynamic minefield generation algorithm, that is, according to the user's choice, a new mine grid composed of multiple mine objects needs to be created in real time. Therefore, in the beginning, mine areas are not fixed in form, but dynamically generated in real time before the game starts [6–8].

#### 3.2.4 Handling of Mouse Related Events

Because this project is a button created in dynamic form, the click event on the button fails to be set by using a static method, but instead, the delegate mechanisms in c# can be used to pull the mouse event below the button.[9]This. mButtonlist [i] Mouse-Click + = New Forms. MouseEventHandler (Mouse – Click).

And the left or right mouse button is used to carry out the next step, it is necessary to determine in advance whether to press the left mouse button and carry out the next step before handling the event by the left mouse button or the right mouse button.

#### 3.2.5 Mines

Based on c#, every cell in minesweeper area can be designed as teardrop, and this mine class is mainly inherited from the button class, so that each mine block can be clicked with the mouse. At the same time, the following variables can be created in the mine class, so as to realize the game logic of minesweeper [10].

## 4 Conclusion

The minesweeper game can be designed with the functions that left mouse can be used to start and right mouse can be used to mark the minesweeper functions. Besides, the functions in timing and showing the number of mines left in the cells, user-definition of the geometric number of mines and automatic presentation of mines by clicking on the blank cells. And through the experimental test of this minesweeper game, the interface is upgraded with beautiful, concise outlook and the results obtained are correct. All functions can meet the requirements of the minesweeper game. The design approach to minesweeper can be useful for development of other.net based game development. Mouse can be used in a minesweeper game, which can also be applied in other Windorm programs, enabling professional game designers to quickly develop professional applications through the.NET platform, so the design of a minesweeper game has a very important significance.

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# Research on Program Design of Internet English Radio in Chinese Medicine Universities

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**Abstract.** This paper expounds the characteristics of Internet English Radio and its application in Chinese medicine colleges and universities, and combines its advantages in the dissemination of Chinese traditional culture and the study of English language in TCM colleges and universities. The purpose of this paper is to give full play to the advantages of Internet English Radio and provide reference for the establishment of Internet English Radio in Chinese medicine colleges and universities.

**Keywords:** Internet · English broadcasting · Universities of Chinese medicine

## 1 Introduction

English radio stations have been developed and used by more and more universities with the help of the rapid development of the Internet for its low cost, good sound quality and easy maintenance [1]. Under the guidance of the spirit of the Nineteenth National Congress, the Internet English Radio established by Chinese medicine colleges and universities should shoulder the glorious mission of international communication of Chinese excellent traditional culture and the beneficial supplement of college English teaching. This requires college English teachers in TCM universities to combine the traditional cultural characteristics of TCM universities and the English learning needs of our students, reasonably design the radio program and improve the English language application ability of college students in TCM universities in order to spread the excellent traditional culture of the Chinese nation at home and abroad.

## 2 Characteristics of Internet English Radio

With the rapid development of Internet information technology, network listening tools are becoming more and more diverse. At the same time, listening channels are becoming more and more abundant, and the broadcasting forms in the information age have changed dramatically.

## 2.1 Websites

Many English radio stations have created websites, and radio programs can be listened to through the Internet without the shortcomings of time limitation, unreproduced content, and no reference text of traditional broadcasting.

## 2.2 Apps

Many English-language radio stations have developed mobile APP software allowing listeners to choose radio stations to listen to English radio programs anytime and anywhere through the mobile network, and to choose similar modules such as “online demand”, “private customization”, “fun interaction”, “paying for high-end services” according to their personal preferences. The audience has gained unprecedented freedom to listen with the Internet and new media.

## 2.3 Players

Besides, various kinds of editing software of electronic players, audio and video on the Internet have sprung up, and listeners can use these software and players to save, edit and play English radio program files in the form of audio or video downloaded from the Internet according to their hobbies and needs [2].

# 3 Application of Internet English Radio in Chinese Colleges and Universities

In recent years, the number of Internet radio stations established in institutions of higher learning has gradually increased from scratch.

## 3.1 Computers

Taking Baidu browser as an example, first of all, “university radio station” was put in and “National University Broadcasting Union” was retrieved, and the names, broadcast time, broadcast forms, FM, WeChat number, Weibo, key operating platforms, Weibo address and other details of 256 institutions of higher learning radio station were found. Secondly, “the official website of university radio station” was put in and 12 related websites were found. Finally, “official website of college English radio station” was put in, and only one related website was found, namely “Henan Institute of Engineering Foreign Language Radio Official Website”.

### 3.2 Mobile Phones

The highest downloads found in Apple's App Store and Android App Stores were the "Himalayan FM" and "Dragonfly FM", both of which were downloaded. And the following were the findings:

Taking the "Himalayan FM" as an example, the key word "campus broadcast" was put in, 20 relevant radio stations were found. "Campus English broadcast" was put in, only 3 relevant radio stations were found, namely, "Hainan University English Broadcasting Channel", "Shandong University English Broadcasting Station" and "East China normal University English Broadcasting VOE".

Taking "dragonfly FM" APP as an example, a total of 57 campus radio stations were retrieved, including 55 campus radio stations in colleges and universities, but only 5 Internet English radio stations in colleges and universities were found, namely: "English Radio of Communication University of China", "Foreign language Radio of Shanghai University of Foreign Languages", "Foreign language Radio of Nanshi (Nanjing normal University)", "English Radio of Jilin Animation Institute", " Foreign language Radio of Henan Institute of Engineering".

Thus, in recent years, although the number of Internet radio stations in colleges and universities has increased, the number of Internet English radio stations is not large. It is urgent for English educators in colleges and universities to actively carry out relevant analysis and research in order to give full play to the advantages of Internet radio stations, strengthen college students' English ability (tell Chinese stories in English) and speed up the international dissemination of Chinese traditional culture (describe Chinese culture in English).

## 4 Programme Design of Internet English Radio for Chinese Medicine Universities

A week's programs as shown in the following tables were designed according to the characteristics of Internet English radio in view of its development in colleges and universities, combined with the traditional cultural characteristics of Changchun University of traditional Chinese Medicine and the students' English learning needs and schedule (Table 1 and 2).

**Table 1.** Programme design from Monday to Friday

Time		Column	Content
Monday Chinese Medicine	7:30–8:00	Xinglin Classroom	TCM words
	12:00–13:00	Qi Huang Talk	TCM experts' experience in a classical prescription
	17:30–19:30	TCM Treasure	Introduction of a TCM treatment tool
Tuesday Chinese Herb	7:30–8:00	Xinglin Classroom	Herbs words
	12:00–13:00	Qi Huang Talk	Pharmacists' experience in the compatibility of herbs
	17:30–19:30	Herbs Treasure	Medicinal properties of a herb
Wednesday Acupuncture	7:30–8:00	Xinglin Classroom	Acupuncture words
	12:00–13:00	Qi Huang Talk	Acupuncturists' experience in a manipulation
	17:30–19:30	Acupuncture Treasure	Introduction of a Acupuncture tool
Thursday Massage	7:30–8:00	Xinglin Classroom	Massage words
	12:00–13:00	Qi Huang Talk	Massagists' experience in a manipulation
	17:30–19:30	Massage Treasure	Introduction of a Massage tool
Friday Nursing	7:30–8:00	Xinglin Classroom	Nursing words
	12:00–13:00	Qi Huang Talk	Nurses' experience in practical operation
	17:30–19:30	Nursing Treasure	Introduction of a nursing tool

With the help of the school Internet English radio station, the English input of students' professional knowledge would consolidate their professional knowledge through the design of the column contents of different sections of the above week's programme in a semester (16 teaching weeks). At the same time, Chinese medicine culture would be carried forward and inherited effectively.

**Table 2.** Programme design on weekends

Time		Column	Content
Saturday	7:30–8:30	TCM news	Broadcast of <i>China News of Traditional Chinese Medicine</i>
	8:30–9:30	Award-winning quiz	Words test
	9:30–11:40	Express of CET-4&6	Interview of a college English teacher on CET-4&6
	14:00–16:00	English for Postgraduate Admission Examination	Interview of a college English teacher on strategies of the exam
	18:00–19:00	Leisure time	Play Taiji music and English instructions
	19:00–20:00	TCM abroad	Interview of a TCM expert with foreign experience on the international spread of TCM
Sunday	7:30–8:30	TCM news	Broadcast of <i>Campus Newspaper of Changchun University of Chinese Medicine</i>
	8:30–9:30	Award-winning quiz	Words test
	9:30–11:40	Express of CET-4&6	Interview of a college English teacher on CET-4&6
	14:00–16:00	English for Postgraduate Admission Examination	Interview of a college English teacher on strategies of the exam
	18:00–19:00	Leisure time	Play Taiji music and English instructions
	19:00–20:00	TCM abroad	Interview of a TCM expert with foreign experience on the international spread of TCM

## 5 Conclusions

College students' study is restricted by many factors and conditions, such as time, teachers and teaching facilities [3]. The effective use of Internet English radio stations can overcome the above difficulties. College English teachers should design English programs broadcast in combination with students' professional and cultural characteristics, and promote the development of Internet English radio stations in colleges and universities. By doing this, students' master of professional English knowledge would be promoted and the excellent traditional culture of the Chinese nation can be inherited and carried forward [4–8].

**Acknowledgements.** This work was supported by the fund: Research and Practice on the Construction of English Curriculum of Traditional Chinese Medicine Culture.

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# Application of Computer and Electronic Information Technology in Engineering Management

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**Abstract.** The management of engineering projects has the important characteristics of high technology and complex engineering. It is embodied in the construction of large-scale projects. The work flow will be quite numerous and complex, especially many engineering personnel. Facing such a responsible situation, it is easy to have problems in management, so it is necessary to manage technology reasonably and efficiently. Among these problems, it is possible to cause information loss, information error or omission due to the large amount of engineering information and documents. According to the statistical analysis of big data, two thirds of the problems in project management in large-scale engineering construction projects are all caused by the problem of information exchange. In addition, there is a big problem related to the cost change and information exchange, which eventually leads to a great cost in the construction of the project. Therefore, it is very important to manage the construction of the project by means of computer and electronic information technology.

**Keywords:** Computer · Electronic information technology · Engineering management

## 1 Introduction of Computer Electronic Information Technology and Engineering Management

With the advent of big data era, China's science and technology has entered a rapid development stage. Computer information technology has been blooming everywhere in China, and plays an important role in various fields. People's work and life cannot be separated from computer electronic information technology. Computer information technology has changed our attitude and lifestyle, and also facilitates our life. Engineering management has been in our vision since the 1980s. Up to now, computer electronic information technology has played an irreplaceable role in engineering management, so computer electronic information technology is an indispensable technology in engineering management. We optimize the project management by means of computer electronic information technology, and finally achieve scientific and modern development of engineering management [1–4].

## 1.1 Introduction of Computer Electronic Information Technology

Computer electronic information technology appeared in the third technological revolution, which is a very great technology. The contemporary world is the era of science and technology, and the era of talent information. Computer electronic information technology has been widely used in various fields, and has changed our attitude and lifestyle, and provided great convenience for our life. In the development of society, it is also inseparable from the application of electronic information technology. For example, the development and progress of construction engineering, water conservancy, education and other industries need to rely on computer electronic information technology. Therefore, computer electronic information technology has changed our working mode and raised working efficiency, which has brought great impetus to the development of our human society [5, 6].

## 1.2 Introduction to Project Management

Project management is to plan the early development of the project, control the scheduling problem in the process of project implementation, and also do a good job of the later maintenance of the project. If we strengthen the project management, we can promote the development of the project construction towards modernization and scientificness. At present, the development of engineering construction in China has been faster and faster, and the scale of the project is expanding. The problem is that we need to strengthen our engineering construction management, so as to improve the engineering management technology and achieve the effect of promoting the scientific development of the project management [7, 8].

## 1.3 Importance of Application of Computer Electronic Information Technology

With the development of science and technology, engineering management needs the computer electronic information technology to join. In order to realize the modernization of engineering management, it is necessary to introduce computer electronic information technology. Because the application of computer electronic information technology to engineering management can improve the efficiency and standard of Engineering Management in China to a certain extent, and achieve the goal of promoting the engineering management to have a city the competition of the field is striving to occupy an important position in the international market [9, 10].

# 2 Advantages and Characteristics of Computer Electronic Information Technology in Engineering Management

## 2.1 Advantages of Computer Electronic Information Technology

With the development of information technology, computer electronic information technology has played a great advantage in the process of data sharing and information science. Because the computer electronic information technology can ensure the

authenticity, integrity and non repudiation of data. If the computer electronic information technology is added in the engineering management, it can provide real and reliable data for engineering management, and there are it helps us make the right decision-making plan in the project management. With the help of computer electronic information technology, the accuracy of data can be ensured. Sometimes people will inevitably have errors in the work, which leads to serious problems in the process of work implementation, and may eventually lead to serious economic losses and resource waste. With the help of computer electronic information technology, we can avoid serious problems caused by artificial errors or errors as much as possible, so as to improve the efficiency and level of management work, and finally realize the intelligent and information technology of engineering management.

## 2.2 Specific Characteristics of Project Management

Project management mainly includes the following characteristics: first, the project management involves a wide range of contents and covers a wide range of areas. The so-called project management is to supervise all the plans and decisions made in the project, and supervise every link of the project work, so as to coordinate the work of various departments, and ultimately achieve the maximum efficiency of our work, so as to achieve the optimal management of resources and achieve our expected management objectives. Second, engineering management is very complicated. From a technical point of view, there are many technologies involved in project management, and there are quite a lot of difficulties in the operation process; from the organizational point of view, there are many complicated projects in the Department, and it is easy to have differences. Therefore, communication and coordination are particularly important in work. Third, in view of the systematic nature of project management, we can regard the project management as a whole. There are bound to be many branches in the whole process, and each branch is interrelated, so we must carry out systematic sorting [11-15].

## 3 Application of Computer Electronic Information Technology in Project Management

### 3.1 Project Management Application Database

Integrating computer electronic information technology into project management can effectively promote the smooth progress of engineering projects. With the help of project management technology, we can improve the overall quality of project management. Project investment plan information and project progress report are usually decided by the project manager. With the help of the project database, the relevant information can be quickly consulted to make the most of the decisions, and then the optimal project scheme can be designed to make full use of resources, accelerate the progress of project management, and save the cost of management project finally, the reasonable control of funds will be realized.

### 3.2 Engineering Material Management Application Database

The management of engineering materials in engineering management can also promote the development of engineering material database with the help of computer electronic information technology, so as to ensure the quality of materials in engineering management. In the project material management, whether the materials in the project are correctly stored, whether the material quality meets the standards, and whether the materials in the transportation meet the safety standards and other factors will affect the implementation of the project management. With the help of the management technology of engineering material database, it is helpful for us to classify and analyze the materials scientifically and rationally, ensure the accuracy of materials, and achieve the effect of digital development of material management information.

### 3.3 Engineering Management Application Database

Engineering construction usually has its own process, each staff will write work report according to their own work content, in order to prevent accidents in the construction. If the project management database is applied to the construction work, we can make effective statistics and Analysis on the work reports of the staff, ensure the correctness of the data, improve our work efficiency, and avoid the omission and error of manual work.

## 4 The Role of Computer Electronic Information Technology in Project Management

If the computer electronic information technology is applied to the project management, it will play a huge role. The engineering management under the computer electronic information technology involves two levels of economy and technology. As long as the reasonable combination of technology and management can improve the work efficiency, improve the technical level and facilitate the management work to be carried out on schedule. Computer information technology can be very systematic induction and analysis of data, can achieve data sharing, ensure the integrity of data. Of course, it also has a good protection effect on project funds. Unified planning of project funds and reduction of project budget cost can bring more economic and social benefits for project management.

## 5 Conclusion

With the rapid development of society and economy, the level of science and technology in China is also increasing. Computer information technology plays an important role in the development of science and technology in China. The development of people's life, work and industry is inseparable from computer information technology. Whether it is the development of economic industry, industry, or education, computer electronic information technology has been integrated into it and played

an important role. Thus, the use of computer electronic information technology is very wide and very important. High quality project management cannot do without computer electronic information technology. Computer electronic information technology brings about earth shaking changes for engineering management, improves the level of project management, makes engineering management work rise to a new height, and promotes the scientific and rapid development of China's engineering management.

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# A Brief Analysis of the Application of Computer Technology in Electronic Information Engineering

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**Abstract.** In recent years, the rapid innovation of computer technology has brought profound changes to all walks of life. The electronic information industry permeates every aspect of daily life and has been developing vigorously in our country. However, some problems have emerged in recent years. This paper starts from the analysis of the basic status of electronic information engineering, points out some of its problems, and how to use computer technology to solve the present dilemma.

**Keywords:** Computer technology · Electronic information · Industry revolution

Accompanied by the rapid evolution of computer technology, has brought new changes in all walks of life, more and more permeate into all walks of life. In the history of electronic information engineering in just a few decades, the electronic information engineering industry has achieved unprecedented development, and the electronic information industry has also become an indispensable part of the national industry [1]. Although electronic information engineering is always in the course of sustainable development, but only put forward higher standards and goals of electronic information industry, to encourage industry to better more face to face the world, to satisfy the demand of the world today, and the blooming development of computer science for the electronic information industry provides such an opportunity.

## 1 Analysis of the Industrial Current Situation of Electronic Information Engineering

Electronic information industry is a new high-tech industry in recent years, its rapid development, development effect is obvious, known as the sunrise industry. China began to develop the electronic and information industry in the 1920s, and by 1990s, the electronic information industry has basically achieved good results in China. Nowadays, the electronic information industry has already become one of the pillar industries of our national economy [2, 3]. However, along with its rapid development at the same time, inevitable also appeared a variety of problems. In this process, the market economy is changing dynamically. Therefore, the electronic information engineering industry must make corresponding adjustments to the changing market economy in a timely manner

and update and perfect itself in order to ensure the steady development of the electronic information engineering industry in China. With the continuous growth of the electronic information industry, China's electronic information industry began to pursue high-tech, high-quality products, developing towards the direction of new modernization [4]. The electronic information industry has optimized and improved its own industrial structure, which has promoted the continuous development of the entire electronic information industry. Due to the lack of innovation consciousness in China's electronic information industry, although China has a certain grasp of the relevant technologies of electronic information engineering construction, most of the engineering technologies currently used come from other countries, which seriously hinders the innovation and progress of electronic and information industry in China.

## **2 Problems Existing in the Progress of Electronic and Information Engineering**

### **2.1 Backward Technical Level**

Compared with developed countries, in China electronic and information engineering industry started late. In the early stage, the state did not pay enough attention to electronic information engineering, which led to the slow progress of electronic information engineering in China, and the technical level and talents were very backward. At present, the progress of electronic and information engineering in China is always mainly completed by the advanced technologies of developed countries, but it needs to introduce foreign technologies and methods, which requires a large amount of capital, causing the outflow of capital of enterprises and increasing the economic pressure of enterprises [5]. Due to the backward technology level, the progress of electronic and information engineering industry in China is in very passive situation, which seriously affects the innovative progress of electronic information engineering in China.

### **2.2 Lack of a Good Market Environment**

At present, in the electronic information market of Our country, the phenomena of counterfeit and shoddy goods, pirated goods selling and infringement of intellectual property rights emerge in an endless stream, which makes the electronic information market unable to have a good market environment [6, 7], and also unable to give security for subsistence and development of the electronic information project. This has seriously affected the competitiveness of domestic electronic information in the international market.

### **2.3 Shortage of Relevant Technical Development Talents**

The innovation and development of science is the basic guarantee for the advance of electronic and information industry, but at present, related technology development talents are in the stage of extreme shortage, which seriously restricts the development

of electronic and information industry. In this paper, the electronic information technology is a very complex tedious, so if you want to produce electronic products with high quality, the proper technology advanced conditions must have innovation, and technology innovation and application is performed by someone [8], so you need to have rich knowledge on technology and electronic information engineering talent.

### **3 Assurance Measures of the Progress of Electronic and Information Engineering**

#### **3.1 Increase Support for the Progress of Electronic and Information Technique**

Science and technology, as the primary productive force to promote social development and progress, will be an decisive tractive force to promote the regulation of industrial structure and further development of economy in China. Since the beginning of the new century, the demand for the adjustment of industrial structure and the deepening of economic globalization have made Our country increasingly dependent on electronic information technology to realize the continuous development of economy. In the process of electronic information technology development, it is necessary to strengthen the cultivation and development of the spirit of innovation, under such a premise, to realize the further improvement of the ability of innovation. Finally, the realization of integrated circuits, high-performance computers [9], new display and other areas of breakthrough progress. Among them, the state's supportive policies and related capital input are the key to achieve these achievements. Therefore, in the future development process, the government needs to further strengthen its attention and input, so as to achieve its long-term development.

#### **3.2 Standardize Electronic Information Market**

The current electronic information market in China is in disorder, and there is no effective system to regulate the market. Therefore, it is urgent for the country to promulgate relevant policies and regulations to regulate the order of electronic and information market and prevent the theft of electronic and information property rights. So as to ensure the market competitiveness of domestic software.

#### **3.3 Increase Investment in Enterprises in the Electronic and Information Industry**

There is a serious problem during the progress of electronic and information estate, that is, technology investment. If you want to develop this kind of product well, you must have sufficient financial support [10]. In order to promote the development of China's electronic information industry and promote in China electronic and information estate to obtain more market share in the international market, we must increase the investment in product development. In addition, the government should also give preferential incentives to this industry to promote the continuous development of the electronic information industry.

### **3.4 Improve the Training System of Electronic and Information Estate Professionals**

Electronic and information estate is a leading industry in China's national economy, but the supply of relevant talents is in a serious shortage. Therefore, the state and enterprises should strengthen the training of electronic information talents, improve the training system and talent selection system. First of all, we should improve the incentive methods for talents and put the favorable conditions for selecting talents in the first place, which is very beneficial to the attraction and retention of talents. At the same time, we should learn from foreign talent training methods and combine with the current situation of our country to establish a talent training mechanism in line with the present condition of our country. In addition, it can also cooperate with foreign advanced electronic information enterprises to explore the introduction of advanced technical concepts, to give a strong guarantee for the development of China's electronic information engineering.

### **3.5 Increase the Support of Computer Technology for Electronic and Information Estate**

The core of electronic and information technology is information processing. In electronic information engineering, it often takes on a lot of work. Information processing should not only ensure the timeliness of information, but also ensure the accuracy of information. During the development of information processing, the influence of computer technique on information processing is inevitable. Therefore, new computer technology can be effectively introduced to improve the problems encountered in the process of information processing. Then comes the security problem of information processing. In dealing with security threats, information processing technology constrains information processing by reasonable use of computer security technology.

## **4 Conclusions**

Electronic information technology will become the most important part of China's national economic development in the near future. How to guarantee a good situation for it in the process of development is an urgent priority for relevant departments in China. At the same time, the problems faced by enterprises in electronic information engineering must be strengthened and the corresponding safeguard measures should be further improved. Only in this way can we provide a good guarantee for the continuous improvement of electronic and information in China and promote the sustainable development of electronic information engineering.

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# Research on Civil Engineering Condition Monitoring Based on Wireless Sensor

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**Abstract.** With the continuous development and progress of the times, a variety of large-scale engineering construction is constantly advancing, but due to the high technical requirements of large-scale civil engineering, if the operation does not meet the standards, it may lead to very serious consequences, so the monitoring of large-scale civil engineering is very necessary. Comprehensive and efficient detection and evaluation of large-scale civil engineering can greatly improve the safety of the project. Therefore, civil engineering detection has become a new research hotspot. Through continuous in-depth research, it is found that wireless sensor technology has obvious advantages, which can help relevant personnel to monitor large-scale civil engineering. This paper mainly studies the application of wireless sensor technology in civil engineering condition monitoring, introduces the new concept of wireless sensor, compares and analyzes the existing monitoring technology, and discusses the important role of wireless sensor technology in civil engineering monitoring.

**Keywords:** Wireless sensor technology · Civil engineering monitoring · Parameter identification

## 1 Introduction

With the continuous progress of society, a variety of large-scale buildings emerge in endlessly. For large-scale projects such as dams, buildings, military facilities, due to the role of their own load and environment [1], the structural strength of the project is constantly changing. Once a major natural disaster occurs, it is easy to cause accidents. The monitoring of large-scale civil engineering is a problem of great concern at this stage. Once these structures are designed and constructed, they cannot be changed. In addition, engineering structures are lifeless, so they cannot change themselves. Therefore, this kind of large-scale civil engineering cannot produce stress response like other living bodies [2]. So, in the occurrence of various natural disasters or environmental damage, these projects cannot reduce the effectiveness of disasters, and designers often take this kind of problem into consideration at the beginning of design, hoping to improve the overall quality of the project and greatly increase the consumption of resources.

## 2 Structural Health Monitoring of Civil Engineering

Due to the current stage of civil engineering design is completely based on the mechanical principle, so many projects in the actual use process will be affected by the environment and natural disasters, which will lead to engineering structure problems or damage phenomenon [3]. If the civil engineering structure health monitoring system is combined with intelligent materials, the traditional civil engineering structure can produce the ability of intelligent perception, so that all kinds of deformation, stress, strength, position and other information in the structure can be monitored in time. Once the environment or natural disasters occur, the damage degree, degree of the structure, and the performance of the structure can be monitored in time, so that the corresponding protective measures can be taken timely. Through the analysis of these data, it can provide technical support for the future design, and help engineers and designers to understand the response of large-scale projects when damaged by the outside world, so as to deepen the understanding of engineering structure. Structural health monitoring refers to the strategy and process of damage identification and characterization of engineering structures. Structural damage will change the structural material parameters and their geometric characteristics. In this process, the periodic sampling sensor array is used to obtain the structural response, and the damage sensitive index is extracted to evaluate the health status of the structure. The application of this system can evaluate the damage of the structure in time and help the relevant personnel to design the maintenance plan as soon as possible. Therefore, the health monitoring system is a very reliable and effective method for the quality inspection of the project. The application of this technology will greatly improve the performance of the structure.

## 3 Status of Structural Monitoring

At the present stage, due to the limitations of various technologies, the structural detection system cannot be popularized on a large scale, which leads to the construction cost of structural health monitoring system is too high, and the operation and maintenance cost is also very high [4]. At present, there are many researches on health structure monitoring system in China, and many related researches have made some progress, but they cannot be popularized on a large scale. Nowadays, the application of structural health detection system is mainly focused on the bridge, which can realize the long-term monitoring of bridge condition. Now, the application level of this technology in China is not very high. In developed countries such as Japan, Germany and the United States, there are many researches and applications of structural health monitoring system, and in these developed countries, the health monitoring system has been applied to the concrete structure, realizing the monitoring of various complex structures and systems. The application of these technologies has many aspects, such as in Japan, it is used to monitor the seismic response of structures. In Italy, this technology is used to detect the damage degree of ancient buildings, so as to repair and maintain the ancient buildings in time.

## 4 Research Status of Wireless Sensor Technology

In 2003, American MIT “Technology Review” journal pointed out [5, 6] that in the future, there will be 10 kinds of technologies that will greatly change people’s lives. Among them, wireless sensor technology is mentioned. The application of these technologies will be in many aspects and fields, which will greatly change people’s lives. In this paper, wireless sensor technology is considered to be a new technology that can have a great impact on the future, which shows that scientists have a high evaluation of this technology. In recent years, wireless sensor technology has gradually come into the sight of researchers, with its research on this technology started in the United States. The research plan is to apply the wireless sensor technology to the national intelligent transportation. Later, Intel Corporation first carried out the application of wireless sensor technology, and applied the micro sensor technology to medicine, environmental monitoring, and even forest fire protection. With the development of many years, there are many technology companies committed to wireless sensor network technology, using radio frequency and processing module and sensor module to work, and the research on this technology is progressing all over the world.

In our country, this technology is constantly applied and developed. This technology has been applied in some bridge health monitoring systems, and put forward more advanced working mode. With the continuous popularization of wireless network technology, it is possible to use wireless sensor technology to monitor the transmission of network data. At present, it has been applied in oil production, irrigation, water quality monitoring and other aspects in China, with diverse application forms.

## 5 Development of Wireless Sensor Devices

### 5.1 Sensor Unit

In the selection of wireless sensor devices, it is necessary to ensure that the device has a strong anti-interference ability and high measurement accuracy, and only in this way can the normal operation of the wireless sensor be ensured [7]. Therefore, the piezoelectric acceleration sensor can be selected when selecting the wireless sensor, because this type of sensor has a strong anti-interference ability, and also meet the related requirement of the sensor in measurement accuracy.

### 5.2 Processor Unit

Now there are a lot of handheld devices and control devices, most of the processors used are ARM7 series processor [8], which has a higher processing speed in relatively low price. Because of its high cost performance, it can be widely used. ARM7 series processor supports SSP and SPI serial interface on the interface, and can also connect debugging equipment at the same time.

### 5.3 A/D Conversion Unit

When the sensor is used to measure the acceleration of the building, the voltage response is usually very small, only reaching the order of 10mV. Therefore, it is necessary to process the signal through the A / D converter to ensure that the resolution is sufficient [9]. In order to ensure that the signal can be fully captured and at the same time ensure a high resolution level, it is necessary to amplify the signal in the pulse test, and then use A / D conversion to improve the resolution of the signal. When selecting the chip, we need to choose the AD7600 series ADC with higher running speed and lower price, and select the standard SPI for the interface.

## 6 Limitations of Sensors

The following will discuss the limitations of the sensors produced at this stage, and mainly analyze the limitations of five aspects to find the direction for further improvement, so that the performance of sensors can be improved more comprehensively, and better apply this technology to the monitoring of civil engineering structures.

### 6.1 Small Battery Capacity

The sensor will produce a certain amount of energy consumption when it is running. Due to the continuous progress of modern technology, the energy consumption of various electronic devices is becoming lower and lower. At present, the energy consumption of the current components is generally low, and most of the energy in the wireless sensor is consumed by the wireless communication module. According to the relevant research, it is found that [10] the energy consumed by the sensor to transmit instructions is far greater than the energy consumed for executing instructions, and there are limits on the sending and receiving power to a certain extent. In order to solve the problem of energy supply at the present stage and further improve the supply time of nodes, it is necessary to increase the external energy input and reduce the energy consumption, so as to achieve the goal of long-term monitoring.

### 6.2 Clock Drift

Wireless sensor can realize the synchronization of measuring points, mainly by using the built-in crystal oscillator synchronous clock. Although this method can realize the synchronization of measuring points, it also has certain disadvantages. Once the test time is too long, the phenomenon of drift will appear. If the accuracy of the clock chip is improved, the cost will be greatly increased. If the accuracy is too low, it will lead to the possibility of drift phenomenon. If the clock drift occurs, the measurement point will have time difference. At present, there is no effective way to avoid clock drift, so in order to improve clock synchronization, researchers of engineering structure and wireless sensor are required to conduct more in-depth research, to better improve the measurement point technology.

### 6.3 Limited Communication Capacity

At present, the main communication technology is GPRS communication module. Compared with other technologies, it has better convenience and can realize remote communication. However, because the data transmission rate of this technology is not ideal, it is not competent for some tasks with high sampling rate. In addition, the network and communication conditions will affect the real-time performance of sampling. Therefore, it is necessary to continuously improve the technology and upgrade the communication ability at this stage.

### 6.4 Limited Storage Capacity

In order to reduce the cost and power consumption, many manufacturers will use smaller storage, and many wireless sensors will use SD card for storage expansion. Due to the limitation of read-write speed, the SD card must be used to store a large amount of data when writing. At the same time, the sampling speed will be affected by the limitation of read-write speed. Therefore, in order to make the sensor better complete various testing tasks, it is necessary to increase the expansion of storage capacity, change the form of data storage, and realize the optimization of resources.

## 7 Conclusion

With the continuous progress of science and technology, wireless sensor technology is also constantly improving and developing. Applying this technology to the health detection of civil engineering structure can ensure the maintenance and design of engineering structure, so as to greatly improve the safety of the project, and timely repair and maintenance of the project. In order to make the wireless sensor technology more widely used, it is necessary to further improve and optimize the wireless sensor technology to promote the full application of this technology.

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# Fast Retrieval Algorithm of English Translation Core Words Based on Simhash

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**Abstract.** Under the trend of economic globalization, English, as the universal language of the world, is more and more widely used in various industries. For people whose native language is not English, it is important and urgent to complete the accurate translation of English. At present, with the development of network technology and computer technology, building English translation system platform can effectively solve the needs of real production and life. As an important part of the developed English translation system, the fast retrieval algorithm of English translation core words has high efficiency for the key and difficult points of the English translation system, such as morphology and target language generation. Therefore, according to the Simhash algorithm, this paper puts forward the status quo of the English translation core vocabulary fast retrieval algorithm based on Simhash, aiming to continuously optimize the efficiency and quality of the existing English translation core vocabulary fast retrieval, improve the accuracy of the English translation system, and promote the international exchange and service work.

**Keywords:** Simhash algorithm · English translation system · Core vocabulary · Fast retrieval

With the advent of the era of big data, the growth of digital information is rapid. Massive data takes up more and more computer space, which gradually affects the application of other computer function systems [2]. Therefore, how to expand the storage and application of massive data has become an urgent task [1]. Based on the current application status of data information, it can be seen that the redundant data accounts for about 60% of the massive data stored in the computer system, and it will continue to increase in the future [3]. It can be said that redundant data reduces the efficiency of computer users for the core data information retrieval and query, and wastes a lot of information resources. The phenomenon of redundant data also appears in the English translation system, which seriously affects the efficiency and quality of English translation activities. Designing an algorithmic translation system that can quickly retrieve English core words has practical guiding significance for English translation work [4]. Similarly, the application of this algorithm can also provide reference for other computer control system database retrieval. The following is a study of related tasks.

## 1 Overview of Simhash Algorithm

### 1.1 Principle of Simhash Algorithm

The original hash algorithm can only fry the original text random mapping into signature value. If the two signature values are not equal, the original contents are not equal [5]. In the English translation system, it means that the retrieval and correspondence of core words cannot be completed quickly. Therefore, the traditional hash algorithm has the limitation in completing the similarity between the core parts of the query text and the original text. The improved Simhash algorithm is a locally sensitive hash algorithm [6]. The basic principle of signature generation is similar to the traditional hsah algorithm, but it can also achieve the direct response of the simultaneous interpreting of the two texts. Therefore, it has a certain application value in the rapid retrieval of English translation core words. The application idea of Simhash algorithm is as follows: transform the data points close to each other in the original content space into a certain code through a unified transformation method, obtain the unknown data points of these data points in the newly generated space, and map the data points far away to the near position of the new space, so as to form a small probability event [7]. Thus, the transformed data can be mapped to a smaller space with the same location code. After all content mapping is completed, the data positions obtained can form a hash table and all data mapping positions on this hash table are relatively uniform [8]. When the data distribution points on the hash table are more uniform, then the similarity comparison can be realized in the region of this set, and the core key data can be quickly retrieved and queried by linear comparison one by one. It can be said that by using Simhash algorithm, the calculation amount of fast retrieval process of core words required in English translation will be significantly reduced and the efficiency of retrieval will be improved.

Simhash algorithm fingerprint generation can be divided into five steps: segmentation, hash value calculation, weighting, merging and dimensionality reduction [9]. Word segmentation refers to the word set processing of the text, so that the hash value of each word can be calculated, letters or Chinese characters can be transformed into a string of numbers, and different numbers are weighted, so that the words represented by each string of data are different. After that, the sequence values are accumulated to form a sequence string, such as “-1, 4, 5, -7, 8”. Finally, according to its positive and negative dimension reduction operation, it is changed into 01 string, thus Simhash is obtained.

### 1.2 Simhash Computing Method

In English translation, it is precisely because of the great difference in the meaning of the expression of English text, and the meaning of each core word in English is also different. Therefore, it is possible to complete duplicate detection based on Simhash algorithm, so as to achieve high-precision de duplication at a fast enough speed [10]. Based on the basic principle of Simhash algorithm mentioned above, it can be seen that the application of Simhash algorithm can effectively improve the speed of text similarity calculation. The main goal of its calculation is to complete the calculation of the

number of different characters in the corresponding position between two characters. In the calculation of physical distance, the distance measurement unit is generally used. Therefore, for the proximity between two characters, the code word of length  $n$  can be used to represent the proximity between two characters. The hamming distance between two characters can be expressed by Formula 1. After calculation, the number of code words with the same position but different bit codes between two binary code words of equal length is obtained. After that, it is necessary to calculate the similarity of two Simhash values. The calculation formula is shown in Formula 2.

Formula 1

$$\text{Hammin}(x, y) = \sum_{i=1}^n (x_i \oplus y_i) \quad (1)$$

Formula 2

$$\text{sim}(S_1, S_2) = \frac{\sum_{K=1}^{128} (S_{1K} \oplus S_{2K})}{128} \quad (2)$$

## 2 Application of Simhash Based Fast Retrieval Algorithm for English Translation Core Words

### 2.1 Overall Framework of English Translation Core Vocabulary Retrieval Based on Simhash

The whole English translation core vocabulary retrieval framework is divided into two parts. The first part is to build the index of English vocabulary. This part can be used to extract the information of the core words in English text. The surf feature of the extracted key byte is represented as the bovw feature vector, and the Simhash index is constructed by signing the feature vector with Simhash. This part of the framework can be preprocessed in offline mode. The second part is the key part, which is mainly about the fast retrieval of similar bytes of core words. This part is mainly through the key byte extraction module to construct the bovw feature vector for the key bytes. At the same time, the Simhash signature with hamming distance less than  $k$  is obtained by using the existing Simhash index and bloom filter. Finally, it completes the collection of similar bytes of core words in the database, calculates the similarity of core words according to the set, and completes fast online retrieval.

### 2.2 Construction of English Translation Core Vocabulary Retrieval Algorithm Based on Simhash

In the construction of Simhash's English translation core vocabulary fast retrieval algorithm, the most important thing is to construct the Simhash signature and Simhash index. Based on the basic principle and calculation method of Simhash algorithm mentioned above. At present, the construction of Simhash algorithm is mainly to de

duplicate the document. By inputting the dictionary and bag model vector, the feature mapping vector of each word in the dictionary is constructed. After that, the weighted sum operation of the vector after the feature mapping of each word is completed, and the Simhash signature in L bit is obtained. Suppose you want to obtain the 3D signature value of any English core word, assume its corresponding 3D vector dimension Formula 1. Then, the signature dimension of a text vector is calculated to be 1, 2, 0, 3, 0, and finally the signature 1 is generated.

$$\begin{aligned} H(W_1) &= \begin{vmatrix} 1 \\ -1 \\ 1 \end{vmatrix}, \quad H(W_2) = \begin{vmatrix} -1 \\ 1 \\ 1 \end{vmatrix}, \quad H(W_3) = \begin{vmatrix} 1 \\ -1 \\ -1 \end{vmatrix}, \quad H(W_4) = \begin{vmatrix} -1 \\ -1 \\ 1 \end{vmatrix}, \\ H(W_5) &= \begin{vmatrix} 1 \\ 1 \\ -1 \end{vmatrix} \end{aligned} \quad (3)$$

### 3 Application Optimization of Fast Retrieval Algorithm for English Translation Core Words Based on Simhash

#### 3.1 Advantages of Simhash Based Fast Retrieval Algorithm for English Translation Core Words

Based on the above analysis, it can be seen that the rapid retrieval of English translation core words based on Simhash algorithm has high application value. In practice, it is found that the fast retrieval system of English translation core words based on Simhash algorithm runs faster. For example, when the number of English translation text bytes is short and the number of expanded core words is less, the speed of fast retrieval under Simhash algorithm is similar to that of other algorithms, but when the number of core words of English translation text increases greatly, the operation time of Simhash algorithm is much faster than that of other hash algorithms. It has a positive correlation with the amount of data. That is, with the increase of data volume, the time of the same algorithm is faster. In addition, Simhash algorithm has the function of data compression. In other words, it can realize the compression processing of massive data, improve the one-time processing of a large number of core words in English translation, and improve the amount of data processing in English translation. In conclusion, compared with the conventional hash algorithm, Simhash algorithm is more suitable for the rapid retrieval of English translation center words and has higher application value. However, with the development of English translation application towards personalization and refinement, the core vocabulary retrieval function in the current English translation system gradually presents the characteristics of lack of integrity, that is, the core vocabulary retrieval results can not match the other contents of the English text. Therefore, there is still a long way to go for the design of Simhash algorithm and English translation system.

### 3.2 Optimization Measures of Fast Retrieval Algorithm for English Translation Core Words Based on Simhash

At present, according to the existing network technology and the performance of computer hardware structure, the lack of performance of various computer materials directly affects the design and construction of English translation system, and also affects the specific application effect of Simhash algorithm. In this regard, it is required to continuously optimize the following aspects to complete the optimization and upgrading of the English translation core vocabulary quick retrieval system under the Simhash algorithm. For example, it is required to increase the technical investment in Simhash algorithm and build an English translation system with better performance structure. In the application of fast retrieval algorithm of core words in English translation system, the application of Simhash's fast de duplication algorithm is not comprehensive, or the construction of English database is not perfect. Therefore, the efficiency of the core vocabulary retrieval function is not high enough. In this regard, relevant departments and scientific research institutions are required to continuously carry out software and hardware work, so as to complete the optimization and upgrading of Simhash algorithm, and form a personalized, more accurate and more suitable for English translation system fast retrieval algorithm.

## 4 Conclusion

To sum up, as an improved hash algorithm, Simhash algorithm has the function of large-scale de similarity data, so as to effectively identify whether the input data is similar segments. In the fast retrieval of English translation core words, Simhash algorithm is playing its role in large-scale document de duplication improvement, immediately extracting the core key English vocabulary content, and completing the translation requirements. At present, under the Simhash algorithm, the design of fast retrieval function of English translation core words is affected by the limitations of Simhash algorithm, which leads to some deficiencies in the rapid retrieval technology of English translation core words. Therefore, it is of great importance to improve the system algorithm in the future design of English translation system.

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# Profit Model of Tourism E-commerce in the Era of Network Information

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**Abstract.** With the advent of the Era of Network information, the tourism e-commerce industry is surging forward with fierce competition, and the profit model of tourism e-commerce is also in chaotic. This paper analyzes the profit model of Ctrip which is the top enterprise in China's online tourism market, summarizes the advantages and disadvantages of its profit model, then gives enlightenment suggestions that can be used by other enterprises.

**Keywords:** The Era of Network Information · Travel E-commerce · Profit model · Ctrip

## 1 Introduction

The 43rd statistical report issued by China Internet Network Information Center in 2019, by the end of 2018, the number of Internet users in China reached 829 million, and the Internet penetration rate reached 59.6%. The Internet information age has arrived. With the help of the Internet, more and more enterprises have formed their own unique profit model. The combination of tourism and e-commerce is far ahead of other industries. Some studies have shown that about 1/4 of the world's major tourist sources purchase tourism products through the Internet, and 1/3 of the people know about tourism information through websites [1]. E-commerce has become the new driving force of tourism development in China.

Nowadays, there are more than 5,000 websites running travel-related services, among them at least more than 300 travel websites operate professionally. Ctrip is the most notable one, it has been the largest domestic transaction volume for several consecutive years. In 2018, Ctrip's overall transaction volume exceeded 690 billion yuan, topped the global online tourism industry. In the internet information age, Ctrip leads the development direction of tourism e-commerce, and its unique experience is worth learning by other enterprises.

## 2 Relevant Concepts

### 2.1 The Concepts of Tourism E-commerce

Tourism e-commerce refers to a new mode of tourism operation that takes the network as the main body and adopts advanced network technology, it can realize the

introduction, inquiry, reservation, online payment and other tourism business activities of tourism products and services [2].

## 2.2 Profit Model and Five Elements

In Discovering The Profit Zone, Adrian J. Slywotky, an American scholar, argues that Profit model has five basic elements: profit object, profit point, profit source, profit leverage and profit barrier. Profit object refers to providing value to customers and obtain profits from them. Profit point refers to the products or services that create profits for enterprises and is aimed at the profit object. Profit source refers to the ways and methods adopted by enterprises in the process of creating value. Profit leverage refers to the unique business activities designed by enterprises to attract more consumer groups and create competitive advantages in response to market demands. Profit barrier is mainly aimed at competitors, and the profit and market share belonging to the enterprise itself only.

## 3 Analysis of Profit Model of Ctrip

The view of above five elements is supported by many scholars in the world. This paper will analyze the five elements of Ctrip's profit model [3].

### 3.1 Profit Object

By understanding the basic situation of Ctrip, we found that Business tourists accounted for 88% and individual tourists accounted for 12% [4]. Ctrip's target customers are mainly business tourists, who are not sensitive to price and are not affected by seasonal changes. According to their consumption habits and needs, Ctrip can provide customized tourism products and services in various aspects to obtain economic benefits.

### 3.2 Profit Point

Ctrip's profit model is mainly agent model. Ctrip provide a communication platform for the buyer and the seller as a middleman for online trading. Ctrip provides value to buyers including reliability, one-stop service, high quality products and services. And provides to sellers including brand awareness, access to customers, Internet online sales platform and low cost.

### 3.3 Profit Source

Ctrip's main revenue modules include accommodation, transportation, group travel and business travel. Accommodation has always been the core business of Ctrip, the revenue contribution rate is about half. Since the acquisition of Qunar tourism network, the share of tourism transportation has occupied half of the market. Package tour and

business travel of Ctrip enjoy a high reputation among the online travels in China. The market share is relatively low, but the market growth space is large.

### 3.4 Profit Leverage

Ctrip links tourism destination market, hotels, airlines and travel agencies to develop cooperative business, forming an industrial value chain. Through the establishment of agreements develops the tourism market, mutual benefit and win-win. In terms of services, take the booking business as an example. Ctrip provides one-stop after-sales service. In the process of management, services are classified and different indicators are established to promote the improvement of the system.

### 3.5 Profit Barrier

The absolute advantage of scale effect, leading technological innovation, rich upstream and downstream resources are ctrip's favorable barriers to competition. Personalized service is the core of Ctrip's successful profit model, and high-quality service management is the guarantee of Ctrip's successful profit model. Ctrip brand agglomeration effect has formed a rather advantageous competitive barrier.

## 4 The Advantages and Disadvantages of Ctrip's Profit Model

### 4.1 The Advantages of Ctrip's Profit Model

#### 4.1.1 Stable Profit Source

Booking agency fee, insurance agency fee, and online advertising fee are all stable profit sources of Ctrip [5]. Ctrip Make profits in the form of profit rebate and price difference, through the cooperation with major hotels, airlines and travel agencies at home and abroad.

#### 4.1.2 High Loyalty of Ctrip Members

Ctrip attaches great importance to customer satisfaction. Relying on strong advantages at the top of the value chain, it guarantee the success rate of member booking and the execution rate of order. Under the good consumption experience, Ctrip has locked in a large number of Business tourists who are not sensitive to the price. For example, three guarantees are provided to enhance customer satisfaction and loyalty in the “independent travel” products, resulting in 75% repeat customers.

#### 4.1.3 High-End Market Accumulation

The high-end customer group and high-end market accumulated for many years have contributed to the largest profit source of Ctrip [6]. From the perspective of internal demand of the company, the demand for customized travel products launched by Ctrip in 2016 has maintained a three-digit growth rate. And the high Gmv orders are More than 30%, which the unit price of domestic tourists reached 10,000 yuan, the unit price of overseas short-distance tourists reached 20,000 yuan, and the unit price of overseas long-distance tourists reached 30,000 yuan. Ctrip consolidates profit barrier from

international supply relying on its clear position in high-end market. Ctrip is often the first choice for some international giants that focus on high-end consumption to cooperate in domestic OTA.

## 4.2 The Disadvantages of Ctrip's Profit Model

### 4.2.1 Lack of New Profit Points

Although Ctrip has begun to deploy the globalization strategy, it lacks new profit point in China where is serious homogenization among the major OTA operation site [7]. Ctrip's existing market share could easily be eroded by rivals, and the new field that Ctrip tries is limited. For example, "Ctrip Financial" user growth stagnated and revenue effect did not meet expectations. In terms of transportation, ctrip's coping strategies have been unsatisfactory due to the impact of the country's policies on reducing the cost of air tickets [6].

### 4.2.2 High Operating Cost

The high operating cost of Ctrip is mainly reflected in two aspects. First, the cost of Ctrip store operation mode offline is obviously higher than the online light asset operation mode, and also in further expansion, the future investment in the cost scale will continue to maintain astronomical figures. Second, the cost of administration is too high. In the early years, Internet penetration was not high, Ctrip operated effectively by the construction of call center. But in the era of network information, Ctrip's intelligent customer service penetration rate is not high. The high operating cost of call center is too high and the administrative efficiency is too low.

### 4.2.3 Lack of Flow Entry

Ctrip's profit lever is often a vertical project in the tourism field, once the profit barrier is lost, the profit object of Ctrip will be lost. Although Ctrip has won a new profit object by a large number of marketing expenses, this part of customers are often not loyal to the brand, switch to other enterprises easily. Meanwhile, competitors in the flow of access to ctrip caused great pressure; Ctrip has lost a lot of market share in the hotel market [8]. In the long run, once competitors choose strong profit leverage, Ctrip will lose the patronage of low-frequency customers easily.

## 5 Suggestions on the Optimization of Profit Model

### 5.1 Finding New Profit Points

Nowadays, the prices of Internet companies' products and services are becoming more transparent. The result of users' choice is either the lowest price or the best experience, the profit model of low price drainage is not the long-term choice. It is necessary to optimize the products and services of the platform, to Find new profit points is necessary for Ctrip by optimizing the products and services of the platform [9]. Refined and differentiated products and services can provide better customer experience [10]. At present, under the influence of coVID-19, the development of pre-purchase mode

will be conducive to the survival of industrial chain enterprises. It will greatly reduce the operating costs for Ctrip.

## 5.2 Enhancing Innovation Capacity

As a service-oriented enterprise, Ctrip should improve the popularization and application of AI intelligent customer service technology. The actual output orders of Ctrip reach one million level every day, and the labor cost is amazing [11]. Today's intelligent customer service technology is becoming more and more mature, which can solve 70% of technical problems. Reducing the number of manual customer service can not only reduce the high operating costs of enterprises, but also improve the information processing ability of the platform.

## 5.3 Excavating Flow Entry

In the past, the online flow entry was basically a graphic platform. With the development of Internet and science and technology, new flow entry such as video, live broadcast and audio have been added. From the end of March 2020, Liang Jianzhang, the co-founder of Ctrip group, appeared in the wechat app studio for the first time in the guise of "Miao Wang". Within six months, Ctrip has achieved a cumulative trading volume of 1.7 billion yuan through the live broadcast matrix, with more than 100 million people watching. The proportion of new users in the broadcast room is more than 10%, and the proportion of users who re-purchase more than twice is more than 60%. This is a successful attempt to excavate flow entry. In the Era of Network information, Ctrip can make further efforts to seize the opportunities and increase flow entry.

## 6 Conclusions

The profit model of Ctrip is in a process of constant change. Ctrip needs to optimize and improve its existing profit model through various strategie, so that it can better adapt to the changes of market competition situation in the network information age.

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# Impact of International Green Barriers on Xinyang Tea Exports and Countermeasures Based on Big Data

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**Abstract.** Through exploring the reason that developed countries have strengthened the green barriers for tea import recently, and analyze the situation of hindering the export process of Xinyang tea with big data technology, as well as the motivation of implementing green barriers in developed countries with macro and micro perspective, It was found that by virtue of their leading technological advantages, under the guise of ensuring the quality of imported tea, they essentially realized trade protection, but the quality problem of Xinyang tea itself is also worth attention. In the study of the effect of green barriers on Xinyang tea trade, the combination of qualitative and quantitative analysis was used to draw the conclusion that the short and long term dual impact (short-term adverse, long-term beneficial), and finally to effectively deal with the green barriers, targeted countermeasures for different individuals (tea enterprises, associations, governments).

**Keywords:** Tea green barriers · Big data · Xinyang City · Influence · Strategy

## 1 Introduction

Green barriers mean that the importing country sets overly strict technical standards, sanitation and quarantine standards, and commodity packaging requirements for foreign import and export products by formulating laws and regulations, establishing technical standards, certification systems, and inspection systems, thereby increasing the technical requirements of imported products. A non-tariff barrier measure that increases the difficulty of imports and ultimately achieves the purpose of restricting imports. Xinyang City, as Henan's main tea planting and export base, is inevitably affected by the international green barriers. In the short term, the comparative advantage of Xinyang tea in terms of cost and price has been weakened, and the quality cannot meet the pesticide residue limits and standard restrictions of developed countries such as the United States, Japan and Europe, which hinder tea export trade. How to deal with the impact of green barriers on Xinyang's tea export trade has become an urgent problem. Against the background of strengthening the implementation of green barriers to tea in importing countries, by analyzing the internal and external reasons why Xinyang tea suffers from green barriers, starting from improving the quality of tea

products, tea companies introduce advanced technology and equipment, the government improves testing standards, and the tea association establishes the warning mechanism to solve the dilemma of green barriers will ultimately have practical significance for deepening the process of tea export and achieving sustainable development.

## 2 Review of Major Literature

Relevant studies on green barriers appeared in the 1980s, and then emerged gradually with the development of international trade. Early scholars mainly discussed its definition, performance characteristics, formation reasons, influence and other theoretical studies in detail. “Green trade protectionism” was first proposed internationally by Anderson (1992) [1, 2]. M. Ganslandt (2001) classified the implementation of green barriers into normal and abnormal green barriers according to whether the implementation of green barriers is reasonable, and relevant provisions of technical barriers in WTO legitimize the implementation of green barriers [3]. Korinek Jane (2008) later supplemented the environmental protection standards issued by importing countries, which violated the principle of trade liberalization, and pointed out that the emergence of green barriers was the “talismans” of new trade protectionism [4]. In the early stage, qualitative analysis was mostly used to study the impact of green barriers on tea exports. Jill E. Hobbs (2006) proposed that the increase in production costs weakened the comparative advantages of tea exporting countries in terms of cost and price, and their competitiveness declined [5]; Eugenio Figueroa B (2008) conducted an in-depth analysis of this [6]. It will “force” tea companies in the medium and long term to improve production technology, improve tea quality, and promote the sustainable and healthy development of the tea industry.

Scholars have gradually turned to the empirical analysis of tea green trade barriers. Klimenko, Mikhail M (2009) introduced the trade gravity model from the perspective of standard differences to quantify the impact of green barriers caused by the differences in tea quality standard systems at home and abroad on China’s tea export [7]. Rezso Seress (2012) compared and analyzed the structure of the international tea market and its share in the market by using the stock index method [8]. Based on the index, it analyzed the export problems of Chinese tea in detail and put forward corresponding countermeasures and Suggestions. Sofia Boza (2015) further made a comparative analysis of the pesticide residue standards in tea and China revealed that the existence of technical gaps have led to frequent notifications of China’s tea exports [9, 10]. However, Chinese tea companies continue to improve their technology to adapt to international standards. Eventually, green barriers promote tea exports and optimize the terms of trade for developing countries.

### 3 Current Status of Xinyang Tea Exports

By 2018, there are 18 enterprises with tea product export qualification in Xinyang city, and the export counties have been increased. In terms of exporting countries in 2005, Xinyang tea was only exported to Algeria. At present, the target market of Xinyang tea has increased to more than 30 countries. The European Union, the United States and Japan were once major importers, but the total exports to these three countries have declined by as much as 9 percent annually since 2000, when they gradually increased their green barriers. However, under the opportunity of One Belt And One Road, the total amount of Xinyang tea exported to Morocco, Russia, Africa and other countries with no strict green barriers increased by about 6.8% annually on average. Especially for Morocco, which has developed into the first exporter of Xinyang tea in more than 10 years, Xinyang accounted for up to 20.52% of the total amount of Xinyang tea exported in 2016. Therefore, the export target market of Xinyang tea is gradually reversed with the evolution of green barriers. Besides, from export tea varieties, the types of tea exports become richer, but green tea exports remain dominant. Xinyang tea green tea export proportion in total exports reached 80.25%, but 80% in the current international tea consumer market is the demand for black tea. The developed countries increasingly stringent green barriers limit the development potential of Xinyang industry, making it more difficult for Xinyang tea enterprises to achieve scale production and long-term economic benefits cannot be improved.

### 4 The Reason that Xinyang Tea Export Suffers Green Barrier

#### 4.1 External Cause

First of all, importing countries implement barriers to protect their own tea market, because developed countries such as Europe, America and Japan have a growing trade deficit in tea exports with China. Against the background of serious foreign trade imbalances, Sino-foreign trade frictions are increasing. Developed countries have a technological advantage and use this gap to continuously set increasingly strict technical standards and environmental regulations, as well as cumbersome testing procedures, and even complex packaging requirements, to reduce export share of tea in the form of green barriers. Besides, consumers gradually turned to the green consumption, care more about food safety problems, especially for some developed countries to ensure the safety of domestic consumers in tea drinking, gradually improve food safety regulatory system, and improve the tea import market access threshold, especially at the request of the evaluation standard on pesticides. The EU's regulations on tea residues cover nearly 470 items, while only 28 items are related to tea in China's "Maximum Pesticide Residues in Food (2014)".

## 4.2 Internal Cause

At first, Xinyang is backward in tea planting, production, and testing technology, and tea farmers lack the awareness of safe production. Most of the tea enterprises in Xinyang are decentralized and small workshops. In order to save costs, pesticides with quick effect and low price are used in the tea planting process. As a result, the use of pesticides exceeds the tea inspection standards of importing countries and is faced with the risk of being returned. Outdated tea production and testing equipment is hardly to realize the unified control of the final tea quality standard, which directly affects the tea quality. As the source of tea quality control, they only rely on accumulation of experience in tea roasting technology and rarely participate in professional technical training, especially lack of scientific knowledge of disease and insect pest control, and blindly rely on pesticide use. The “pesticide tea” in the tea area has been repeatedly exposed, causing consumers’ doubts about the quality of Xinyang tea and causing a decline in tea sales. In addition, Xinyang tea also lacks brand effect, and international consumers have a low awareness of Xinyang tea brand, which makes it difficult to realize brand loyalty.

## 5 The Double Influence of Green Barrier to Xinyang Tea Export

### 5.1 Short-Term Negative Impact on Xinyang Tea Export

The increasing export cost of Xinyang makes the profit margin shrunk, and the comparative advantage of prices in the international market has been weakened. In order to meet the entry threshold of tea quality in importing countries, Xinyang tea enterprises will invest capital to purchase equipment to improve tea production process and quality testing technology, thus increasing the tea production cost and weakening the price comparative advantage of Xinyang tea in the international market in the short term. Moreover, the speed of importing country changing tea inspection standard increases rapidly, which increases the risk of Xinyang tea export. Importer customs authorities will be carried out in accordance with the new regulations on imported tea mandatory inspection, they often have a propensity to the attitude of the performance, such as the degree of increasing the detection of tea trial, adopt the method of full inspection, does not meet the new environmental standards of the tea customs refused to customs clearance, will be destroyed on the spot, cause the loss of Xinyang tea exports in the short term.

### 5.2 Long-Term Positive Impact on Xinyang Tea Export

The quality of exported tea leaves will be improved constantly, and the tea industry will upgrade and adjust. Xinyang tea enterprises must abandon the traditional extensive production mode; establish the awareness of green production. Tea farmers should also strengthen skills training, strengthen awareness of cleaner production, and significantly reduce pesticide use. Under long-term conditions, the Xinyang tea industry will take

the initiative to integrate, upgrade and optimize resources in response to green barriers. Tea companies will achieve large-scale operations through mergers and reorganizations. At the same time, they will continue to adjust and optimize the structure of export tea products to reverse the single and inconsistent tea export structure. It will promote the government to improve the tea quality inspection mechanism and conform to international green standards. Because the current tea testing standards in Xinyang City are lower than the relevant standards of tea importing countries. The quality inspection department of Xinyang City only conducts sampling tests for 500 tea product testing items, while countries such as Europe, the United States and Japan have already tested the number of tea products increased to 1160 that are ready to be put into the domestic market.

## **6 Strategies and Suggestions for Xinyang Tea Export Trade to Cope with International Green Barriers**

Xinyang tea companies should adapt to the current changes in the demand for green consumption, combine economic and environmental benefits, purchase international advanced tea production equipment, and achieve effective control of the clean production process of tea through the realization of a large-scale production model. The expansion of scale has brought about a drop in long-term average cost, and continues to exert its advantages with lower production costs. In addition, it is necessary to increase the popularity of Xinyang tea, create strong international tea brands, upgrade and optimize the tea industry structure chain, and extend the added value of tea products, such as in-depth development of currently underutilized summer and autumn tea, and the ingredients with health-care functions are extracted to design a new type of healthy tea.

The Chinese government department should first ensure that the quality inspection standards of domestic export products are synchronized with the international green standards, which can refer to the various indicators and regulations of countries with stricter green barriers. At the same time, under the multilateral trading system, it should pay attention to communication and coordination with these countries, and use the WTO trade dispute settlement mechanism to safeguard its legitimate rights and interests. Furthermore, in the face of the fact that Xinyang tea companies are mostly operating on a small scale, they lack funds to improve their technical level. Therefore, the Xinyang Municipal Government should adopt compensation and support policies, such as using loan assistance to provide credit for purchasing equipment or low-interest loans, adopting special tax incentives to reduce the tax burden of tea operators, and providing regular financial subsidies for technical training of tea farmers to improve their production efficiency.

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# Innovation and Reform of University Data Audit Mode Under the Background of Big Data

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**Abstract.** The development of information technology promotes the rapid expansion of data production capacity in Colleges and universities, based on the comprehensive audit, it has become the development trend of internal audit in Colleges and universities to be able to grasp the auditees as a whole and to discover problems and doubts efficiently. This paper analyzes the new characteristics and problems in practice of data audit in Colleges and Universities under the environment of big data, and then discusses the path to realize the value-added of data-based audit through innovation and Reform in many aspects.

**Keywords:** Big data · Data audit reform · Data-based audit mode

## 1 Overview of Data-Based Audit in the Context of Big Data

With the development of Internet, big data and cloud computing, the informatization level of colleges and universities is constantly improving, and the audit environment in Colleges and universities has undergone great changes. Both audit thinking and audit technology will usher in changes.

### 1.1 The Influence of Big Data

Big data is an important result of the rapid development of new generation information technology, which presents the characteristics of 4V (volume, velocity, variety and value). Its value lies in data, technology and thinking, through the in-depth analysis of massive data, the association relationship is found to achieve accurate prediction and integrated management. Under the influence of the development of information technology, the data production and complexity of colleges and universities are growing rapidly, and gradually showing the characteristics of big data. In this context, the expectations of internal audit in Colleges and universities are constantly increasing, the scope of audit is becoming wider and wider, the amount of data information is increasing, and the demand for audit results is higher and higher. The traditional audit mode has been unable to meet the dual requirements of audit breadth and depth. Data based audit mode uses data analysis technology, computer instead of human to perform the necessary repeated calculation and analytical review, which can quickly and

accurately find doubtful points, realize deep mining and accurate implementation, and improve the quality and efficiency of audit, which has become the development trend of internal audit in Colleges and universities.

## 1.2 The Meaning and Characteristics of Data-Based Audit Mode

It is not a new concept. Scholars believe that it was first proposed by Shi Aizhong and Sun Jianyu in 2005. It is defined as “an audit method based on the system internal control evaluation, through the collection, transformation, collation, analysis and verification of electronic data, to achieve the audit objectives.” Its biggest characteristic is to get rid of the traditional electronic account set and its reflected financial information, go deep into the underlying database of information system, and obtain more extensive useful information. Since then, data-based audit has experienced the development of building data comprehensive analysis system and integrating risk-oriented concept, and has become increasingly powerful in the emergence and development of big data technology, showing some new features [1–4].

- (1) Thinking systematization. Data based audit is based on comprehensive audit. Auditors use the data analysis method to mine all the data of the audited objects, find out the doubtful points, make specific verification, and make overall evaluation and prediction. It is a systematic audit thinking from the whole to the part and then back to the whole.
- (2) Information integration. Traditional data-based audit is mainly based on financial data. Under the background of big data, data-based audit achieves audit objectives through multi-system data association analysis, combines business analysis with financial analysis, and internal audit department needs to collect the original structured and unstructured data of relevant business systems in Colleges and universities.
- (3) The method is intelligent. Data based audit changes the traditional audit method which relies on spot check and test, transforms the core method into data analysis, and makes the auditors’ ideas concrete and data, which is helpful to grasp the whole, highlight the key points, analyze deeply and extend accurately. By accumulating various audit concerns and analysis methods, the standardized analysis model is gradually constructed and the intelligent method system is established.
- (4) Application strategy. Through massive information integration and powerful analysis function, data-based audit can mine and summarize the overall situation, deep-seated problems and potential risks, which has strategic significance for improving internal control, improving governance ability and assisting major decision-making.

## 2 The Problems of Data Audit in Colleges and Universities

### 2.1 Data Collection

First, the data collection is not comprehensive. At present, the Audit Department of colleges and universities can basically obtain the underlying data of financial system, but the access to structured data generated by personnel, students, employees, assets, scientific research systems, and unstructured data such as meeting minutes and internal system is still not smooth [5–7]. Secondly, the data quality is not high. At present, due to the different degree of informatization construction of various functional departments in Colleges and universities, there are some problems, such as inconsistent statistical caliber, unreasonable data structure, lack of continuity, integrity and accuracy of data, which directly affect the audit quality.

### 2.2 Data Analysis

Under the background of big data, although auditors pay more attention to internal control, they still deepen the development of traditional audit ideas based on financial accounts, and fail to establish systematic audit ideas, which makes the data analysis technology as a tool aimless.

### 2.3 Data Security

Data-based audit concentrates the data of many information systems into the audit system, which greatly increases the risk of data storage, system security and illegal operation. At present, most colleges and universities have not established a perfect security protection system and electronic data management system for audit informatization. Auditors lack the ability to identify confidential and sensitive information, system design loopholes and improper authority setting may lead to data tampering, theft and other risks.

### 2.4 Platform Support

Due to the limitation of human resources and financial resources, most colleges and universities take the step-by-step implementation scheme to carry out the audit informatization construction. The integration of each module of the system is not enough. In the era of audit, the financial 135 management system and data analysis software are independent of each other, so the data analysis results cannot be directly stored and used as audit evidence Audit disjointed, there is a “passive following” trend for informatization, which affects the further development of data audit.

### 2.5 Application of Achievements

At present, colleges and universities lack of in-depth analysis and processing of the problems found by audit, and do not comprehensively extract the overall and universal problems. Most colleges and universities remain in the passive demand for rectification

of the audited units, and the trend analysis and structural analysis of data-based audit have not been effectively used, which cannot fully show the advantages of analysis ability, and the role of providing value-added services for schools is not obvious.

### 3 The Way to Realize the Value-Added of Data Audit Through Innovation and Reform

Under the requirement of full coverage of audit, internal audit has gradually expanded from financial audit to internal control audit, benefit audit, risk management audit and other fields. Data based audit needs to closely follow the informatization construction of colleges and universities to realize the following innovative changes:

#### 3.1 From Data Collection to Information Collaborative Integration

- (1) To promote the establishment of audit data management center with the guarantee of organization and coordination. Starting from the top-level design, we should get through the channels, regularly collect the financial and business system data required by the audit analysis model, conduct pre-processing such as conversion and cleaning, establish the corresponding database, gradually bring the unstructured data into the platform, realize the integration of multi-system and multi-channel information, improve the incomplete and discontinuous problem of scattered data acquisition, and lay a good foundation for data analysis.
- (2) Starting from the system construction. Establish electronic data management and use methods and information operation procedures, strengthen data security training, reasonably set approval authority, strictly manage data collection, transmission, cleaning, conversion, analysis, backup and destruction, and jointly conduct risk assessment and prevention for data operation environment with information departments, so as to provide institutional constraints and system guarantee for data security.

#### 3.2 From Auxiliary Analysis and Verification to Comprehensive Improvement of Management Service

- (1) Audit thinking has changed from part to whole under the data-based audit mode, the previous restriction that all factors could not be tested due to time and manpower reasons has disappeared. The technical transformation from sampling to full quantity has prompted auditors to look from part to whole, no longer limited to financial data compliance, but from internal control and governance, from “experience dependence” to “data basis” [8–11].
- (2) From finding problems to early warning of risks. Big data technology has laid a foundation for risk prediction. Data based audit should identify key risk areas through overall analysis, multi-dimensional correlation analysis and trend analysis, implement key real-time monitoring and abnormal reporting for common problems in high-risk areas through standardized audit model, establish risk early-warning

mechanism, and realize the transformation from “post-earthquake rescue” to “pre earthquake prediction”.

- (3) Auditors have changed from single knowledge structure to compound type. Data-based audit depends on the thinking and professional judgment of auditors. Although the knowledge structure of financial and economic majors cannot meet the needs of data analysis, the introduction of information technology professionals alone cannot improve the application effect. Colleges and universities should strengthen the training of audit backbone, improve their computer and database analysis and application ability, cultivate compound talents, and build a multi-level data audit team.

## 4 Conclusions

Under the background of big data, the audit department should further improve its position, establish the overall thinking, change the idea of taking the issuance of audit report as the end point, reveal the audit problems as the purpose, and use the data type audit method to develop the audit results at multiple levels, and fulfill the “second half of the article”. Dynamic follow-up audit found that the rectification of problems, the construction of rectification and supporting materials tracking management database, analysis of repeated problems, extraction of global, universal problems, mining risk points, generate risk prompt list, provide the basis for improving the management of colleges and universities. In addition, according to the historical development of audit projects, the audit department should make overall use of audit results in the formulation of audit plans and plans, reasonably allocate audit resources, and further improve the quality and efficiency of audit.

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# Virtual Reality Interaction and Security Control System Framework Based on Digital Twin

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**Abstract.** The emergence of digital twin technology provides an effective way for virtual reality intelligent interaction and security in intelligent manufacturing system. At present, the research on digital twin mainly focuses on workshop operation and maintenance, while the research on virtual real intelligent interaction and security control of digital twin is less. The virtual real interaction of intelligent devices is an important part of intelligent manufacturing. Therefore, this paper proposes a virtual reality intelligent interaction and security control framework in intelligent manufacturing. This paper discusses the distributed integration method of virtual reality intelligent interaction based on intelligent module unit. This paper proposes a security control method based on information interaction and human-computer interaction, which provides some help for future research.

**Keywords:** Digital twins · Intelligent manufacturing · Safety control · Virtual reality interaction

## 1 Introduction

“Made in China 2025” clearly points out that “intelligent manufacturing is the core of a new round of scientific and technological revolution, and also the main direction of digitalization, networking, and intellectualization of manufacturing industry” [1]. Intelligent manufacturing system (IMS) is a man-machine integrated intelligent system composed of intelligent equipment and artificial experts [2]. Intelligent device virtual reality interaction system is an advanced remote control system. It is based on the industrial Internet, which can safely and reliably realize the real-time monitoring and operation control of intelligent equipment, and realize the safe interconnection between objects and people. However, heterogeneous and decentralized subsystems produce a large number of structured, semi-structured and unstructured data, which makes it extremely difficult to manage and control virtual reality interaction and remote interaction [3]. How to achieve effective virtual reality interaction, multi privilege operation and security management is the research difficulty of virtual reality intelligent interaction in intelligent manufacturing system. The emergence of digital twin

(DT) technology provides an effective way for virtual reality intelligent interaction and security control in intelligent manufacturing system. Based on this, this paper constructs the virtual real intelligent interaction and security control architecture in the digital twin environment, and proposes the distributed integration method of virtual real intelligent interaction based on intelligent module unit, the security control mechanism of information interaction and the safety control method of human-computer interaction.

## 2 Virtual Real Intelligent Interaction and Security Control Architecture in Digital Twin Environment

The framework of virtual real intelligent interaction and security control for intelligent equipment in digital twin environment is established, which includes five levels: Hardware execution layer, industrial network layer, system control layer, logic control layer and user operation layer. Each level has a certain logical interaction relationship, and each layer has its own perfect virtual real interaction and security control system.

**Hardware Execution Layer:** The main function is to execute all kinds of production instructions from workshop production and management software. In the intelligent manufacturing system, industrial robots, CNC machine tools, machining centers, 3D printers, intelligent AGV cars and workers form intelligent human-computer clusters.

**Industrial Network Layer:** The industrial network layer is a real-time industrial communication network that interconnects the bottom field control unit and intelligent production equipment of intelligent manufacturing system. There are two ways of industrial equipment network communication based on Fieldbus, industrial Ethernet, wireless network, radiofrequency and other technical means [4, 5].

**System Control Layer:** This layer is the middle core layer of the framework model of intelligent manufacturing system. Through the system control layer, the safe and reliable remote monitoring and control of intelligent equipment can be realized.

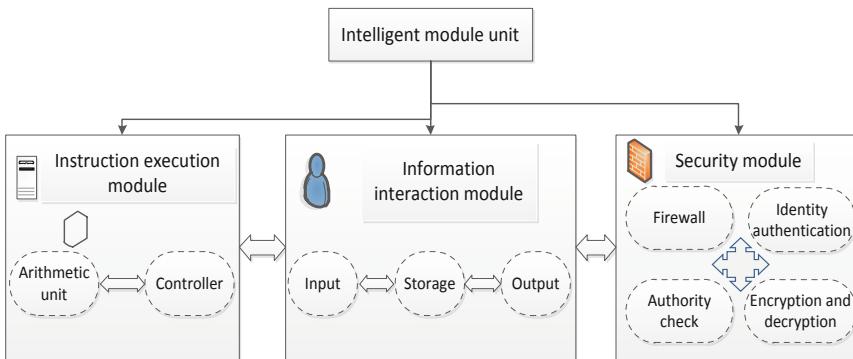
**Logic Control Layer:** The logic control layer mainly processes the operation instructions from the user operation layer to the system layer, processes relevant data, and completes the functions of approval control and business interaction.

**User Operation Layer:** The main function of this layer is to realize the interaction between the user and the software system and transmit various instructions to the hardware execution layer. It consists of multi types and multi-authority operators, various application system interface interfaces, multi type user terminal equipment (such as data gloves, cameras, VR eyes, etc.), a variety of industrial app applications, API interfaces, etc.

### 3 Distributed Integration Method of Virtual Real Intelligent Interaction Based on Intelligent Module Unit

The virtual reality intelligent interaction system in the digital twin environment is a distributed integrated system, including intelligent system of data acquisition gateway, numerical control system using PLC, intelligent equipment using special OPC server, etc. A distributed multi-type network will be formed in the system of mixed integration of software and hardware, and the inconsistency of system structure and software and hardware interface will appear between different subsystems [6–8].

Based on the standard protocol of each layer, the intelligent module unit is established, as shown in Fig. 1.



**Fig. 1.** Basic structure of intelligent module unit

Each module unit has a command execution module, information interaction module and security control module. The instruction execution module includes arithmetic unit module and controller module, which is mainly used for system operation and execution of related results. The information interaction module includes input, memory and output modules to realize the transmission of information, accept the human high-level language, and convert the human high-level language into machine instructions, and then convert the execution results into a high-level language that humans can understand. Security control module mainly includes authority check, identity authentication, encryption and decryption, firewall and other modules, the main role is to protect the independent intelligent module unit.

## 4 Information Interaction Security Control Mechanism and Human-Computer Interaction Operation Safety Control Method

The security control of virtual real intelligent system includes two aspects: one is the information security of virtual real interaction between human and equipment; the other is the personal safety of human-machine interaction in the manufacturing site. Information security mainly refers to the confidentiality of remote information transmission, and personal safety mainly refers to the safe operation in the process of human-computer interaction.

The system includes architecture security, user operation layer security, logic control layer security, system layer security, industrial network layer security and hardware execution layer security [9–11].

For architecture security, the architecture based on intelligent module technology unit is proposed. The first mock exam module is equipped with independent security control capability. If there is a module unit in the system, it will not affect other intelligent module units.

Aiming at the security threat of user operation, fixed IP and port, APP electronic signature, dynamic login password and other methods are adopted to prevent the false interface from stealing user information and tampering with the app.

Aiming at the threats of ultra vires operation, illegal instruction and illegal information in the process of logic control, the methods of instruction review and multi-level approval are adopted to ensure that illegal instructions and unauthorized operations are not executed.

Against the security threats such as stealing user information, illegal invasion and unreasonable operation in the system control layer, real-time monitoring, illegal operation and system abnormal alarm are adopted to prevent.

Aiming at the security threat of the industrial network layer, the firewall, secure hypertext transmission protocol and secure transaction technology protocol are adopted to encrypt, authenticate and sign the packets in the process of network transmission.

Aiming at the security threats such as port intrusion, unreasonable operation and equipment failure faced by hardware execution layer, communication security protocol, equipment operation review, fault alarm and other security protection are adopted.

The personal security of the interaction between the human and the machine is made for the intelligent interactive system [12]. The paper studies the twin model of human-computer interaction based on digital twin. Before the practical operation, it helps operators to familiarize operators with the working environment and avoid the prosperity of safety accidents caused by illegal operation. In the actual operation process, the digital twin model can obtain the state data of the machine in real-time. According to the control algorithm, the robot motion is planned to reduce the risk to at the lowest, the possible hazards are predicted and alarm shall be given according to the data of workers' operating habits; after an operation, machine data and operation data shall be used as training data to provide a reference for similar situations in the future [13, 14].

## 5 Conclusions

Digital twinning is one of the important ways to realize intelligent manufacturing, which puts forward higher requirements for virtual real intelligent interaction and security control in intelligent manufacturing system. This paper presents the framework of virtual real intelligent interaction and security control in digital twin environment, the distributed integration method of virtual real intelligent interaction based on intelligent module unit, and the control method of virtual interactive information security and human-computer interaction operation safety. This paper provides a reference for the future research on virtual real intelligent interaction, information security and human-computer interaction security in the digital twin environment.

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# Purchase Perception Research Under E-commerce Live Broadcasting

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**Abstract.** With the continuous development of the Internet and e-commerce, the consumption mode of online shopping has been deeply integrated into People's Daily life. In recent years, in order to meet the diverse needs of users, major e-commerce platforms are seeking for innovation to solve the bottleneck of traffic shortage. The form of e-commerce live streaming brings consumers a more intuitive and vivid shopping experience. The total amount of transactions keeps increasing, and it has gradually become a new growth force for e-commerce platforms.

**Keywords:** Live broadcasting marketing · AIS AS marketing mode · Purchase decision · Digital marketing

## 1 Development Status of E-commerce Live Broadcast

The comprehensive and three-dimensional publicity effect of e-commerce live broadcast, as well as large-scale viewing users, can enable brands to expand marketing channels and obtain higher conversion rate and sales. The number of users of e-commerce live streaming is increasing for the following reasons. First of all, e-commerce live broadcasting can change “people looking for goods” into “goods looking for people” [1]. Consumers can buy products while watching. Through the introduction of anchors and the intuitive display of products, users can make purchase decisions more quickly, shorten the selection time of users and improve shopping efficiency. Secondly, diversified selection of broadcast rooms, precise matching of demands and real-time interaction of anchors enable consumers to enjoy the pleasure of shopping [2]. Thirdly, receive coupons; enjoy exclusive price of live broadcast, direct broadcast exclusive gifts and other benefits, so that consumers can enjoy the highest cost performance. Finally, the dynamic real-time display between users, such as bullet screen and purchase orders, enhances the sense of social sharing, and at the same time, the group effect can more arouse consumers' desire to buy [3]. However, as the users of e-commerce live streaming are getting younger and younger, their consumption concepts also show new features, such as reduced price sensitivity and a greater proportion of perceptual factors in consumption decision-making. These features will have an impact on the future e-commerce live streaming model.

## 2 Scale and Questionnaire Design

This paper adopts the method of questionnaire survey to collect the research data. According to the variables extracted above and the report of the research hypothesis, the scale is designed, and finally a complete questionnaire is formed. At the beginning of the questionnaire, the respondents were explained the purpose of the survey, introduced the research topic, emphasized that the privacy of the respondents would be protected, expressed thanks, and the respondents would not have to worry about the future, and filled in the questionnaire truthfully [4]. Then, basic statistics are conducted on the personal information of the respondents, including gender, age, education level, occupation, consumption level and other information, to understand the characteristics of the respondents; At the same time, screening questions were set to ask the respondents about their experience in watching e-commerce live broadcasts, and the respondents were screened to improve the accuracy of the questionnaire. In the main part, the variables of this study were measured. In order to ensure the validity of the measurement, at least 3 questions were designed for each variable, and the respondents' attitudes were measured by likert scale with 1 indicating "strongly disagree" and 5 indicating "strongly agree". The degree of consent was increased in turn. In order to ensure the reliability of the questionnaire, this research draws on the mature scale in the previous research. Based on the maturity scale summarized in previous studies and combined with the specific situation of e-commerce live broadcasting, this paper proposes the following three items (Tables 1, 2 and 3):

**Table 1.** Interactivity scale

Variable name	No.	Multi-item
Interactive	A1	If I have questions about products, I can interact with anchors in the e-commerce broadcast room [5]
	A2	In the e-commerce broadcast room, I can feel it through the bullet screen Other consumers watched and shopped with me
	A3	In my opinion, anchors can actively respond to consumers' questions in the e-commerce broadcast room [6]
	A4	I can participate in interactive activities such as receiving coupons and drawing prizes at thumb up in the e-commerce broadcast room [7]

**Table 2.** Discount and promotion scale

Variable name	No.	Multi-item
Preferential promotion	B1	In the e-commerce broadcast room, the promotional activities made by businesses can attract my attention
	B2	Only in the exclusive price of the goods in the broadcast room, will have a certain impact on my purchase intention [8]
	B3	In the process of e-commerce live broadcasting, I will be more attracted to watch if coupons or lucky draw are often issued [9]
	B4	In the e-commerce broadcast room, the merchants do promotional activities

**Table 3.** Opinion leader scale

Variable name	No.	Multi-item
Opinion leaders	E1	The more professional the anchor, the more I trust the product
	E2	The more product knowledge an anchor has, the more I trust the quality of the products he or she recommends [10]
	E3	The more influential the anchor is in the field, the more I trust the product
	E4	Anchors have reputation and reputation in the society, and I think the products they recommend will be more guaranteed

### 3 Existing Problems

#### 3.1 The Relationship Between Interaction and Perceived Functional Value

This study proves that interaction positively affects trust and perceived functional value, but has no impact on perceived affective value. The interactivity of this study refers to the communication and interaction between consumers and anchors, consumers and other consumers through barrage questioning and communication, lottery drawing, coupon receiving and other ways and means in the context of e-commerce live broadcasting.

#### 3.2 Relationship Between Discount Promotion and Perceived Functional Value

The research shows that promotional offers negatively affect trust and perceived functional value, while promotional offers have no impact on perceived emotional value. Special promotion refers to the special promotion activities that consumers participate in in the live broadcast of e-commerce, which can refer to discounts on prices, discounts on coupons, full reduction, gifts, free shipping and other preferential activities.

#### 3.3 Relationship Between Opinion Leaders and Perceived Functional Value

It is concluded that opinion leaders positively affect trust, perceived functional value and perceived affective value. In consumer behavior, opinion leaders specifically refer to those who screen, explain or provide information for others. Because of their continuous attention to a certain field, opinion leaders acquire more knowledge and experience about certain products or services. In this study, opinion leaders refer to anchors in e-commerce live broadcasting. There are some influential kols in e-commerce live broadcasting. These people may be celebrities, web celebrity or authorities with strong practical experience, and they act as opinion leaders.

## 4 Suggestions

### 4.1 Launch High-Quality Products to Enhance Consumers' Perceived Value

Studies have shown that consumers' perceived functional value and perceived emotional value positively affect their purchase intention. When consumers watch the live broadcast of e-commerce, they can feel the quality of products more intuitively, get interested in the products, and thus have purchase intention. The products recommended in the e-commerce broadcast room are the key to the success of live broadcasting.

On the one hand, e-commerce live broadcasting platforms should clearly define the quality standards of live broadcasting products, so that merchants and anchors can have certain reference basis, do a good job in reviewing the products entering the broadcast room, and ensure that the quality and use effect of products meet the standards. On the other hand, by means of data analysis, merchants or anchors can select high-quality products with high demand from consumers and enter the broadcast room, strictly control product quality, strengthen consumer stickiness through live broadcast, cultivate loyal customers, and drive the turnover of other products.

### 4.2 Grasp the Intensity of Promotional Offers and Pay Attention to Product Quality

Research has proved that to some extent, discount promotion has a negative impact on consumers' trust and their perception of the product's functional value. At present, all the major e-commerce studios are stimulating users to buy through low price modes such as live broadcast exclusive, but the stimulation degree of these benefits to users is gradually becoming saturated. In contrast, consumers pay more attention to the quality and cost performance of the goods themselves.

On the other hand, businesses should establish more flexible and diversified preferential policies for broadcast studios. For example, in addition to price concessions, you can also take free gifts, full reduction, coupons and other activities; Combine double 10-1, queen's Day and other specific festivals to carry out promotional activities. On the other hand, when broadcasting, businesses should focus on the introduction of their products, instead of stimulating consumers to buy by means of preferential promotion only. Consumers may make impulsive purchase only because of preferential promotion, but it will also result in a high return rate. Even consumers may be dissatisfied with brands, merchants and anchors due to quality problems, resulting in a decline in customer satisfaction, which is not conducive to the long-term development of e-commerce live broadcasting.

### 4.3 Give Play to the Influence of Opinion Leaders and Create "Star" Anchors

Research shows that the stronger the influence, popularity and professionalism of opinion leaders, namely anchors, the more consumers trust the products and the more

they can perceive the functional value and emotional value of the products. Therefore, brands and businesses in choosing cooperative anchor, have certain fame and influence, the product has strong professional fields of anchor can more attractive to consumers, endorsed by personal influence, enhance consumer trust of products, more intense perception to the value of products, enhance product volume.

In addition, self-broadcast businesses should also pay attention to the cultivation of anchors to create “star” anchors. First of all, we should strengthen the professional ability cultivation of anchors to improve their understanding of products and product fields. Secondly, anchors’ personal characteristics, such as image and taste, should be positioned and disseminated through social media to enhance their influence.

**Acknowledgements.** This work was supported by Youth Fund Project, Wuhan Donghu University (2020)- «Research on the influencing factors of consumers' purchase decision in live delivery» .

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# Network Security and Prevention of Accounting Information System in the Era of Big Data

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**Abstract.** In today's era of big data, the development of accounting informatization has been promoted, providing a platform for resource sharing for accounting information system, reducing the cost of informatization and improving the efficiency of informatization. But also brought some risks, such as information to accounting information disclosure risks, risks of virus and hacker attacks, hardware and software, personnel responsibility risk, etc., have put forward suggestion to strengthen the accounting information system security modules, strengthen hardware and software development, build perfect accounting supervision system, improve the accounting information relevant laws and regulations.

**Keywords:** Big data · Accounting information system · Network security and prevention

## 1 Introduction

Accounting information system is a system based on computer technology, which converts accounting data into information and realizes enterprise financial information management. Its main function is to collect, store, process and output accounting data, and provide reference information for enterprise management and decision-making. Most of the current Accounting Information systems belong to EDP (Electronic Data Processing Accounting) and MIS (Management Information System) [1]. The characteristics of the accounting information system are as follows:

### 1.1 The Breadth of Data Sources

The accounting data sources of accounting information system are extensive and the data volume is large. The structure of data and the process of data processing are more complex. This requires that its data have authenticity and reliability [2, 3].

### 1.2 Sharing of Accounting Information

Under the background of the Internet, accounting information can be Shared in the “cloud” through the cloud accounting environment, which is not only conducive to

accounting workers can deal with accounting business anytime and anywhere, so as to improve their work efficiency. It is also helpful for enterprise managers to carry out real-time mining and analysis through the accounting information system after information fusion, so as to have some understanding of the operation of enterprises and make decisions based on this.

### **1.3 Centrality of Information Management**

The development of network technology and application make the financial information system realizes the remote operations, enterprises are able to extract useful data at any time, the business activities can be real-time tracking, greatly improving the efficiency of data analysis processing, can provide useful decision information in a timely manner, in order to realize the integration of internal resources, strengthen centralized management level.

## **2 Security Risks of Accounting Information System in the Era of Big Data**

### **2.1 The Cloud Computing Platform is Developing Slowly, and There is no Reliable Storage and Accounting Center for Accounting Information**

The establishment of cloud computing platform requires high economic cost and technical support, and the research takes a long time and costs a lot. Moreover, China's technology is still in the initial stage of exploration, theoretical knowledge and practical operation are relatively weak, and domestic enterprises do not dare to use foreign software for information security. Without safe storage and accounting space, accounting information is easy to be stolen by criminals and increase business risks.

### **2.2 Risk of Disclosure of Corporate Financial Information**

Nowadays, with the rapid development of Internet technology, most enterprises have adopted accounting information system to deal with their business transactions. Important financial information of enterprises is recorded and kept in the network [4]. The operation of enterprises can be analyzed through financial information, which is classified as enterprise secret. In the era of big data resource sharing, the use of big data technology to obtain, process and share information increases the risk of corporate financial information disclosure, which will cause huge losses to enterprises.

### **2.3 The System is Exposed to Viruses and Hacker Attacks**

The network is an open system, which not only facilitates people to share network resources, but also provides a platform for some criminals [5]. On the financial data without encryption, data transmission on the Internet in the process of prone to security vulnerabilities, hackers can use spyware or virus breakthrough finance software level

into the enterprise internal financial database, thus illegal access to the financial information of the enterprise, may also have to malicious tampering of corporate financial information, these threats will bring unimaginable economic losses.

## 2.4 Software and Hardware Risks of Information Systems

The hardware and software of the accounting information system are prone to failure, resulting in the absence of stored accounting information. Under the traditional paper manual accounting system, confirmation, measurement, accounting and other work are closely linked, and the physical recording process is left, which has more advantages in information storage. The accounting information recorded in the virtual space will cause the absence of accounting information due to the failure of the software or hardware of the machine, which will bring certain business risks.

## 2.5 Personnel Liability Risk

Under the background of ERP business accounting of accounting information is more simple, intermediate accounting personnel handling, accounting supervision function weaken, part of the data input error was found to be not easily, also reduced the difficulty of tampering with accounting data, it is easy to cause a lot of error and distortion of accounting information, false accounting information to calculate the error of the financial indicators will guide the decisions of enterprise managers do not, for enterprise to bring huge economic losses [6, 7].

# 3 Accounting Information System Network Security Precautions

## 3.1 To Build an Independent Accounting Information Resource Sharing Platform

The government can set an example by pooling capital, talents and other resources to realize the reasonable allocation of resources and make different industries give full play to their strengths. In addition, the government should attach importance to technology research and development, train its own technical personnel, develop its own technology, and strive to reduce costs. In addition, the integration of accounting information system and other information systems, such as ERP, should be strengthened. ERP can enable the accounting information system to collect data more widely. Each enterprise can process data according to its own needs and output data that meet its own needs.

## 3.2 Strengthen the Security Module of Accounting Information System

First of all, enterprises should regularly upgrade hardware equipment and choose appropriate application software according to their characteristics. For example, manufacturing industry can choose ERP software of SAP Company with better process

integration, financial insurance bank can choose software of ORACLE Company that is more suitable for itself, and the software should be updated, updated and maintained regularly. Secondly, the enterprise should strengthen the daily virus detection work, establish a firewall, to resist external interference and attacks; finally, enterprises should pay attention to the development of hardware system functions, such as adding protection functions to prevent the loss of input data in case of system crash, sudden network outage, power outage and other emergencies.

### **3.3 Strengthen the Development of Software and Hardware of Accounting Information System**

Does not exist in the process of the normal operation of the computer software and hardware failure problem, but if the long-term accumulation of a large number of data can make the computer caton breakdowns, software and hardware have certain damage, can strengthen the computer system software and hardware development, running a lot of financial data, more simple and efficient algorithm, hardware can have large amount of CPU memory to deal with more information, to reduce the occurrence of fault, to reduce the possibility of accounting information system is lost [8, 9].

### **3.4 Establish and Improve the Accounting Supervision System**

Refine the functions of internal supervision and design the accounting process so that the accounting information can be reviewed by more internal accounting personnel, avoid simple input errors, and avoid bookkeepers tampering with the original accounting information [10]. Or introduce a third party institution to comprehensively supervise and manage the financial data accounting information of the company, which can effectively avoid the relevant data information being tampered with by malicious attacks. With the application of the third-party fair system platform, the job responsibilities of each department in the company are clearly divided, so as to restrict each other in accordance with the functional requirements, which to a large extent helps to improve the effectiveness of the company's internal control management and reduce business risks.

### **3.5 Improve Relevant Laws and Regulations on Accounting Informatization**

Comprehensively promoting the construction of accounting information system is an important measure to implement the national information development strategy and promote the rapid development of China's economy. Therefore, it is necessary to combine the problems encountered in the development of accounting information system in China and draw on the experience of other countries to formulate accounting informatization laws and regulations in line with the national conditions, so as to provide guarantee for the process of accounting data collection, transmission and storage.

## 4 Conclusions

With the rapid development of the Internet, the Internet not only simplifies the accounting work, but also brings many risks to enterprises. To this end, we must strengthen the security of accounting information system, strengthen the development of hardware and software, improve the relevant accounting supervision system, improve the relevant laws and regulations, create a safe and stable network operating environment, ensure the timeliness and accuracy of financial information, and better play the role of accounting information.

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# Mode of Big Data Analysis Professional Training Based on Network Security

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**Abstract.** With the diversified development of modern education model, information technology provides more support to higher education model. Under the premise of network security and big data, the training mode of higher education integration has been explored and studied at home and abroad. The model of interdisciplinary integration supported by data analysis can realize interdisciplinary complementary education, cohesive education and related education. This paper analyzes the requirements, contents and characteristics of integrated education, and compares the existing integrated education model of big data specialty.

**Keywords:** Data analysis · Network security · Professional training · Educational model

## 1 Introduction

Secondary vocational education and higher vocational education are two different stages and different levels of education in vocational education, which are independent and interrelated. It is an inevitable requirement for the development of vocational education. The integration of convergence and integration makes the middle and higher vocational education as a whole play an important role [1]. It is necessary to adapt to and promote economic and social development. The integration of middle and higher vocational education can increase the natural attraction of vocational education. It is beneficial to establish a perfect modern vocational education system to solve all kinds of problems existing in the middle and higher vocational education of our country at present [2].

## 2 Main Mode Abroad

There are three kinds of modes of connecting between middle and high vocational education in the world: the state confirms the equivalent mode of universal education and vocational diploma, the mode of connecting by special tutoring to reach the standard of academic qualifications, and the mode of direct connection through curriculum or syllabus.

## 2.1 Mode in Germany

The German occupation education is the characteristic of “dual system”, through the spiral educational system and curriculum implementation in Higher Vocational cohesion ladder curriculum [3].

Occupation occupation technology education of high level to low level occupation education as the basis. Occupation practice emphasizes students’ experience. After the occupation of secondary vocational education stage graduates can obtain employment, can also go to accept the occupation education of higher levels. To provide equal competitive conditions and a number of advanced countries for each road of secondary vocational school students. Germany offers a variety of entry have opportunity to receive secondary occupation education students, vocational graduates dual studies have to apply for college and high school graduates and the equivalent qualifications. Courses in Higher Vocational stage, by using ladder type comprehensive occupation curriculum mode in the curriculum, to improve the higher vocational education occupation education system. Aims at “training skills” training teaching, strong flexibility, hierarchy and convergence, emphasize the development of occupation ability [4].

## 2.2 Mode in United States

The United States implements an educational system that closely links secondary vocational education with post-high school technical preparation education, and formulates a unified syllabus linking secondary and higher vocational education [5].

Adopting the linking mode of middle and higher vocational education with curriculum system. According to the “Parkins Vocational and Applied Technology Act” promulgated by the state, the post-secondary technical preparatory education is to be carried out. By means of cooperation between secondary vocational schools and higher vocational schools or signing contracts, the syllabus at all levels and the teaching plans of similar specialties are formulated and implemented in a unified way. The method of linking courses with community colleges is to link the courses of post-high school technical education with community colleges. The practical technical courses in technical colleges have established an inherent connection, and with the needs of domestic economic development for talents, they have constantly improved the linking curriculum system, and offered some technical preparation courses for students in higher vocational colleges to combine organically. Pay attention to practical engineering courses [6].

## 2.3 Mode in Japan

Japan has a complete system of vocational education at the senior high school level, vocational university level, etc. [7].

By means of recommended examinations and other means, Japan has selected excellent vocational high school graduates to enter the national higher vocational specialized colleges and universities. Because of the tradition of focusing on lifelong education, students are generally willing to enter vocational colleges and specialized schools after graduation from vocational high schools. Vocational colleges attach importance to the vocational qualifications they obtain in the secondary vocational

stage when they conduct the selection of freshmen. In the entrance examination, the proportion of vocational courses is considered and taken into account. For specialized schools, according to the fact that 20% of the graduates of vocational high schools are promoted to specialized schools. To develop a teaching plan that can link up with the teaching content of vocational high school, and seek the cooperation between the two.

## 2.4 Mode in Australia

In 1995, the Australian Government introduced the Australian qualifications Framework (AQF), which has 12 levels of qualifications in Fig. 1.

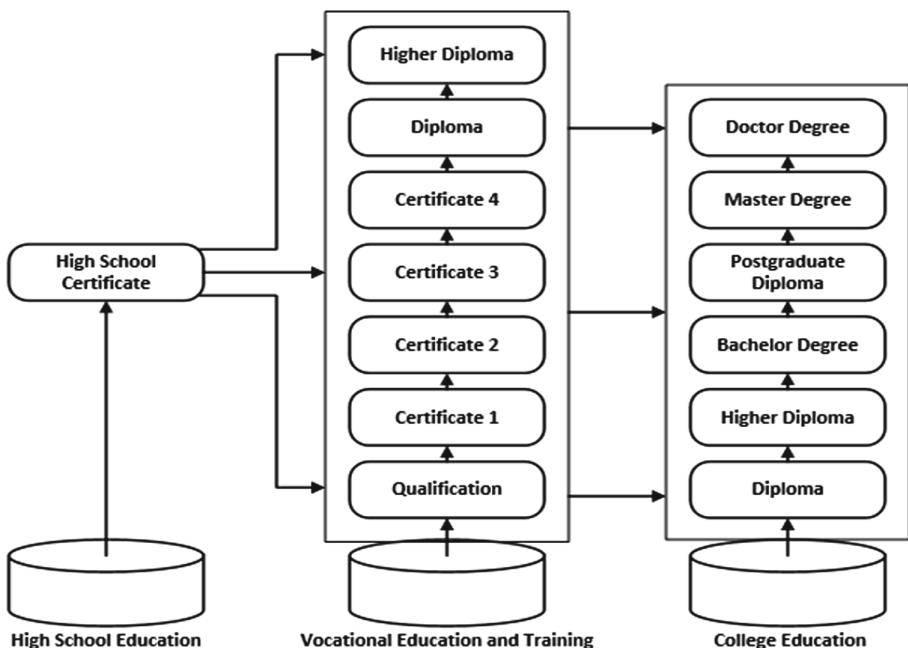


Fig. 1. Australian qualifications Framework (AQF)

The framework covers 12 levels of qualifications in school education, vocational education and training and higher education [8]. School education has a certificate of upper secondary education and vocational education and training has a qualification. Certificate IV and two diplomas and three degree qualifications. The eligibility requirements for each level of the qualification framework are clear, and Australia stipulates that the qualifications at all levels of the eligibility framework must be mutually recognized, And allowing for the interconversion of credits within the eligibility framework. The framework also includes all qualifications recognized in post-compulsory education, and the State sets out the specific content of each qualification and its rationale and bridging protocols, the issue and conversion of qualification certificates. Australia develops “training package” through the organization at the

national level to link up the courses in the national middle and higher vocational schools [9]. The “training package” is a continuous and nationally recognized training in Australia. Identify and evaluate the sum of skills elements, which consist of national competency standards, assessment guidelines and national qualifications. The “training package” is developed by institutions and enterprises, such as the National Industry training Advisory Board.

### 3 The Mode of Big Data Professional Training in China

In recent years, some provinces and cities in China have organized secondary vocational schools and applied undergraduate colleges to jointly explore a mode of linking secondary vocational schools and undergraduate schools that conforms to their own actual conditions. In the practical work, we have summed up a variety of secondary vocational and undergraduate job cohesion models. At present, there are two main categories of higher vocational education system structure and its cohesion in China.

The middle and high vocational college graduates enter the middle and higher vocational colleges and universities by taking part in the adult college entrance examination, which is one of the modes of the middle and higher vocational education convergence at the present stage [10]. However, the adult college entrance examination emphasizes on the culture course examination. The characteristics of vocational education in adult colleges and universities are not outstanding, to some extent, it only solves the problem of secondary vocational students’ academic qualifications.

The secondary vocational school graduates pass the “opposite entrance study”, and the higher vocational graduates enter the mode of linking up with the middle and higher vocational colleges through the examination of “specialized promotion”. There are some problems that cannot be ignored in this mode: first, the culture course examination is necessary, the second is the middle grade, Higher vocational students should not only review cultural courses, but also study and practice in specialized courses. They often take care of one another and lose one another and worry about gain and loss. Second, in higher vocational schools, more majors are offered, while fewer majors are enrolled in undergraduate courses. Some students’ specialties are mismatched; some colleges and universities will teach in the same class without distinction between high school students and high school students, resulting in teaching difficulties and waste of resources [11]. There is no docking in the curriculum, the choice of teaching materials and the overlapping of teaching contents, the theoretical depth is not obviously progressive and effective convergence, which is not conducive to the cultivation of students’ comprehensive vocational ability. At the same time, it is difficult to do two levels of vocational education construction and teaching, which is not conducive to the development and construction of higher vocational education.

Although the connotation and operating mechanism of the above - mentioned joint modes are different, the aim is to give the secondary vocational college graduates the right to continue their undergraduate education through specific educational policies and teaching reform measures. At present, there are still many problems in the mode of talent training and the construction of curriculum system in the middle and higher vocational education of our country, especially the problem of curriculum convergence, because the secondary vocational and undergraduate courses are often independent and

separate from each other. Non-professional matching causes dislocation of knowledge and skills, non-integrated design of professional counterpart, duplication of the contents of specialized courses, disconnect of basic cultural courses, “upside down” of skills training courses, difficult to train high-skilled talents.

## 4 Conclusions

It is the foundation of the sustainable development of vocational education to carry out the connection of middle and higher vocational education, to promote the scientific development of vocational education and to construct a perfect modern vocational education system. Related to the success or failure of the coordinated development of higher vocational education in the new era, vocational education reform and development of an important task.

**Acknowledgements.** This research was supported by a grant of Research and Development of Industrial Technology of Jilin Province in 2020, “Research on Key Technologies of Vertical-oriented Knowledge Map Construction Platform” under Grant No.2020C017-4, Educational research project of the Education Department of Jilin Province in 2018, “Exploration and Practice of the Training Mode of Big Data Professionals with Multi-disciplinary Interfusion”.

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# An Analysis on the Teaching Reform of Human Resource Management Major in Colleges Under the Background of Big Data

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**Abstract.** With the rapid development of big data and informatization, the teaching mode and method of HRM in colleges need to be changed, this is in line with the requirements of society. The research methods of this paper are mainly to use the method of literature review and investigation. It expounds the importance of introducing curriculum thinking and politics in professional teaching in the era of big data; it analyzes the problems existing in the teaching of HRM. Then, the article lists four solutions. The conclusion is that the integration of professional courses in ideological and political education can ensure the realization of the goal of “three-whole education”, and curriculum ideological and political education is an inevitable trend and choice of higher education.

**Keywords:** Big data · Curriculum ideology and politics · Human resource management major

## 1 Introduction

The development of information technology has an impact on all aspects of society, which is the embodiment of social development and scientific and technological progress. In this context, the work of HRM has also undergone significant changes [1]. First of all, the management philosophy of managers began to change. Human resource managers should pay attention to the use of data thinking in HRM. The scientific management and allocation of human resources on the basis of data have improved work efficiency. Under such a background, the course teaching of HRM major should also make corresponding changes to provide more data-oriented HRM talents for the society. Therefore, schools should attach great importance to the big data platform information to carry out ideological and political education for college students. In the past, China's higher education has been in a state of mutual separation and independence between specialized course and ideological education; Teachers are only responsible for the class, they don't pay attention to value guidance, and the separation between teaching and educating is quite common [2].

## 2 The Importance of Introducing Curriculum Ideology and Politics into Teaching Reform

“Curriculum ideology and Politics” in the new era of implementation and implementation of the basic task of moral education is an inevitable requirement, ideological and political education is related to colleges to implement the basic task of moral education [3], it is an indispensable part of training generations of socialist builders and successors [4].

All course teaching should guide college students to acquire ideological and political theory, disciplinary knowledge, professional skills, social ability and values in multi-disciplinary and multi-course learning.

## 3 The Teaching Problems of Human Resource Management Major in Colleges

The teaching methods of HRM in colleges and universities are relatively simple. In the implementation of teaching activities, the teaching methods are backward. Teachers only teach students human resource knowledge in class, ignoring the principal position of students, ignoring the principal position of students and rarely interacting with students. The teaching effect is not good. In other words, the teaching of HRM should place special emphasis on practical teaching, and teachers should impart more practical methods and experience of HRM to students. However, the current teaching status of HRM is that teachers emphasize the teaching of theoretical knowledge, and the coordination efficiency of HRM teaching theory and practice teaching is not high. This affects the overall quality of teaching.

In the teaching of HRM major in colleges, the teaching system is relatively backward, which affects the teaching quality of HRM major [5]. First of all, in the major of HRM, the comprehensive quality level of the teacher team is relatively poor. Teachers of HRM major are the teaching implementer of HRM major in colleges, which has a very important influence on the teaching quality of HRM major. At present, the knowledge level of HRM teachers in colleges and universities is very high, most of them have a master's degree or above. However, the problem is that human resource teachers lack ideological and political concepts. Many teachers do not care about politics, so it is difficult to cultivate people in teaching. Secondly, teaching materials for HRM in colleges are relatively backward, and traditional teaching materials are still used, which is not consistent with the teaching of HRM in the era of big data [6]. Students use old teaching materials for learning, and it is difficult for them to apply them to HRM positions after graduation.

## 4 Measures for Teaching Reform of HRM Major in Colleges

“Curriculum ideology and Politics” points to the whole teaching system of colleges, emphasizes fully excavating the moral education elements of all teaching subjects and practical activities, and focuses on cultivating the “four talents” with ideal, morality,

culture and discipline [7]. When implementing the teaching plan of professional courses, the content of ideological and political theory courses should be integrated into other course contents in a hidden form, so as to enable students to realize the all-round development of knowledge, skills and values.

The construction of ideological and political courses in colleges and universities is the quality of personnel training. Therefore, teachers' awareness of education is very important, fully explore the moral elements of hidden curriculum, use big data information and technology to develop ideological and political education, test the teaching effect in practice, and quickening the pace of the construction of curriculum ideology and politics.

#### **4.1 Reform of Talent Training Program**

The implementation of all teaching reforms must be based on the overall talent training program. First of all, the training program for HRM professionals should be revised. The teaching content and teaching plan of professional courses should be adjusted accordingly, the implementation of ideological and political elements should be emphasized, and the laws of education and teaching should be followed [8].

#### **4.2 Strengthening Teaching Design, Teaching Resources Development, Teachers Teaching Platform Construction**

In teaching design, the ideological and political value and significance of professional practice and discipline development should be clarified first. The selected ideological and political elements and contents are of authenticity and value, and the entry point and connection point should be identified [9]. It is very important to design the curriculum system of HRM as a whole, how to introduce ideological and political elements in the curriculum teaching of HRM, and how to select the content of ideological and political elements. Generally speaking, teaching objectives are set in our current teaching, and the setting of teaching objectives for HRM specialty must be equipped with cognitive, emotional and technical objectives. In addition to the cognition of professional knowledge, the cognitive objective should also include the cognition of the party's principles and policies, socialist core values, national consciousness, etc. How to integrate them into teaching is very important. For the realization of emotional goals, it is more necessary to consider which ideological and political factors should be adopted to guide students' values correctly, so that students can correctly judge relevant issues. The realization of the skill goal includes not only the training of operational capacity of the corresponding modules of the HRM major, but also the integration of the task of using scientific theories to guide the skill training into the project training, To achieve the comprehensive cultivation of moral standards, political consciousness, theoretical level and professional level of the HRM major students.

The major of HRM should establish a teaching system based on ideological and political education courses, modify course objectives, teaching plans, teaching courseware, etc., and compile typical course textbooks.

In the era of big data, teaching ideas have changed and the teaching method should be improved. Traditional teaching, with teachers as the main body, ignores the subjective

factors of students, and students lack enthusiasm for learning, believing that the curriculum is unitary. With the rapid development of network technology, its advantages such as large information dissemination capacity, fast speed, instant communication, instant interaction, etc., it provides convenience for ideological and political education. In order to carry out curriculum reform for HRM major in colleges and universities, teachers should change teaching methods, apply new teaching methods to attract students to learn and improve teaching quality. In addition, teachers should also help students to establish a data thinking mode in teaching and learn to apply data to complete human resource learning and practice. Teachers of HRM major courses need to strengthen the construction of platforms such as theoretical teaching, practical teaching and online teaching, and use the “Internet + education” platform to serve teaching, and promote the integration of traditional advantages and information means in ideological and political work. New online learning apps for example “learning power” or “classroom online”, as well as “WeChat”, “MicroBlog”, “QQ” and other instant messaging apps in the “curriculum ideological and political” construction process [10].

#### **4.3 The Teacher's Personality Charm Leads the Course Ideological and Political Teaching**

As a teacher of HRM, we must first have a higher ideological and political consciousness, Teachers majoring in human resources should practice their words and deeds in teaching and integrate ideological and political education elements into professional teaching with their own personality charm. Training the personality charm of professional teachers is particularly important for their professional development. Whether a teacher's values are correct or not plays a key role in guiding students. Nowadays, teachers' primary duty is to teach and educate, so it is necessary to enhance teachers' moral awareness and value pursuit. Only when teachers have a correct understanding of only teachers have a correct understanding of the core socialist values, and consciously guide their own words and deeds according to the requirements of core values can they be the first to guide and educate students in teaching practice. At the school level, teachers should be provided with training and learning opportunities so that teachers of specialized courses can better and more actively explore the ways and methods of curriculum ideology and politics.

#### **4.4 Colleges and Universities Should Strengthen the Institutional Guarantee for the Implementation of Curriculum Ideology and Politics**

Curriculum thought and politics should be taken as an indicator of assessment and evaluation in teaching quality assessment and teacher performance assessment, and the indicators should be quantified. In this way, teachers can be more effectively promoted to actively carry out curriculum ideological and political courses, in terms of funds and other key support for curriculum ideological and political education and teaching reform research and practice projects.

## 5 Concluding

In the era of big data and information technology, college teaching reform is of great significance to the development of HRM. Integrating into the professional curriculum of ideological and political education can ensure the realization of the goal of “three comprehensive education”. Curriculum ideology and politics is a consequent trend and choice for the existence of higher education, which can promote moral education work in colleges to achieve a qualitative leap.

**Acknowledgements.** Jilin Province Education Science thirteenth five-year plan key Subject “An Exploration and Analysis of the Teaching Reform of HRM Major in University from the Ideological and Political Perspective of Curriculum”. The project number is NO. ZD19090.

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# Research on the Improvement of College English Learning by Artificial Intelligence

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**Abstract.** English has become a popular language in the world, and English is becoming more and more routine in our lives, so the importance of college English teaching is becoming increasingly obvious. Artificial intelligence (AI) has been in the shape of breakthrough and development, especially in language translation. It has been able to comprehensively improve the efficiency of college English teaching and learning process, improve the learning and teaching experience and make personalized learning a reality in all aspects of learning tutoring, teaching evaluation and teaching scenes. On the basis of discussing the advantages of AI in English learning, such as accurate testing, pronunciation correction, intelligent evaluation, data tracking and efficiency improvement, this article discusses the core elements of language learning listening, speaking and reading in the aspect of writing, putting forward some strategies for the application of AI in English learning, such as improving the freshness of listening resources, creating a “mother tongue” communication environment, increasing reading entertainment and enhancing writing enthusiasm.

**Keywords:** Improvement · College English learning · Artificial intelligence

## 1 Introduction

With the continuous progress of science and technology, artificial intelligence has been widely used in almost all aspects of our life. Many experts are vigorously exploring the use of artificial intelligence technology to solve some practical problems in the field of education. The in-depth integration of increasingly mature artificial intelligence and English teaching contributes to the modernization of English learning concepts and methods [1]. Some educators are trying to make in-depth discussions on issue in order to fully explore the role of artificial intelligence in improving English learning and lead to the changes in English learning quality, which can help hundreds of millions of learners in my country alleviate the difficulties of English learning, so that they can learn happily and improve quickly.

## 2 English Learning Calls for the Support of Artificial Intelligence

In my country, the efficiency of English teaching is not high, the effect of students learning English is more reflected in the examination results, and improving the English application ability is the original intention of the general public to learn English. Under the new situation of globalization and internationalization, English teaching reform is imminent. It is necessary to use increasingly mature artificial intelligence to solve the dilemma of poor teaching quality and poor effect in the process of English teaching and learning, adjusting to the needs of personalized talent training, and providing technical services education. Through the in-depth synthesis of artificial intelligence and English education, teachers are able to innovate English teaching modes, teaching methods, and learning methods to truly promote the in-depth development of English teaching reform.

The development of English teaching has always been related to the development and progress of science and technology. Therefore, in many universities in my country, the first audio-visual education department appeared in foreign language schools. The development of technology provides good support for students to learn English. Every teacher and student can feel the convenience brought by technology to English learning [2]. With the emergence of new technologies and new ideas, great changes have taken place in the teaching and learning environment, thus promoting the change of learning methods.

Language is an important way for humans to obtain information. Many technologies in the field of artificial intelligence can promote language acquisition. At present, China has the leading world artificial intelligence speech recognition, the accuracy rate of which has reached more than 97%, and its response speed is very fast. Language communication between machines and human beings is gradually being realized [3]. The application of various advanced technologies in English learning can effectively help learners practice oral English and improve their communication skills.

## 3 Strategies and Methods of Using Artificial Intelligence to Improve English Learning

First of all, improving the freshness of English listening resources. Let English learning return to specific scenarios, such as various daily life, travel, campus life, workplace office, leisure and entertainment, etc., and artificial intelligence virtual tour guides can be set up, learners can establish connections in any scene, listening to virtual tour guides to introduce local features and attractions of interest. Learners can choose different scenes and different degrees of difficulty, and each of them can find the listening audio suitable for their English level to realize the vividness of listening. Through role playing, learners can also participate in the specific English learning scene and turn the boring learning content into vivid and three-dimensional content, so as to learn easily, happily and efficiently [4].

Secondly, creating a “mother tongue” English communication atmosphere. The emergence of educational robots provides support for building the environment for English practices. Educational robots have the ability to act, who can accompany learners to progress like sincere friends, and create a real and natural language learning environment through active and timely communication, creating a continuous and natural language environment that is entertaining [5]. Educational robot can intelligently identify learners’ emotions. When learners feel learning difficulties, it can encourage learners by strengthening emotional communication, such as “Your pronunciation has improved today”, so that learners are able to feel the motivation of learning and stimulate their interest in continuing learning and exploration. In a real and natural language environment, through dialogue with intelligent robots, learners will become more relaxed, and the efficiency of language acquisition will increase.

Thirdly, increase the enjoyment of English reading. With the continuous advancement of technology in the field of language teaching, more and more scholars put forward the concept of game teaching. Its advantages are mainly reflected in improving the sense of immersion, participation and loyalty of users [6]. The introduction of game based teaching concept into English reading learning process can increase the enjoyment of English reading and improve the learners' English reading ability from the aspects of interest driven, virtual company and incentive promotion. In English learning, it is very important to cultivate self-confidence. Praise and encouragement are effective ways to cultivate self-confidence. Motivation can create a relaxed and pleasant learning atmosphere, make learners feel the sense of achievement, generate positive learning motivation, and enjoy the happy learning process. In the process of reading, the system automatically gives feedback and encouraging comments according to the learners' self-searching reading information and self-summarizing information. The incentive evaluation obtained by learners can further stimulate their enthusiasm for learning.

Fourthly, improve the enthusiasm of English writing. With the help of artificial intelligence technology, the use of machine networks to correct English composition has been achieved [7]. The use of artificial intelligence technology can realize the timely evaluation and feedback of writing, and is no longer limited by time and space, providing effective feedback and evaluation for students' learning through a new open form.

#### **4 The Development Direction of AI in My Country's College English Teaching**

With the realization of the Internet of Everything, the speed of information changes in the artificial intelligence era will be faster than in the Internet era [8]. Therefore, making good use of learning tools, such as information retrieval tools, online interactive collaboration tools, translation tools, etc. have become compulsory skills for learners. Effective learning tools can promote efficient learning. Learners can use English learning software to spontaneously set up English learning groups when writing English, discussing topics of interest, writing text reports, using machine corrections, peer corrections, interactive learning methods, friends PK, grade rankings, etc. AI can

improve learners' enthusiasm in English learning. Through the output process of language learning, the level of English can be improved qualitatively.

For example, English teachers should use the support of technology to cultivate learners' English writing habits. Firstly, through the writing system, publishing personalized writing tasks in the learning space, and the virtual teacher will guide students in writing methods and conceive the writing framework together with the students; secondly, the virtual teacher will prompt the students with relevant vocabulary according to the students' writing progress to exercise students' English writing language organization ability, which can help students complete writing tasks smoothly; finally, the works are handed over to the machine to correct the composition, and through the timely feedback of machine review, students can feel the joy of writing in the process of repeated revisions and enhance their confidence in English writing [9].

## 5 Conclusion

Artificial intelligence can improve English teaching efficiency, found new language learning approaches, playing a role in helping learners learn English efficiently in a more suitable environment. The use of artificial intelligence helps teachers to carry out teaching and research activities and teaching reflection, and will effectively improve the quality of language teaching. Through the combination of artificial intelligence and the teaching process, the functions of advanced technology will be released, thereby promoting the continuous progress of language education [10–12].

Modern information technology represented by artificial intelligence will help to innovate the concept of English teaching, promote the generation of new teaching ideas and teaching methods, and provide language teaching workers with a broader vision.

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# Application of Mathematical Calculation Model in Computer Science

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**Abstract.** Mathematics is an essential subject in daily life, and computer science has played an important role in human life, and the combination of the two will still produce unexpected results. Mathematics also has a wide range of functions in computer science. For some mathematical knowledge and mathematical models, computer science can be applied and improved, so as to promote the further development of computer science. The model is to mathematicize the actual problem, and the algorithm is to solve the mathematical problem contained in it. The mathematical method is to solve the model. The selection and application of algorithms in computer science are of great significance to modeling. By analyzing some specific contents of computer science, this paper points out the influence of computer science and its application on life and production in the specific practice process, and finally points out the role of mathematics in computer science and its application, hoping to give some reference suggestions to relevant staff.

**Keywords:** Mathematical model · Computer science and its application · Function analysis

## 1 Introduction

In computer science, the commonly used methods of mathematical modeling are: analogy, dichotomy, dimensional analysis, difference, variation, graph theory, analytic hierarchy process, data fitting, regression analysis, mathematical planning, mechanism analysis, queuing method, countermeasure method, decision-making method, fuzzy evaluation method, time series method, grey theory method and modern optimization Algorithm, etc. Some models such as optimization model, differential equation model, statistical model, probability model, graph theory model and decision model can be solved by these methods. In practice, the selection and application of algorithms in computer science are of great significance to modeling itself [1].

The content of computer science is the combination of computer hardware and software. The range of computer knowledge is wide. According to different needs, there will be different contents. It is a subject centering on computer. The contents are very rich, including the research and development of computer technology, the maintenance of technology and the maintenance and upgrading of computer system.

We should carefully review the contents of the computer and make different adjustments according to some special needs. In today's society, computer talents are also in short supply. It is necessary to further tap new computer talents and cultivate some high-quality talents with independent innovation ability and independent practice ability according to the needs of the times. At present, many colleges and universities have set up the computer specialty, which is very professional. It must have deep knowledge reserve and flexible application ability.

## 2 Application Scope of Computer Science

Computer has strong flexibility and agility. With the development of society, the world has entered the information age. Everyone has information connection and can timely share the latest information from all over the world. For some special information requirements, timely communication and information complementation can be achieved, which plays a crucial role in promoting the development of the whole society. The application range of computer science is very wide, which has an important impact on the country, enterprises and individuals.

### 2.1 National Application

The application of computers in the national scope can involve economic, political and military aspects. In the military aspect, with the application of computers, some military equipment can be remotely controlled, such as the launch of rockets, the ascent of spaceships, and the submergence of nuclear submarines. It will also have an important impact on economic development. For example, computer can be used to predict the future economic trend and explain the future economic development trend. It will also play an important role in politics. The leaders of the two countries can realize friendly exchanges between the two countries through real-time computer communication.

### 2.2 Application in Enterprises

Some business problems of enterprises also need to apply computer science. In general, the financial statements, capital turnover statement and corresponding engineering material management table of enterprises need to be completed by computers. Some business projects of enterprises are closely related to computers. For example, some information industry must be applied to computers and use computers to expand new fields. Therefore, computer science and corresponding knowledge must be used in the daily activities and business activities of enterprises. Computer science will also be popularized and widely used in enterprises, which will inject a strong back thrust for the development of enterprises.

### 2.3 Application in Personal Life

In our daily life, Everyone needs a computer to convey some information, and most people will master some simple computer operation skills, which have a vital impact on

a person's overall development. Therefore, we must strive to master some corresponding computer knowledge, and computer science is also a more logical discipline, which is for us to learn some science Family also plays an important role [2].

### 3 Common Algorithms in Computer Science

Under the background of modern science and technology changing with each passing day, the development of computer science and advanced mathematics is advancing by leaps and bounds. Mathematical calculation promotes the continuous evolution of computer, while the development of computer science makes mathematical calculation faster. The algorithm greatly enhances the speed of computer program development, a good algorithm can make the calculation problem get accurate solution, on the contrary, choosing the wrong algorithm will result in different or even wrong results.

#### 3.1 Graph Search Algorithm

The path is calculated from a given starting point to a given end point. A heuristic estimation is used to estimate the best path for each node to pass through the node, and to arrange the order for each location. The algorithm accesses these nodes in the order they are obtained. Therefore, this algorithm is an example of best first search.

#### 3.2 Dynamic Programming Algorithm

This paper shows the subproblems and the optimal sub architecture algorithm covering each other. This method also reflects the close relationship between mathematical calculation and information computing science.

#### 3.3 Branch Definition Algorithm

An algorithm for finding specific optimization solutions in a variety of optimization problems, especially for discrete and combinatorial optimization. This idea of calculation is also a methodology.

#### 3.4 Data Processing Algorithms Such as Data Fitting, Parameter Estimation, Interpolation, etc.

In some domestic competitions, a lot of data need to be processed, and the key to data processing is these algorithms, usually using MATLAB as a tool. There are many problems related to graphic processing, which are related to fitting. This kind of problem has many functions to call in MATLAB, only familiar with MATLAB, these methods can be used well.

### 3.5 Numerical Analysis Algorithm [3]

If high-level programming language is used in the competition, some commonly used algorithms in numerical analysis, such as solving equations, matrix operation, function integration and so on, need to write additional library functions to call. Numerical analysis studies various numerical methods for solving mathematical problems, especially those suitable for computer implementation. Its main contents include numerical approximation of functions, numerical differentiation and integration, numerical solution of nonlinear equations, numerical algebra, numerical solutions of ordinary differential equations, etc.

### 3.6 Computer Algorithms Such as Branch And Bound

All feasible solution spaces of constrained optimization problems are searched systematically, which is the content of branching and delimiting. Generally, the whole feasible solution space is repeatedly divided into smaller and smaller subsets, which is called branching, and an objective lower bound is calculated for the solution set in each subset, which is called bounding. After each branching, those subsets whose bounds exceed the objective value of the known feasible solution set will not be further branched. In this way, many subsets may not be considered, which is called pruning.

In addition, there are also such as Buchberger algorithm, data compression, Diffie Hellman key exchange algorithm, Dijkstra algorithm, discrete differential algorithm, dynamic programming algorithm, Euclidean algorithm, expectation maximum algorithm, fast Fourier transform, gradient descent, hash algorithm, heap ordering, Karatsuba multiplication, Ill Algorithm, maximum flow algorithm, merge sort, Newton method, Q-learning learning algorithm, twice screening method, RANSAC, RSA public key encryption algorithm, sch ü nhage Strassen algorithm, simplex algorithm, singular value decomposition, solving linear equations, struktressor algorithm, merge search algorithm, Viterbi algorithm.

## 4 Mathematics in computer science and its application

Mathematics, as a subject with strong abstract logic, can exercise people's logical thinking ability, improve people's thinking ability by drawing inferences from one instance, and help people better grasp the spatial imagination ability. There are also some mathematical knowledge, mathematical formulas can also be applied to computer science. The following is an analysis of the role of mathematics in computer science and application.

### 4.1 Develop Logical Thinking Ability

As we all know, mathematics has a very high demand for people's logical thinking ability. Some solid geometry knowledge requires people to have high spatial logical thinking ability. Only with this ability can we design more abstract but satisfying graphics. These drawings are some building structural models that meet the needs of social development, Or some military weapon models and so on. Mathematical

knowledge will provide some knowledge reserves for computer science, which will inject continuous power into the development of computer science. Only by mastering the basic logical thinking ability can we learn computer well. What we must make clear is that mathematics is a basic subject, which everyone must learn, and these arithmetical abilities can help the computer to run and operate better.

## 4.2 Promote the Development of Computer Science

Because the combination of mathematics and computer science can form a new discipline. This new discipline will help the development of computer science. Through the combination of computer and mathematics, some mathematical thinking, such as rational thinking ability, can help computer science establish a more accurate development concept, can make computer science more rigorous, rational dominant will promote the whole society moves forward. The Department of computer science is more widely used in life, because mathematics is an indispensable subject in everyone's life. Some simple computing ability and abstract generalization ability are essential elements for a person's overall development. Mathematical knowledge will play such a role in computer science, helping computer science and its application to go deeper into life and more appropriate to life. In order to obtain more extensive application, promote the deep level development of computer science.

In a word, mathematics plays an important role in computer science and its application the long-term development of computer science.

## 5 Conclusions

Mathematical model is to convert Abstract practical problems into mathematical problems, and express them with mathematical models that are easy to understand and calculate. Generally speaking, models can be understood as calculation formulas, common mathematical definition theorems, etc. algorithm is the calculation method, which is used to solve mathematical models, that is, the method to solve the model. As an important way for the development of computer science, it can also provide a reference for the development of computer science. We should strive to learn mathematics well, learn some new mathematical knowledge and some thinking modes, promote the development of computer science, constantly promote the innovation of computer technology, realize the real information age, and promote the continuous development of China's economy.

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# Fuzzy Recognition of Color and Its Application in Image Retrieval

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**Abstract.** Content based image retrieval (CBIR) has become a research hotspot in the field of image processing because of its high theoretical and application value. Extracting and matching image features is the main method of CBIR. However, it is extremely difficult to extract the effective features of images. Based on HSV color space characteristics and human perception of color, a color recognition method is proposed. And the structure of this class of pixels is extracted by the method of classification. Image feature matching will be carried out among the same pixel sets, which reduces the complexity of image feature extraction and matching. Experimental results show that the proposed image retrieval method has a good effect.

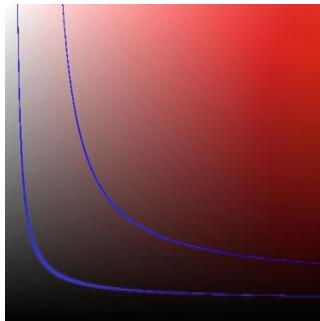
**Keywords:** Image retrieval · Fuzzy set · Color recognition · Feature extraction

## 1 Introduction

With the rapid growth of the number of digital images, text-based image retrieval technology has been gradually eliminated due to the non objectivity of its description of image content and the impossibility of manual annotation. At the same time, CBIR has become one of the most valuable research topics. The common method of CBIR is to extract image features and match them. The complexity of natural images makes feature extraction very difficult. Therefore, the difficulty of feature extraction can be reduced by properly decomposing the image, regarding the image as a part of the unity of multiple attributes, and extracting features in each part separately. Color histogram is the most commonly used method in color based image retrieval. Konstantinidis et al. Proposed a method based on fuzzy color histogram. Afsar et al. Proposed a color histogram method based on intuitionistic fuzzy sets. However, color histogram only considers the statistical information of pixels, which loses the structural information of pixels, which affects the retrieval effect. In this paper, the image is decomposed into several parts according to the color to keep the structure information of the pixel, avoiding the complexity of the image color and the interaction between different colors. In image matching, only the structural features of corresponding parts of different images are compared, which simplifies the complexity of image retrieval. Experiments show that this method can achieve good retrieval results.

## 2 Fuzzy Recognition of Color

Phan and androutsos showed that when  $h$  was fixed, there was a boundary between color and non color in V plane. However, since achromatic to color is a gradual process, there is a fuzzy region on the SV plane. In this region, it is difficult to distinguish whether the color is colored or achromatic, so the boundary is difficult to determine. It is more reasonable to distinguish the color from the non color and the fuzzy area between them by two curves. In this paper, the boundary between the above three regions is obtained through the average results of a large number of tests, as shown in Fig. 1 [1]. The left curve equation is the right half branch of hyperbola  $(-0.07)(-0.03) = 001$ , and the right curve equation is the right half branch of hyperbola  $(v-0.12)(-0.12) = 006$ . On the left side of the curve on the left, the color is considered achromatic. On the right side of the curve on the right, color is considered color. The color between two curves is fuzzy.



**Fig. 1.** Boundary of color and non color fuzzy region in SV plane

According to the boundary of the three regions, this paper defines color fuzzy sets and achromatic fuzzy sets. In HSV space, color fuzzy set  $C$  is a fuzzy subset defined on  $[0, 1] \times [0, 1]$  and its membership function is

$$C(s, v) = \begin{cases} 0, & (v - 0.07)(s - 0.03) \leq 0.01 \\ 1, & (v - 0.12)(s - 0.12) \leq 0.06 \\ \frac{d_l}{d_l + d_r}, & \text{other} \end{cases} \quad (1)$$

Where  $d_l$  and  $d_r$  are the distances from the point  $(s, v)$  to the left and right curves, respectively). An achromatic fuzzy set  $a$  is a fuzzy subset defined on  $[0, 1] \times [0, 1]$ .

## 3 Monochromatic Region of Image and Its Characteristics

### 3.1 The Monochromatic Region of an Image

According to the color recognition method in Sect. 2, each pixel of the image is recognized. In this paper, we do a layered processing on the image, each layer contains

only pixels with the same color in the image. How many layers an image is divided into is determined by the number of colors in its pixels.

The hue, saturation and brightness of pixels in monochromatic regions are semantically coherent. In addition, pixels in monochromatic regions retain their structural information in the image. In this paper, the feature extraction is carried out in the monochromatic region [2]. Therefore, we do not need to consider the information of the pixel itself, only the structure information of the pixel. In the process of image comparison, we only need to compare the features of monochromatic regions corresponding to two images.

### 3.2 The Characteristics of Monochromatic Region

The area of monochromatic region reflects the importance of monochromatic region in the image. The area of the monochromatic region is the total number of pixels in the monochromatic region, which is recorded as  $S$ . At this time, when the number of monochromatic pixels in the region is too small, it is considered that the number of monochromatic pixels in the region is too small. In this paper, we take  $s < \delta$ , as the width and height of the image respectively.

The distribution of monochromatic pixels in the original region is reflected. Generally, the regional dispersion is expressed by the ratio of the square of the perimeter to the area. If the eight neighborhoods of pixel P in the monochromatic region are not filled, the pixel is considered as the boundary point of the monochromatic region. If the total number of boundary points of monochromatic region is  $n$ , then the dispersion of monochromatic region  $x$  is:

$$x = \frac{N^2}{S} \quad (2)$$

The centroid of monochromatic region shows the position of each monochromatic region in the image and the overall structure information of each monochromatic region in the image. Considering that images with the same content in the image library may have different specifications, it is necessary to take the image specifications into account, so that  $w$  represents the width of the image,  $h$  represents the height of the image, all in pixels, and the centroid  $c$  of the monochromatic region is:

$$c = \left( \frac{\sum_{i=1}^n x_i}{nw} \right) \quad (3)$$

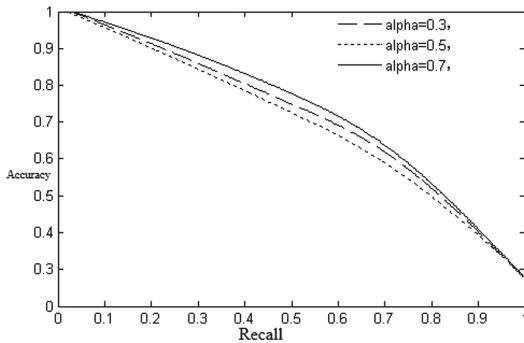
## 4 Comparative Experiment

The experimental images are from corel1000 image library. Select different  $a, b$  values, according to the distance between the images defined above, carry out image retrieval experiment. Figures 2 and 3 show the first 30 images of a retrieval example, in which

the one image is the query image. Figure 3 shows the average recall accuracy curve of the proposed method under different parameters. The accuracy comparison of this method and two color histogram methods in finding out the same number of related images is shown in Fig. 3 [3, 4]. It can be seen that the accuracy of this method is obviously better than the other two methods when finding out the first 60% of the relevant images.



**Fig. 2.** Results of horse image retrieval



**Fig. 3.** Precision curve of average recall rate under different parameters

## 5 Conclusion

After a large number of experiments, the color recognition method proposed in this paper can better classify the color in the king SV space. According to this method, the image is decomposed to form a monochromatic region. In image comparison, only the differences of corresponding monochromatic regions are considered, which avoids the mutual influence of multiple colors, reduces the difficulty of feature extraction, and achieves very good results in CBIR. In addition, extracting effective features of monochromatic regions is a problem worthy of further discussion.

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# Image Denoising and Inpainting Strategy Based on Partial Differential Equation

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**Abstract.** With the increasing of computer processing ability and the increasing demand of multimedia information processing in information society, image processing has become a very active research field. The denoising and enhancement of images is to improve the quality of images, so that they are more suitable for the practical application needs, so it has a high research value. This paper mainly studies the methods of image denoising and enhancement under the framework of PDE theory, especially the difficulties encountered in the theory and practical application of the methods. This paper focuses on the image denoising and enhancement, analyzes the axiomatic partial differential equation model, partial differential equation model based on variation and geometric partial differential equation model. It discusses a series of difficult problems in image processing method based on PDE and puts forward solutions.

**Keywords:** College partial differential equation · Image denoising · Image enhancement · Numerical fidelity term

## 1 Introduction

Image denoising and enhancement is a research topic that appears with the development of imaging technology. Because of the inevitable degradation factors of image quality in imaging equipment and imaging process, image denoising and enhancement has always been an important research content in image academic and engineering fields [1]. There are four reasons for image degradation: defocus of imaging system, relative motion between imaging equipment and object, inherent defects of imaging equipment, external interference, etc. The purpose of image denoising is to eliminate the influence of image noise on image quality, which is an objective process. Image denoising is essentially the inverse process of image degradation. It is an inverse problem to estimate the degradation process and compensate the distortion caused by the degradation process. Image denoising is often a ill conditioned problem. It needs to be transformed into a well posed problem by regularization technology, but different regularization methods will produce different results, So this is an area where new research results are constantly emerging. Compared with image denoising, image enhancement is a relatively subjective process. Its purpose is to enhance the visual effect of the image, so as to provide images suitable for specific image engineering applications or users like to accept.

## 2 Study on Coupled Adaptive Fidelity Terms in Nonlinear Diffusion Equations

Image denoising is an important research content in image processing. Effective denoising methods can keep the geometric structure of the object in the image while removing the noise. The denoising method based on nonlinear diffusion equation has the above advantages, which has been used in many fields. Their basic idea is to adopt different smoothing strategies in the region and the target edge, that is, to accelerate the smoothing in the region, and to suppress the smoothing at the edge [2].

The denoising method based on diffusion equation can be divided into two dimensional thermal diffusion processes along the gradient direction and perpendicular to the gradient direction, such as Perona Malik model and MCM Model 6. Although these models can suppress the diffusion at the edge and maintain the edge structure, the denoising speed of diffusion term along the direction of gradient is related to the local curvature of the image, which causes the evolution speed of the target sharp corner in the image is faster than the edge. If the number of iterations of diffusion equation is not reasonable, the sharp angle will be lost.

### 2.1 Research on Numerical Fidelity Term of Existing Models

Nonlinear diffusion equation denoising method is an extension of linear thermal diffusion equation. Solving linear thermal diffusion Eq. 1 is essentially equivalent to Gaussian convolution of image, so it will cause the position shift and blur of target edge. In order to maintain the edge in the diffusion process, Perona and malik proposed to introduce the control function related to the image edge features in the linear thermal diffusion equation to suppress the diffusion at the edge, and achieved good results.

$$\frac{\partial u}{\partial t} = \operatorname{div}(\nabla u) = \Delta u \quad (1)$$

In Eq. 1,  $u$  is the image,  $t$  is the evolution time parameter, and  $u_0$  is the original noise image.

$$\frac{\partial u}{\partial t} = \operatorname{div}(g(|\nabla u|)\nabla u) \quad (2)$$

$u$  is an image and  $g$  is a positive function of monotonic descent of image gradient.

### 2.2 A Denoising Model Coupled with Adaptive Numerical Fidelity Terms

Through the above analysis, we can find the importance of adaptive numerical fidelity in the denoising process. Different numerical fidelity strategies for different structures and components of the image can significantly improve the image denoising effect.

The above-mentioned methods all adopt the spatial adaptive numerical fidelity term to maintain the texture components in the image, which improves the denoising results to a certain extent, but the effect of these methods to maintain the structural components

of cartoon image is not ideal. The denoising of cartoon image is of great significance in medical image processing. Therefore, we propose an adaptive numerical fidelity strategy for cartoon images.

The image denoising method of coupling adaptive fidelity terms proposed in this section can keep the structure information of the image well. Firstly, it estimates local structural features, such as lines, corners, etc., through fuzzy structure tensor, and takes different fidelity weights for these features. Finally, an adaptive numerical fidelity term is introduced into the denoising model based on directional diffusion equation, so as to improve the shortcomings of the existing methods. The new model also adopts a more stable numerical solution.

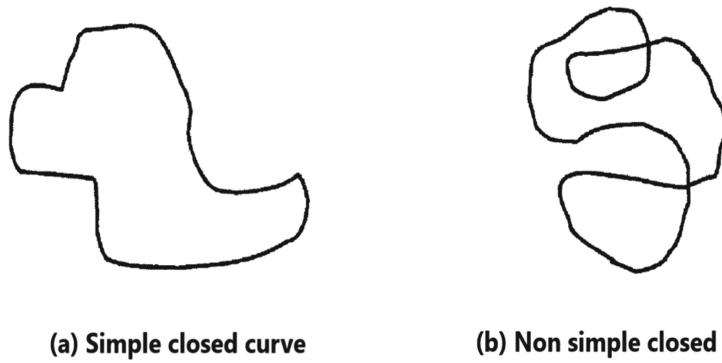
### 3 Research on Image Denoising Method Based on Geometric Image Model

Another important theoretical source of image denoising and enhancement based on PDE is geometric image model. This kind of image denoising and enhancement methods take the image as level set or surface, and achieve the purpose of image processing through the evolution of curves and surfaces. The significance of geometric image model is that it can combine the prior knowledge of object shape and position of image data, and constrain the evolution of curve and surface according to specific requirements, so as to provide a unified solution for a series of computer vision problems such as contour extraction, shape modeling, image segmentation, stereo matching, motion tracking and so on [3].

The most successful method of image processing based on geometric model should be active contour model, including parametric active contour model and geometric active contour model [4]. With the further research, these models have been successfully applied to image denoising and enhancement. The theoretical basis of these models is curve evolution theory and level centralization of image function. Of course, the image denoising and enhancement methods based on the surface evolution theory are slightly different from these methods on the theoretical basis. They regard the image as a surface (or manifold) in high-dimensional space.

The object of curve evolution is simple closed curve, that is, the curve is closed and does not cross (Fig. 1).

When the second-order nonlinear diffusion equation is used for image denoising, the order effect is easy to occur. In order to overcome the shortcomings of the traditional nonlinear diffusion denoising model, this chapter proposes that the image is constrained by horizontal line distribution in the denoising process, and the third-order constrained partial differential equation corresponding to the constraint model is derived. Furthermore, it is proved that the third-order constrained PDE does not change the gradient value at the zero crossing point in the image. The traditional second-order diffusion equation denoising model can effectively suppress the order effect by coupling the third-order constrained partial differential equation, and obtain more natural processing results.



**Fig. 1.** Type of closed curve.

## 4 Conclusion

Image processing using partial differential equation is a hot spot in this field. In this paper, three kinds of theoretical models for image denoising and enhancement under the framework of PDE theory are studied: Axiomatic PDE model, variational PDE model and geometric PDE model. The problems encountered in the theoretical and practical application of these models are discussed, and solutions are proposed.

In the framework of axiomatic partial differential equation theory, an adaptive numerical fidelity term is proposed to prevent the diffusion process from destroying the important structural information of the target in the image. This paper summarizes the damage of nonlinear diffusion filtering to structural information and the shortcomings of total variation de-noising method in retaining too much noise and other small-scale information. It proposes to construct adaptive numerical fidelity terms by using the structure correlation which can effectively distinguish the structural information and noise in the image, so as to overcome the shortcomings of the classical methods in the use of numerical fidelity terms. The new nonlinear diffusion denoising model can effectively remove noise and keep the important geometric structure of the target such as sharp angle and edge. In terms of the numerical solution method of the model, this paper proposes a more stable and reliable numerical solution method based on the idea of difference scheme optimization, which makes the model suitable for various types of noise.

**Acknowledgement.** This article is the research result of the online open course project of Yunnan University of Finance and Economics.

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# Recognition of Transparent Image of Cracked Egg Based on Ordered Wave Signal Extraction and Discrimination Algorithm

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**Abstract.** Consumers have higher and higher requirements for egg quality, so it is more and more important to systematically carry out nondestructive testing of egg freshness. The color transparent image of eggs was obtained by cold light source illumination. The L component of the transparent image in lab space was extracted and the binary image of egg was obtained by gray threshold segmentation. The binary image of the air chamber is obtained. The G component of RGB space of transparent image is extracted for adaptive gray adjustment and linear space filtering of user-defined template. The yolk image is extracted by morphological method and threshold segmentation method. The edge of egg yolk is extracted by Obel operator and the yolk ellipse is fitted by least square method. Three kinds of characteristics related to freshness, such as air chamber size, yolk size and ovality, were extracted from the translucent image, and the single factor linear regression model of them and egg freshness was established respectively. The unit freshness model of egg transparent image was obtained by training the three characteristic factors by gradient descent method. The model can be used to test the reliability of the model.

**Keywords:** Transparent image · Feature extraction · Yolk ellipse fitting · Ternary freshness model

## 1 Feature Selection and Experimental Design

FDA of the United States and bureau of industry standards and inspection of China 13, 14 have clear regulations on egg freshness grading, and relevant research also points out the egg morphology in the process of egg freshness loss.

The longer the storage time of fresh eggs is, the water inside the eggs gradually loses, and the air chamber of eggs becomes stable and increases gradually. At this time, the egg yolk gradually flattens when the water content of the egg goes back to the inner depth of the yolk [1]. At this time, when the egg is laid horizontally, the yolk will gradually float up, and the plane image shows that the yolk area increases. After storage, egg yolk and egg yolk became longer and longer. The fresher the egg is, the bigger the egg yolk will hold up. If the egg is laid flat, the yolk will float upward and deviate from the regular circle in the irregular spherical shell. The freshness of eggs can

be obtained by extracting the air chamber area, yolk area and egg yolk ellipse coefficient from the transparent image.

In order to obtain the transparent image of eggs and process them accordingly, a transparent image acquisition system of eggs as shown in Fig. 1 is built. The light source of the system is 12 W and 3 w high brightness LED lights; the camera is a smung industrial color CCD camera (effective pixel  $752 \times 582$ ), the Computar lens (focal length 3.5–8 mm) is  $(4 \pm 1)$  cm away from the light hole; the computer is equipped with dhvt142 image acquisition card,  $768 \times 576 \times 24$  bit image resolution, rgb8888 mode, pal mode, single frame acquisition mode; the ambient light intensity is 3–20 lx.

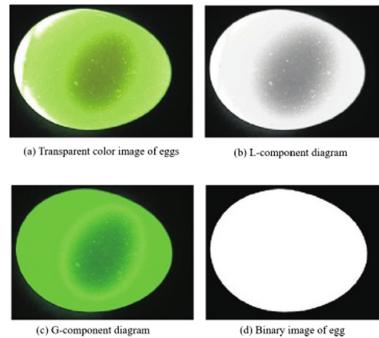
Turn on the power switch and highlight the LED light source to illuminate the eggs through the condenser [2]. As the high brightness LED lamp is a cold light source, the freshness of the tested egg will not be reduced due to the heating of the light; the sealed box only allows the light to be emitted from the light hole, avoiding the reflection and shadow of the external light on the light source, and ensuring the maximum concentration of light. The eggs used in the experiment were 9 fresh eggs of the same batch from Tingting agricultural and sideline food company of Hai'an County, Jiangsu Province. Three eggs were taken every day. The transparent images of the eggs were extracted and processed, and the eggs were broken to measure the real Haugh value.

## 2 Image Processing of Egg Transmission

### 2.1 Extracting the Binary Image of Eggs

In order to obtain the ratio of the air chamber to the whole egg area, the ratio of the egg yolk to the whole egg area, and the ovality of the egg yolk, it is necessary to process the transparent image of the egg captured by the camera. The whole egg shape, gas chamber segmentation and yolk extraction were carried out on 90 images. Due to the different light transmission effects of eggshell, yolk and protein, the LED light used in the experiment is green, the eggshell is white, the yolk is dark green, and the protein is light green. The L component of color image is extracted in lab space for gas chamber segmentation, and G component in RGB space is extracted for egg yolk contour extraction. The extracted L-component and g-component images are shown in Fig. 1.

The L-component image was histogram balanced to enhance the contrast of the air chamber; then expanded and corroded to remove the spots caused by the uneven color and thickness of the shell; alkali in the connected area was detected to extract the edge of the gas chamber; Hough line was used to detect the segmentation line between the air chamber and the egg.



**Fig. 1.** Egg component diagram and outline

## 2.2 Extracting Egg Yolk Image

The gray image of egg g component is adjusted by adaptive gray level adjustment and linear spatial filtering to enhance the contrast between yellow region and other regions. According to the different eggshell depth, the adaptive gray level adjustment threshold is set for different eggshell color before gray level equalization. It is found that the transparency of white shell eggs is higher than that of brown shells, and the same size eggs have more high brightness pixels. Through the histogram comparison and analysis of the g-component gray-scale images of shell eggs with different colors, the number of pixels num1 and num2 with gray values between 50–100 and 101–150 are calculated. If  $\text{num}_1 < 2/3\text{num}_2$ , it is judged as white shell egg, otherwise it is brown shell egg.

In order to reduce the image noise, Gaussian kernel function is used to filter the gray adjusted image in linear space:

$$g(x) = \exp\left(-\frac{\|x - x_0\|^2}{2\sigma^2}\right) \quad (1)$$

The mean value of Gaussian kernel function is 0,  $\sigma = 3$ , and the size of filtering template is  $n = 11$ .

After inverse color and gray threshold segmentation, the yolk and egg are completely separated [3]. After all the parts except the yolk are set as the background, the morphological operation of the egg yolk contour is carried out. The accurate yolk edge, the error between the whole egg edge and the whole egg contour in the reverse color map, and the spot caused by the excessive difference of eggshell thickness are removed.

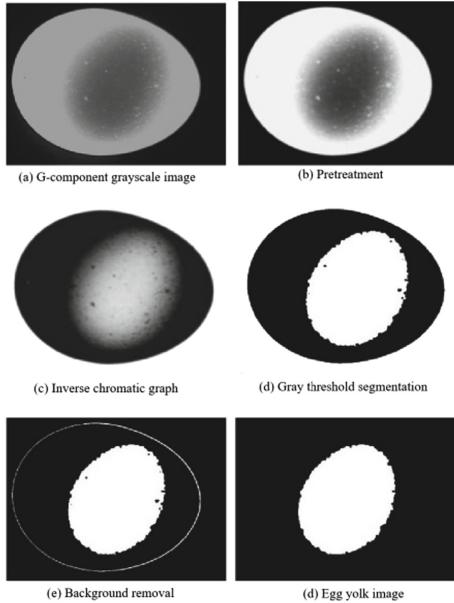
## 3 Selection and Calculation of Characteristic Parameters

### 3.1 Ratio of Air Chamber Area to Whole Egg Area

The number of pixels in the contour of steamed egg and the number of pixels in the air chamber were calculated.

$$S_0 = \frac{A_{eq}}{A_e} \quad (2)$$

In formula (2),  $A_{eq}$  the number of pixels in the air chamber, and  $A_e$  is the number of pixels in the whole egg [4]. The egg yolk segmentation image is shown in Fig. 2(f).



**Fig. 2.** Egg yolk image extraction

### 3.2 Area Ratio of Yolk to Whole Egg

According to the extracted yolk image and the shape of the whole egg, the area ratio is the ratio of the number of pixels

$$S_1 = \frac{A_{ey}}{A_e} \quad (3)$$

The number of egg  $A_{ey}$  is the whole number  $A_e$  of pixels.

## 4 Conclusion

Using image processing technology, through connected region detection and line detection algorithm for gas chamber segmentation, adaptive gray level adjustment, improved spatial filtering and threshold segmentation to extract egg yolk image, and least square method for yolk ellipse fitting, effectively extract the egg air chamber area,

yolk area, yolk ellipticity and other image features related to egg freshness. Combined with three kinds of image features that affect the freshness, and using gradient descent algorithm to train samples, the single factor model and the comprehensive factor model are obtained. The single factor model has high reliability by goodness of fit test and explicit test. The comprehensive factor model has higher correlation factors and significance than single factor, and can obtain more accurate Haff value. The algorithm is based on machine vision and uses LED cold light source to realize the non-destructive detection of eggs, and is not affected by the color of egg shell, which provides a strong guarantee for the freshness detection and grading of eggs.

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# Design and Implementation of College Health Sports System Based on C4.5 Algorithm

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**Abstract.** The number of college students has increased rapidly, so the anthropometric data related to students has also increased significantly, including students' attendance information and physical health test data. Therefore, it is an inevitable requirement for the development starting from sunshine sports, this paper uses C4.5 algorithm of data mining to build a decision tree based on students' real physical health test data to generate rules and knowledge. Through the analysis of the decision tree, we can understand the relationship between the important factors affecting students' health and the indicators, so as to guide colleges and universities to adjust the management means of physical education timely.

**Keywords:** Construction system · Multi-objective optimization · Ant colony algorithm

## 1 Introduction

The meaning of construction network system reliability of construction engineering project is: in the process of project construction, the ability to safely and effectively reach the predetermined project quality within the required completion period and within the limited cost. Therefore, we can understand the construction reliability of construction engineering project from the four aspects of cost, construction period, quality and safety, which is specifically understood as the construction period reliability, cost reliability, quality reliability and safety reliability of engineering projects. Reliability includes qualitative and quantitative meanings, and is generally described quantitatively by reliability. It is specially pointed out that the meaning of reliability and reliability in this paper are the same, and both represent the size of reliability. The reliability of construction work unit of engineering project refers to the ability of each work unit in the construction project to complete the construction task safely and effectively and achieve the predetermined project quality under the required planned cost in the construction process. The reliability of construction network system is based on the reliability of each work unit. Only when the reliability of each work unit is determined can the reliability of the construction system of the whole construction project be determined.

## 2 Related Research Based on Decision Tree

### 2.1 Technical Characteristics of Data Mining

With the development of the Internet and the improvement of science and technology, various types of data are also increasing. The storage of these data needs to use the database, so the database capacity also needs to continue to expand. But for the current application, database application mainly focuses on simple data management and data query. In such a huge amount of data, there are a lot of intentional information hidden, so it is difficult for database system to achieve knowledge acquisition and information extraction based on massive data storage [1]. The emergence of data mining technology is to obtain valuable information from complex data.

### 2.2 Research on Decision Tree

Decision tree is a learning algorithm for classification. The algorithm is based on the consistent generation probability of various situations, and through the formation of the decision tree, the probability that the net present value is greater than or equal to zero is obtained, and the feasibility judgment  $\theta$  is made. In machine learning, decision tree is a model, which is the mapping between data and object values. At the same time, as the name implies, as a prediction model, the structure of decision tree is very similar to that of tree. Because the tree node can be divided into root node, branch node and leaf node, the top of decision tree can be called root node, that is, the starting point of all data sets. In the decision tree, attributes can be divided into different branch nodes [2]. The final result of classification is to generate leaf nodes. The path of decision tree from top to bottom is the prediction rule gate.

## 3 Algorithm Model of Decision Tree

With the development of big data, as an important method of data mining, decision tree has been fully studied, and many decision tree building algorithms have been developed. The widely used decision tree algorithms include D3, C4.5, cart and slq algorithm 8. The most widely used D3 algorithm is compared with C4.5 algorithm, and the most suitable algorithm is selected for sports big data mining in this study.

### 3.1 ID3 Algorithm

If the value of the random variable  $x$  is 0:

$$X = \{X_1, X_2, X_3, \dots, X_n\} \quad (1)$$

The probability of each type is  $\{P_1, P_2, P_3, \dots, P_n\}$ , and then the entropy of  $X$  is defined as

$$H(X) = - \sum_{i=1}^n p_i \log_2 p_i \quad (2)$$

The advantages of ID3 algorithm are as follows:

- (1) Because of the decision tree strategy, the rules generated by the decision tree are easy to understand.
- (2) Since ID3 algorithm constructs decision tree from top to bottom, this algorithm only searches part of the data set every time [3]. Therefore, ID3 algorithm has faster classification speed and less test times.

Although the ID3 algorithm has many advantages, it also has some disadvantages, as shown below.

- (1) When D3 algorithm passes through the decision tree constructed by ID3, it can only maintain one solution, so the advantage of hypothesis is not obvious.
- (2) The disadvantage of information benefit selection is that it inclines to select attributes with multiple attribute values.

### 3.2 C4.5 Algorithm

C4.5 algorithm 0 is a decision tree classification algorithm of improved D3 algorithm. C4.5 algorithm is not a single algorithm, but a group of algorithms. It has many functions, each of which corresponds to an algorithm, and these functions are combined to create a set of algorithms, namely C4.5.

Expected information formula:

$$Info(D) = - \sum_{i=1}^n p_i \log_2(p_i) \quad (3)$$

Measurement formula:

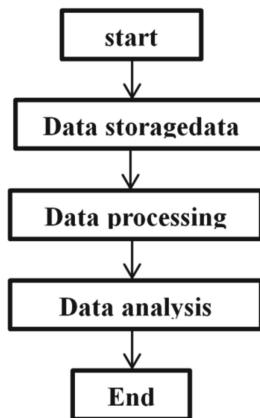
$$Info_A(D) = - \sum_{j=1}^v \frac{D_j}{D} Info(D_j) \quad (4)$$

Compared with ID3 algorithm, C4.5 algorithm has many advantages that ID3 does not have.

- (1) Information gain rate is used to select attributes
- (2) C4.5 can handle not only discrete values, but also continuous value attributes
- (3) It can deal with missing attribute values in training samples.

## 4 Design and Implementation of Sunshine Sports System Based on C4.5 Algorithm

Firstly, this paper collects data from mys α l database and preprocesses the data. Then, using C4.5 algorithm differences between boys and girls, two kinds of decision trees are formed analyzing the health of college students. The research process of this paper is shown in Fig. 1.



**Fig. 1.** Flow chart

With the help of mys α l database, the anthropometric data of some college students are stored in real time. The data information in this paper includes the basic information of students, the attendance information of sunshine sports, and the evaluation information of students' physical health. Compared with other databases, the operation of MySQL database is relatively simple and easy to use, and you can directly use nevicate to operate MySQL tools on MySQL database. In addition, the data is presented in the visual form of tables to ensure data persistence. This paper collected the height, weight, vital capacity, step test, grip strength, stretching and standing long jump test data of all students of grade 2009–2012 in the spring of 2013, and then used database technology to generate the data mining basis of this paper [4]. Data integration is the integration and extraction of multiple data sources. In this paper, through the database technology, the data collection database files (including the basic information of students and students' physical health test data) are included in the students' physical fitness test data.

## 5 Conclusion

“Sunshine Sports” is a strategy to promote physical exercise and healthy physique. In order to better carry out the sunshine sports information management, the construction of sunshine sports system is the inevitable requirement of the information age. Data mining technology is the fastest growing technology processing technology. As an

important branch of data mining, decision tree algorithm has also made some achievements in scientific research. The application of the decision tree to sunshine sports system is the focus of this study.

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# Design and Application of Preschool Music Teaching System Based on Moodle Platform

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**Abstract.** The system adopts B/S structure, including user login module, Moodle platform module and database module. The application of the system in music teaching is analyzed. Network teaching not only changes the former teaching method, but also changes people's concept of expanding knowledge field, and has good effect in the process of practical teaching. However, the network teaching system software on the market has a high price, and the related service and upgrade costs are also high, which has become an embarrassing task for colleges and universities to explore teaching mode and improve teaching effect.

**Keywords:** Moodle platform · Music teaching · B/S structure

## 1 Introduction

Moodle platform is a teaching management software, which is designed based on constructivism, and contains various functions, such as teaching, homework, testing, etc. after the platform came out, it was upgraded and transformed, and was applied in the teaching process by more and more disciplines. In recent years, in the information environment. The core of this change is the innovation of teaching mode, which emphasizes student-centered, so is music teaching in Colleges and universities. Applying Moodle platform to music teaching can provide students with a personalized and collaborative rich media learning environment.

## 2 The Current Situation of Music Teaching in Colleges and Universities and the Problems Solved by the Platform

We can see that professional music teaching adopts collective teaching method, most teaching materials, and the teaching process relies on the teacher's explanation and demonstration performance. It is mainly "oral and heart-to-heart", and the theoretical teaching occupies a high proportion of class hours [1]. After the teaching is completed, teachers regularly organize students' learning achievements display, This teaching method has the following disadvantages: first, with the expansion of enrollment, the number of students is increasing, and the teaching staff can not be satisfied with the increasing number of students. After the large class teaching, due to the limited class hours, the teachers have limited time to guide each student, and the learning effect is

not ideal, which reduces the students' interest in learning, Thirdly, the online teaching resources of music course are not perfect.

The application of Moodle platform in music teaching can solve the above problems. Students can use the time after class to review and preview the knowledge explained in class, complete the knowledge transfer in advance, and ask questions for specific problems in class, so that students can learn more music knowledge in limited time, Secondly, through the online Q & a module of Moodle platform, the “one-to-one” interaction can be realized through the online Q & a module of Moodle platform to break the space limitation, strengthen the communication between students and teachers after class, realize interactive teaching, and construct online resource module of curriculum.

### 3 Overview of Moodle Platform

Moodle EP modular object-oriented dynamic learning environment is a free open source software. It can customize teaching and learning platform. 2. Compared with many network learning platforms, it has the following advantages: first, it is a comprehensive and systematic platform, which conforms to the B/S structure and provides rich learning resources, To meet the needs of curriculum content arrangement, teaching evaluation, teacher-student interaction, etc. Second, Moodle platform is in line with the constructivism design concept. Thirdly, Moodle platform breaks through the space-time limitation and emphasizes cooperation and exchange 3. Fourth, the platform adopts the consistent interface design style, and the technical threshold is low [2]. You can use free Linux platform with Apache Web server, or use Microsoft Windows platform with IIS or Apache Web server; with high security, the form transmission will be verified by data and encrypted by cookies.

Each reflection text D is represented as vector D in vector space. The feature space of reflective text set D is the set of all words appearing in the reflective text set.

$$T_D = \{t | \forall t \in d, \forall d \in D\} \quad (1)$$

TF-IDF is calculated by the following formula:

$$dfidf(d, t) = tf(d, t) \times \log \frac{N}{df(t)} \quad (2)$$

### 4 Design of Music Teaching System Based on Moodle Platform

#### 4.1 Music Teaching System Based on Moodle Platform

The music teaching system based on Moodle platform adopts three-tier B/S structure. The user login interface, database module and Moodle platform module are separated. The relationship of each part of the system is shown in Fig. 1.

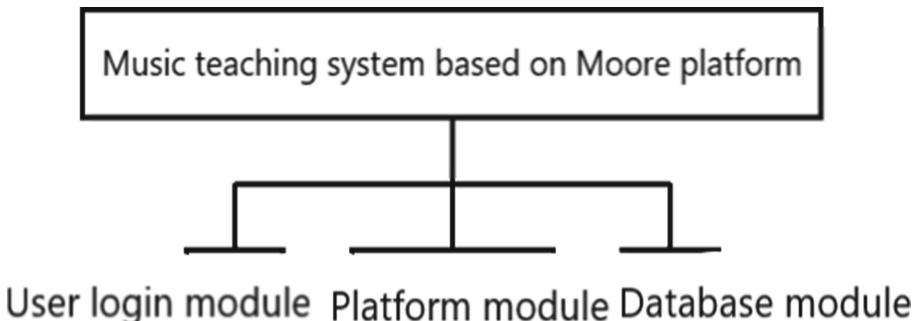


Fig. 1. Music teaching system based on Moodle platform

#### 4.2 Platform Installation

Since Moodle platform is a web software developed with PHP, it is necessary to configure the environment before installing Moodle, such as selecting operating system, setting up Web server, installing database, configuring PHP running environment, etc. [3]. Under the win7 system environment, the web server can be IIS, but Apache PHP is the most recommended: the current minimum is 5.3, basically 5.5 or above.

### 5 Using Moooe Platform to Change the Learning Mode of Preschool Music Teaching

Teaching resources module. It mainly presents the course content and a series of resources that students need to carry out learning activities. These resources can be used for teachers' classroom teaching needs, and can also provide resources support for students' after-school online learning. Learning center. As the organizer and director of the teaching process, teachers add resources and activities to this module. The design of this activity plus resource is different from the traditional cramming teaching and indoctrination teaching. It provides learners with a space to obtain resources and an interactive platform to participate in activities. The students' learning style has jumped out of the mode of cramming. A series of activities, so that the relationship between teachers and students is reflected incisively and vividly, but also makes teaching and learning become diversified. Assignment submission and achievement display module. In this module, teachers can assign tasks to students, and students can upload their learning results to the curriculum. Evaluation module. Moodle provides a relatively complete evaluation system. Teachers can track students' learning records in the whole process, so as to better implement formative assessment and carry out peer-to-peer evaluation. Communication and interaction center. Teachers mainly design some activities, such as wblog chat and discussion area. These activities provide students with an open and collaborative learning environment, which can well realize the communication and cooperation between teachers and students, between students and teachers.

## 6 Specific Application Analysis

This paper analyzes the application of music teaching system based on Moodle platform with the teaching of “Indian music culture” in the course of “world national music” [4]. The system administrator first adds the course “world folk music” on the platform, and imports the student user data. Then, the teacher uploads the teaching plan and relevant teaching materials to start teaching.

- (1) Before class. Teachers upload relevant teaching materials and videos of “Indian music culture” in music teaching on Moodle platform. For example, after uploading “dejupada praying to the God of korshina”, the teacher asks students to appreciate and ask relevant questions, such as “what is the line of vocal melody? Is there decorative sound? What is the rhythm and rhythm?” etc. teachers and students can discuss relevant issues online, Determine the key points, difficulties and targeted points of teaching.
- (2) Class section. According to the questions raised before class, the teacher introduced the main teaching contents, taught the basic background culture of India and the basic content of Indian music, such as the map of India, the famous building of one of the seven wonders of the world - the Taj Mahal, Indian costumes, and disciples of different faiths in India, In view of the system students’ pre class preview questions, into the targeted solutions, and finally enter the stage of practical creation and performance, try to play the ten tatter system with the piano, understand the scale system of rag, and feel the style characteristics of rag. Lead the students to sing with the basic rhythm of Tara. Using the guitar as a bass accompaniment instrument, instead of the tambula, imitate the simple accompaniment form in the video.
- (3) After class. For teachers, the following operations can be carried out online tracking access. The teacher carries on the targeted statistical analysis to the study situation and the result in the system, 2) arranges the homework after class. Assign homework to upload to the platform, consolidate and review the knowledge. 3) Online testing. The online test module of the platform is used regularly to test the students’ knowledge of “Indian music culture”. 4) Teaching evaluation. According to the students’ learning situation of Indian music culture, the teaching evaluation was carried out and the learning strategies were adjusted. 5) Answer questions online. For students in the review after class, autonomous learning questions for online answers.

## 7 Conclusion

This paper designs the music teaching system based on mooe platform, and analyzes its application effect. Practice shows that music teaching based on Moodle platform can significantly improve the enthusiasm of students in classroom questioning and answering in class. Therefore, in the future research and exploration process, we should constantly improve the platform function, so as to improve the music teaching effect in Colleges and universities.

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# Vehicle Aided Navigation and Positioning Method Based on Computer Vision

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**Abstract.** In order to accurately Park large vehicles in a certain position, this paper proposes a vehicle aided navigation and positioning method based on computational vision. The position of the navigation ruler is detected by Hough transform on the basis of interval accumulation. The amount of information required for vehicle navigation and positioning is analyzed, and the angle and position information can be provided in real time according to the navigation ruler. The experimental results show that the method is not only simple in structure and easy to implement in hardware, but also has good real-time performance.

**Keywords:** Computer vision · Intelligent vehicle · Navigation and positioning · Dynamic detection

## 1 Introduction

Intelligent driving assistance system is an important part of intelligent transportation system, which has been paid more and more attention in recent years. Compared with laser, radar and ultrasonic sensors, visual signal has the advantages of wide detection range, complete target information, relatively cheap price and more in line with people's cognitive habits, especially in road detection, visual signal has irreplaceable advantages. Therefore, many scholars are trying to use computer vision technology to solve the problem of assisted navigation in intelligent assisted driving system.

## 2 Composition of Computer Vision Navigation and Positioning System for Special Vehicles

The computer vision navigation and positioning system of special vehicle is mainly composed of three parts: acquisition module, image processing module and display module. The main function of the acquisition module is to digitize the analog image, mainly including CCD camera and image acquisition card; the function of the image processing module is to process the digital image, extract the target position according to the target characteristics, and then calculate the information required for vehicle navigation and positioning [1]. These tasks are completed by the computer; the display module mainly displays the collected images on the display.

After the image collected by CCD camera is transformed into digital image by image acquisition card, one way is directly transmitted to the display, the other is sent to the computer for processing to extract the target and calculate the navigation and positioning information. In this way, it not only provides the driver with intuitive image information, but also gives the angle and distance deviation of special vehicles in digital form in real time.

### 3 Calculation of Navigation and Positioning Information

The data needed by the driver include the position information and angle information of the vehicle, that is, the deflection angle of the vehicle body, the distance from the target and the lateral deviation. These three information can be calculated by the detected straight line.

#### 3.1 Calculation of Angle Information

Since the camera is installed on the front center line of the car body, the vertical plane where the camera axis is located is approximately parallel to both sides of the vehicle body, and the included angle between the vehicle axis and the navigation ruler is  $\alpha$ ; in the image, the angle between the direction of the navigation sign line and the axis of the image is  $\beta$ . If the camera installation deviation is ignored,  $\alpha$  can be approximately represented by  $\beta$ . If the system has high requirements for the angle, the deviation can be obtained by camera calibration technology, and then it can be subtracted in the calculation.

#### 3.2 Calculation of Distance from Target Point

Because there are navigation mark points on the navigation mark line, and the distance between each mark point is fixed, increasing by the arithmetic sequence, the distance between the vehicle body and the target position can be determined according to the distance between the mark points in the image. Therefore, the first step is to detect the location of the marker points and calculate the distance between them. In this experiment, the distance between the mark points increases with the tolerance of 5, and the distance between the first two points is 5 cm.

##### (1) Detection of navigation mark points

The navigation mark points on the navigation ruler are black with low gray value. Therefore, we take 1/4 of the difference between the maximum value and the minimum value of the gray value on the line where the ruler is located as the threshold value. Pixels whose gray value is less than the threshold value may be the navigation mark points [2]. In order to eliminate the influence of the possible stains on the navigation mark line (the gray value of the stain may be close to zero), the detected black spots must be continuous on the straight line and have a certain length before they can be considered as navigation marks.

## (2) Calculation of actual distance

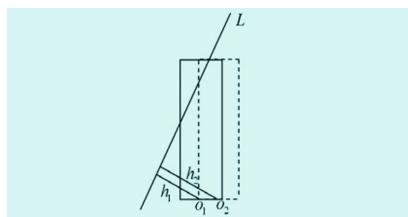
The transformation from world coordinates to image coordinates is a  $3 \times 4$  matrix:

$$Z_v \begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{14} \\ a_{21} & a_{22} & a_{24} \\ a_{31} & a_{32} & 1 \end{bmatrix} \bullet \begin{bmatrix} X_w \\ Y_w \\ 1 \end{bmatrix} \quad (1)$$

### 3.3 Calculation of Lateral Deviation of Car Body

When the angle information of the vehicle body relative to the navigation mark line and the distance information to the target point are known, the vehicle can not be guided to the target position completely and accurately, because the lateral deviation of the vehicle body is unknown. We define the lateral deviation as the distance between the projection point on the ground (we call it the positioning point) and the navigation ruler when the car body reaches the target position.

As shown in Fig. 1, the straight line  $L$  is the navigation sign line, and the shape of the car body is simplified to a rectangle. When the car body is located at the solid line position and the dotted line position respectively, the angle value and distance of the car body remain unchanged, so the driver can not know the exact position of the vehicle at this time. Especially when the angle information and distance information of the two positions have met the requirements, the lateral movement of the vehicle body will no longer cause the change of the distance information and angle information. If the distance information meets the requirements, it does not mean that the vehicle positioning has been completed. If the lateral deviation exceeds the requirements of vehicle positioning, the vehicle body positioning still fails. So we have to detect the lateral deviation of the car body in real time.



**Fig. 1.** Diagram of lateral deviation of car body

A direct idea of measuring the lateral deviation of car body is to transform the positioning point into the image plane through the homography matrix, and then calculate the lateral deviation of the car body on the image plane, and then convert the deviation value into the actual coordinates. This process involves two transformations from the actual coordinates to the image coordinates and then to the actual coordinates, which is not only cumbersome, but also easy to bring about large errors [3]. Therefore,

we change our thinking, convert the straight lines in the image coordinates to the actual coordinates, and then calculate the transverse deviation in the actual coordinates.

We know that two points determine a line, so we can simplify the transformation process of the line from image coordinates to actual coordinates as the conversion of two points on the line from image coordinates to actual coordinates. The actual coordinates of two points on the line determine the position of the line in the actual coordinates. Without losing generality, we can take the intersection point of the line and the upper and lower boundaries of the image as the point to determine the line. We define  $I$  as the row value of the image point,  $j$  as the column value of the image point, and the linear equation is  $j = ki + b$ , then the image coordinates of two points on the line can be obtained by making  $I$  take 0 and image height respectively, and then the actual coordinates of these two points can be obtained through the inverse matrix  $H^{-1}$  of the calibrated homography matrix  $H$ . The equation in the actual coordinates of the navigation ruler line is also determined, assuming that it is  $y = mx + n$ .

In the process of camera calibration, once the position of the calibration reference is determined, the coordinates  $(x, y)$  of the point and the linear equation  $y = mx + n$  can be determined:

$$d = \frac{|mX - Y + n|}{\sqrt{m^2 + n^2}} \quad (2)$$

Get the distance  $d$  from the point to the straight line, which is the lateral deviation of the vehicle positioning we need.

## 4 Simulation Results and Analysis

In order to verify the correctness of navigation mark line recognition, the recognition results are displayed in the lower part of the video window, while the original image is kept in the upper part; in the lower part of the screen window, in order to make the recognition result obvious, we will keep the original image within a certain width on both sides of the identified line position, and the rest are black. The current status of the system (image acquisition, dynamic recognition, etc.) is described in the upper left corner of the whole window; the buttons on the lower right of the window and the text indicating function are the control keys for image acquisition, adjustment and exit from the system, and the driver can manually control the vehicle positioning process through them; the three small windows on the upper right of the window display the values of three information needed for vehicle navigation and positioning in real time, The unit of the angle is degree, and the left side is negative, and the right side is positive. The unit of the angle is cm, which is accurate to two decimal places [4]. The experimental results show that the method can not only provide real-time vehicle position and angle information, but also has good robustness and can adapt to a variety of environments.

## 5 Conclusion

This paper presents a method of vehicle positioning based on the vehicle positioning and positioning information. The experimental results show that the method can not only meet the real-time requirements of the system, but also has a simple structure and is easy to implement in hardware.

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# A Study on Internet-Based Autonomous Learning of College Students' English Based on ID3 Algorithm

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**Abstract.** Renewal of knowledge, teachers should not only teach students English knowledge, make them master these knowledge, but also cultivate students' ability to learn knowledge independently. The enthusiasm and autonomy of students in College English learning, ID3 algorithm is combined to make them interested in learning and actively participate in curriculum and knowledge learning. Connotation autonomous learning and research-based learning, this paper designs a research-based learning mode based on autonomous learning. This model advocates the combination of autonomous learning and research-based learning.

**Keywords:** College English learning · Data mining · ID3 algorithm

## 1 Introduction and Application of Data Mining and Decision Tree

Decision trees algorithm is a classification and regression algorithm, which can be used to predict continuous and discrete values. For discrete values, the algorithm will make predictions based on the relationship between input columns. It uses the Istate of the input field to predict the value of the predicted field. For example, to predict which customers are more likely to buy a product? For continuous values, the algorithm will use linear regression to determine the bifurcation of the decision tree. If there are multiple prediction fields, the algorithm will establish an independent decision tree for each prediction field. This paper will discuss the application of the former. To train the model with 3 data of information technology infrastructure library, we need to prepare the data before creating the model. First, the ITIL source data is passed through ETL (extract, transform, The load tool cleans, transforms, and loads it into a database. The database can be relational or non relational. Then, it explores the data, builds the model, trains the model with historical data, and finally validates the model [1]. The detailed development process is not described in this paper. Please refer to the following documents: <https://docs.microsoft.com/en-us/sql/analysis-services/data-mining/data-mining-ssas>. We will use decision trees, clustering and naive Bayes algorithms to build three models respectively. Their inputs and outputs are exactly the same, and the parameters are set according to default.

## 2 Decision Tree Algorithm Steps

In today's computer popularization, although the memory and CPU are getting bigger and faster, there will be a lot of data that can not be put into the memory when processing. In many decision tree algorithms, most algorithms need to put all the data sets into main memory when the decision tree is generated and classified, which is no problem when the data set is small, but once the data size exceeds the main memory limit, these algorithms can not do anything. In order to solve the above problems, SLIQ (supervised learning in quest) algorithm proposed some improvements, and it can guarantee the classification accuracy unchanged. In the process of SLIQ decision tree generation, other algorithms can be applied, and their accuracy is the same as these algorithms. However, for large order of data, SLIQ efficiency is greatly improved, and the generated model is relatively simple. In addition, since SLIQ breaks the limitation of main memory, it has no limitation on the amount of training data and attributes.

1) Pre sort. For continuous attributes, it is necessary to sort the training set according to the value of the attribute when searching for the optimal splitting criterion of continuous attributes in each internal node, which is a waste of time. For this reason, SLIQ algorithm adopts pre sorting technology. The so-called pre sorting is to sort all the records according to the value of each attribute from small to large, so as to eliminate the sorting of data set at each node of the decision tree. In the specific implementation, it is necessary to create an attribute list for each attribute of the training dataset and a category list for the Category attribute. 2) Breadth first strategy. In C4.5 algorithm, the tree construction is completed according to the depth first strategy. It takes a lot of time to scan each attribute list at each node. Therefore, slq uses breadth first strategy to construct decision tree, that is, scan each attribute list once at each layer of the decision tree to find the optimal splitting criteria for each leaf node in the current decision tree.

## 3 ID3 Algorithm

This method uses mutual information to select test attributes. When obtaining information, the uncertain content is transformed into the definite content. Therefore, the information is accompanied by uncertainty. Intuitively, small probability events contain more information than large probability events. If something is "100 years old". "Seeing" is definitely more than "what I used to think it contains: The amount of information contained in a source is the average uncertainty of all possible messages sent by the source. Shannon called the information content of a source as information entropy, which refers to the average value of the information content of each symbol. The average information content of M symbols is:

Generally, recall rate and precision rate are used to measure the accuracy of classifier. A good classifier should have high recall rate and accuracy rate at the same time. Of course, these two indicators are mutually exclusive in general, and sometimes we need to make some trade-off and compromise between the two indicators:

$$G(A) = I(s_1, s_2 \dots, s_m) - E(A) \quad (1)$$

## 4 Improved ID3 Algorithm

Among them ( $B1, B2, \dots, Bv$ ) is the attribute selected by v nodes, and  $w_i$  refers to the weight of the subset. The weight  $w_i$  is calculated by the proportion of the subset B in the whole set, and then the weighted entropy is calculated, and the value of the attribute is selected by comparing the weight entropy.

In addition, aiming at the improvement of information calculation in ID3 algorithm, in order to simplify the complexity of information calculation, the basic properties of logP function are studied firstly. Through the research, it can be proved that the information calculation formula is a kind of convex function, so the calculation formula of information quantity can be improved by using the unique properties of convex function.

In the OGP function used in the information calculation formula, P represents the percentage of a certain type of records in the total number of records, and its definition domain is  $[0, 1]$ . When any two points  $p_1$  and  $p_2$  on  $[0, 1]$  satisfy  $p_1 - p_2 = \Delta p - \alpha(0)$ , the OGP function is continuous in the interval  $[0, 1]$ . The concavity and convexity of logP function can be checked according to Theorem 1.

It is proved that the OGP function is a convex function on the interval  $[0, 1]$ .

Because  $(\log P) = \frac{1}{p \times \ln 2}$ ,  $(\log P) = \frac{1}{p^2 \times \ln 2} < 0$ , according to the definite theory[2]. GP function is convex function in the interval  $[0, 1]$ . From the basic properties of the convex function, the following conclusion can be obtained.

## 5 The Autonomous Learning of College Students' English by Decision Tree

The paper analyzes the self-learning of English by selecting the five attributes of the longest login time, accumulated time in latitude, the number of access to the learning resources network, the situation of question posting and the progress of autonomous learning as candidate attributes and the results of autonomous learning as the class label attributes. The data records are from the university English learning database, which keeps the records of the English learning of the university students of Foreign Languages College for the past two years, including the one year of undergraduate, the second grade general arts and the University of science and engineering.

Table 1 explains the five candidate attributes and one class label attribute.

**Table 1.** Attribute explanation table

Property name	Defining properties	The property value is taken as 0	The value of the property is 1
x	Learning outcomes	qualified	unqualified
A	Landing time	The longest landing time is more than 1.5 hours	The longest landing time is less than 1.5 hours
B	Online time	Cumulative online time $\geq 28$ hours	Cumulative online time $< 28$ hours

It can be found that if the number of questions and posts of a student reaches or exceeds 5, it indicates that the communication between the student and the teacher is relatively active, and the number of visits to the learning resource network reaches or exceeds 20 times, the autonomous learning progress is normal or ahead, and the cumulative online time reaches or exceeds 28 h, then the student's English autonomous learning result is qualified, The student can be upgraded and qualified for the next College English course.

This paper uses ID3 algorithm and improved ID3 algorithm to study college students' English autonomous learning [3, 4].The simpler the decision tree is, the less the cost of storing the decision tree, Moreover, the cost of transferring information between two entities is smaller. Moreover, the sample correct classification rate of the improved algorithm is  $\eta$  1.20%, which is higher than the sample correct classification rate  $\delta$  5.23% of the improved algorithm. Therefore, compared with the traditional ID3 algorithm, the improved ID3 algorithm has more advantages in the field of College Students' English autonomous learning.

## 6 Research on How to Improve English Autonomous Learning Ability Based on Internet

Its teaching includes teacher's console, student workstation, switch and server, etc. teachers can monitor and guide student network through the console to communicate with teachers and students or search for necessary information from online database by using computer network. Network teaching can make learning resources available Materials are more abundant and practical. Students can download materials at will at any time, which will undoubtedly help to expand students' horizons and expand their knowledge. However, the looseness, uncertainty and uncontrollability of network content will lead to some students at a loss, In addition to the temptation of some bad websites, students will gradually lose their original intention of online learning. In this way, the network can not promote learning, but lead them astray. Therefore, the key to the success or failure of online teaching is that students should have the ability of Internet English, and an efficient and orderly English autonomous learning network is also a place.

## 7 Conclusion

Generally speaking, ID3 is a good example machine learning because of its which. It is a good example and also a useful tool for knowledge acquisition. Students' awareness of autonomous learning is not high, and teachers' active guidance is needed. Teachers can consciously establish the concept of autonomous learning to students through multimedia courseware, teacher-student interaction and student-student interaction in the classroom, so as to help them fully understand the process the necessity of self-learning, so as to improve their sense of identity for autonomous learning and gradually form a good habit of autonomous learning.

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# Influencing Factors and Preventive Strategies of University Computer Network Security

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**Abstract.** In the 21st century, with the continuous development of computer technology, new media computer network in all walks of life plays a very important role, especially in teaching, but with the rapid development of this technology, computer network security is also slowly highlighted, if the campus network is threatened, it will have a great impact on the normal teaching and work of the school. This paper mainly analyzes the characteristics and existing problems of computer network in Colleges and universities in China, and finally discusses some prevention of campus computing

The strategy of network threat.

**Keywords:** New media · Universities · Campus network · Network security

## 1 New Media Background

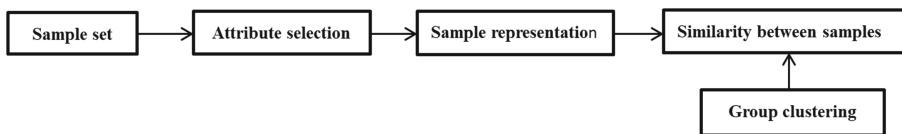
New media has opened a new era of human communication. The emergence of new media makes ordinary Chinese people have different rights Influencing factors and preventive strategies of university computer network security of freedom of speech. If the change from radio to television can be seen as a change in quantity, then the transition from television to new media is a qualitative leap. The “one-way communication” from transmission to reception has become a “network communication” that integrates communication and reception; we media (private, civilian, general and autonomous communicators, by means of modernization and electronic means, has transformed the “one-way communication” into a “network communication” that integrates communication and reception The era of new media, which is a specific single person to transmit normative and non-standard information, has come, and this situation is spreading with personal radio, podcast and microblog [1]. Taking new media (mainly network) as the carrier, Internet users from all walks of life actively participate in it and disseminate relevant information, resulting in events that have a significant impact on society, which are called new media events. For the past style new media satellite TV, the current emerging new media is based on the network, including mobile phone network and Internet, so new media events are also called network events. Through the new media, Internet users can receive their own personalized content, and can use the new media as a platform to form the equivalence of communication between the receiver and the communicator. Moreover, this kind of communication can not only be one-to-one, but also many to one, one to many, and

even many to many. Therefore, new media is regarded as the communication between all people.

## 2 Construction of Clustering Model and Classification Model Under the Background of New Media

### 2.1 The Principle of Cluster Analysis

Cluster analysis is a process of dividing a set of sample objects into several clusters according to their similarity, and those with similar properties are classified into the same cluster, so that the objects scored in the same cluster have the maximum homogeneity, while the objects divided into different clusters have the greatest heterogeneity. The general analysis process chart of cluster analysis is shown in Fig. 1.



**Fig. 1.** General process of cluster analysis

### 2.2 Improvement of Bayesian Network Model

There are three main classification models based on Bayesian: Bayesian optimal classifier, naive Bayesian classifier and Bayesian network classifier. Bayesian network model is a graphical model which is based on Bayesian reasoning to express the dependence between variables. Bayesian network is composed of network structure and network parameters. This frame structure can easily show the causal relationship between data, so it is also called causal network or belief network. The joint probability of Bayesian network is as follows:

$$P(X_1 X_2, \dots, X_n) = \prod_{i=1}^n P(X_i | Pa(X_i)) \quad (1)$$

Let  $U = \{X_1, X_2, \dots, X_n, C\}$  be a finite set of discrete random variables, where  $X_1, X_2, \dots, X_n$  are attribute variables. The value range of  $C$  is  $\{C_1, C_2, \dots, C_l\}$ . The Bayesian network classifier is used to classify the instance  $X = \{X_1, X_2, \dots, X_n\}$ .

$$C_{BN} = \arg \max P(c_j) \cdot \prod_{i=1}^n P(x_i | parent(x_i), c_j) \quad (2)$$

Bayesian network is an effective tool to represent and analyze uncertain and probabilistic things. But with the further research, we find that there are two basic problems in Bayesian network.

- (1) In Bayesian network parameter learning, the expectation maximization algorithm (EM) is used. Due to the local optimization of EM in parameter learning, it is easy to fall into local optimization.
- (2) Bayes formula

$$P(B_i|A) = \frac{P(B_i)P(AB_i)}{\sum_{k=1}^{\infty} P(B_k)P(A|B_k)} \quad (3)$$

For problem (1), Gibbs sampling algorithm (Gibbs) can be used Sampling) divides the whole Bayesian network model into several separate Bayesian network models by taking a parent node and all its child nodes as the cutting unit, and then learning each Bayesian network parameter separately can effectively avoid falling into local optimum; this model is called hierarchical Bayesian network model.

### **3 Current Situation of Computer Network Security in Colleges and Universities**

The 21st century is the era of information network, the development of computer technology has brought people into a new era, making people closer and closer, now the computer network has been socialized, and constantly promote the development of the information age. Internet technology is more and more widely used, now in every. All industries are basically inseparable from the computer. It can not only bring a lot of information to people, but also help people find what they want in a lot of time. Although it brings a lot of convenience to people, it also leads to the problem of information security. In recent years, many users' private information and data have been seriously damaged by viruses, which leads to serious losses, so the network It has gradually become one of the problems that people are worried about, which makes people pay more and more attention to the research and prevention in this field [2]. In the information technology era, people's computers can be interconnected, which not only improves the efficiency of work, but also makes people's data sharing. This role has played a great effect, especially in the school has highlighted the advantages of computers.

### **4 Computer Network Security and Characteristics of Campus Network**

#### **4.1 Computer Network Security**

The security of computer network is to make the data in the computer be effectively protected, which can not be tampered with or stolen by some malicious software or viruses, and can make the computer run reliably. From another perspective, computer security is to make the computer have integrity, availability, confidentiality, controllability and authenticity. Generally speaking, its contents include technology and

management, which complement each other and are indispensable. The key point of technology is external protection, and the focus of management is human management. At present, the urgent problem to be considered and solved is to improve the security of computer network and protect important information data.

#### **4.2 The Structure and Characteristics of Campus Computer Network**

The basic structure of campus network is a local area network system composed of several multi-functional multimedia classrooms, several computer network classrooms, an office network, a virtual library, an information center and some other applications. It uses modern network technology and multimedia technology, and connects through router and Internet to serve the teaching and management of the school. Campus network is not a completely closed and self operating network. It is also in a semi open state to the Internet. It is a network system with relatively independence while maintaining information exchange with the outside world.

#### **4.3 The Security Factors of Campus Computer Network**

At present, there are common hidden dangers in the security of computer networks in Colleges and universities in China, such as insufficient information filtering, a large number of junk files destroy the mail server, or viruses invade the computer and paralyze the system. The main reasons for these hidden dangers are as follows: (1) in the initial stage of construction, most schools mainly invest their financial and human resources in the scale construction of campus network, while ignoring the importance of security Want sex. (2) The campus network of most colleges and universities in China is managed by some personnel who are not strong in network technology and experience. They are difficult to deal with sudden network security accidents, and the campus network lacks professional security management personnel.

### **5 Construction of a Comprehensive Computer Network Security Strategy**

#### **5.1 Improve Management**

First of all, the school must pay attention to the security of computer network, increase the investment in it, formulate and improve the rules and regulations of computer network security management, employ professional computer personnel to manage the campus network, increase the professional training, establish and improve the computer network security supervision mechanism, and at the same time, strengthen the network teaching of college students Education, the basic knowledge of network security training, so that they master the basic security technology, in order to resist attacks from outside the campus network.

## 5.2 Technical Security Strategy

In terms of technology, in the face of the ever-changing network environment, we should use reasonable and effective network technology to organize, supervise and control network information processing and communication services. At the same time, when the computer fails, it can be found and eliminated in time to ensure the normal operation of the computer [3]. Network security from. In terms of technology, it is generally composed of several security components such as firewall, intrusion detection and anti-virus. At present, the most common and mature technologies are firewall technology, data encryption technology, access control technology, intrusion detection technology and anti-virus technology.

## 6 Conclusion

Computer system network security is an important part of computer management. At present, the use environment of computer network has changed with each passing day. Many network attacks are becoming more intelligent, beneficial and purposeful. Therefore, computer network security defense technology needs to keep pace with the times and improve rapidly. Combining with the traditional firewall and antivirus software, we can build active and deep-seated In order to ensure that the computer network and its application system are in a safe state and users can use the network normally.

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# Design and Implementation of English Autonomous Learning Platform Based on Output Oriented Teaching Mode

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**Abstract.** Comprehensively promoting the ideological and political construction of university curriculum is the focus and direction of higher education reform under the new situation. College English course is a compulsory public basic course for college students. It has both instrumental and humanistic features. The integration of Ideological and political education in teaching can cultivate students' national feelings and international vision. Guided by the theory of output oriented approach, this paper discusses the teaching design of College English "curriculum ideological and political" from four aspects: the design of total output objectives, the design of driving tasks, the design of facilitating activities, and the design of "Online + offline" teaching activities, in order to promote the improvement of teaching effect.

**Keywords:** College English curriculum ideological and political · Output oriented method · Teaching design

## 1 The Current Situation of College English "Ideological and Political Curriculum" and the Theory of Output Oriented Approach

The core system of output oriented method includes teaching idea, teaching hypothesis and teaching process mediated by teachers. Based on the teaching concepts of "Learning Center Theory", "learning application theory" and "whole person education theory", it puts forward three teaching hypotheses of "output driven", "input driven" and "selective learning" [4] to realize the teaching process of "driving promotion evaluation". The theory emphasizes the importance of "output", which not only takes language "output" as the teaching goal, but also takes it as the driving means. At the same time, the input activity is regarded as a means to promote the output task. Therefore, the output oriented method is to combine the input type "learning" with the output type "use", so that students can maximize the use of the knowledge they have learned, so as to improve the quality of learning.

The idea of "whole person education" of the output oriented method is consistent with the idea of "all staff all round education" advocated by "curriculum ideological and political education", which are all aimed at achieving the goal of curriculum education and improving students' comprehensive quality. At present, for the

“Ideological and Political Curriculum” of College English, the education sector pays more attention to how to tap the ideological and political elements into College English teaching, that is, the study of Ideological and political input, but little research on the output of students’ Ideological and political. This paper, guided by the theory of output oriented approach, takes the new century college English teaching materials as an example, and discusses the teaching design of “Ideological and political course” in College English with modern information technology.

## 2 Systems Analysis

Demand analysis the history of Higher Vocational Education in China is not long. In terms of Public English teaching, we still use the mode of College English Teaching for reference, and use college English level ab test to check the teaching level and students’ English application ability [1]. Although our school has perfect teaching hardware facilities, teachers also try their best, but the passing rate of English AB level is still generally low, teaching can not achieve the expected goal. The reasons are as follows: 1) students’ English foundation is weak and they have a negative attitude towards English learning. 2) The effect of classroom teaching is not ideal.

The student module includes text learning, extended learning, self-test, self-evaluation and learning communication. Student model is the core of the whole teaching system and one of the sources of all data. Through this module, students can accurately reflect their level and learning ability. Students can carry out personalized learning, overcome the limitation of time and space, use the learning tools, learning resources and information provided by the platform to learn according to their own interests and hobbies, broaden their horizons and broaden their knowledge.

The teacher module includes student management, uploading text learning content and related multimedia materials, adding test questions, giving students learning guidance, and evaluating students’ learning. It combines the knowledge of teaching strategies and curriculum structure, answers questions for students, supervises and evaluates their behaviors, and provides corresponding multimedia materials for teaching. When students need, it can select appropriate supplementary materials for them. Collect students’ response and learning information in a timely manner, analyze and process them, judge students’ learning; provide targeted individual guidance and appropriate remedial materials; easily obtain teaching materials and guidance materials through the Internet, and upload them to the platform after processing.

## 3 System Design

### 3.1 System Objectives

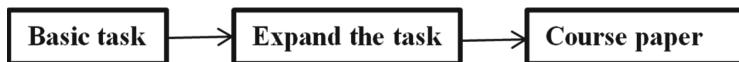
The system adopts the way of human-computer interaction, the interface is beautiful and friendly, the information query is flexible and convenient, and the data storage is safe and reliable. The user input data, the strict data test, as far as possible to avoid

human error [2]. It can automatically score the exercise results. Teachers can manage teaching information separately.

Program running environment system development platform: Microsoft visuastudio2008, macro media Dreamweaver8 system development language.

### 3.2 System Function Structure

In this stage, the teaching activities of the first eight hours of driving, promoting and evaluating the basic output task (i.e. argumentative writing) are basically the same as those in the previous stage. Therefore, there is no need to repeat the same teaching process, but only focus on driving, promoting and evaluating the new expanding tasks (see Fig. 1 for the teaching process).



**Fig. 1.** System structure diagram

### 3.3 Database Design

Due to the large amount of data for exercises and student information in the self-learning platform, Microsoft SQL Server database is selected to store data information.

### 3.4 Content Based Recommendation Algorithm

The cosine similarity of student interest vector table and course feature vector table is calculated, and the higher value of curriculum resource information is pushed to students, and the similarity calculation formula is as follows:

$$\text{sim}(P(C_i), F_j) = \cos(W_i, W_j) = \frac{W_i \cdot W_j}{\|W_i\| \|W_j\|} \quad (1)$$

Calculate the target student u and course recommendation:

$$p(u, i) = \sum_v m_{uv} r_{vi} \quad (2)$$

## 4 System Implementation

### 4.1 Realization of Student Module

The knowledge point learning module is mainly composed of three parts: the teacher's teaching video, teaching detailed case and knowledge point practice. Students can learn through the teaching video and detailed teaching plan of the knowledge point, and then

consolidate through knowledge point practice. The implementation method of knowledge point practice is similar to that of comprehensive test. The comprehensive test module is for students to take the exam within the specified time. When the examinee has finished answering the questions, click the “hand in” button. At this time, the system will submit the answer results of the student to the automatic scoring module [3].

## 4.2 Implementation of Teacher Module

Exercise management module plays a very important role in Teachers’ module. When teachers log in this module, they can add, modify and delete knowledge point exercises and comprehensive tests, as well as input standard answers.

## 4.3 Administrator Module Implementation

The administrator module has the highest authority. After logging in as an administrator, the basic information management of students, teachers and administrators can be realized [4]. In this module, the technology of querying, adding, updating and deleting the database is mainly applied.

## 5 Conclusion

To sum up, the design of “Ideological and political” teaching of College English under the guidance of output oriented method is to integrate ideological and political elements into each teaching link, and finally achieve the purpose of Ideological and political output. The teacher designs the total output goal by digging the ideological and political themes of the unit, presents the communicative scene, challenges the students’ productive ability, provides input materials for students to learn and evaluate the students’ output tasks, so as to stimulate the students’ initiative in learning and enhance their language application ability. The improvement of their critical thinking and problem-solving ability has virtually strengthened their ideological and political awareness. The author will further explore the online teaching of College English “Ideological and political course”, constantly improve the teaching design, and expect to improve its teaching effect and teaching ability through teaching practice.

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# Study on Evaluation System of Urban Seismic and Disaster Avoidance Spatial Structure

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**Abstract.** Urban disaster avoidance space is composed of emergency and fixed disaster avoidance space, which is the life support line of urban earthquake. If the number of emergency and fixed disaster avoidance space is enough and the layout is reasonable, the casualties can be reduced. And the premise of rationalization of urban disaster avoidance space is the evaluation of urban disaster avoidance spatial structure. In this paper, through the principal component method, analytic hierarchy process, field research and GIS technology and other related methods and technologies to study the urban seismic disaster avoidance spatial structure evaluation. First of all, through literature review and collation and sorting out the national norms, the author summarizes 15 evaluation indexes of earthquake emergency disaster avoidance space and 16 evaluation indexes of fixed disaster avoidance space in mountainous small cities. After that, the evaluation indicators were screened by expert questionnaire, and kmo measure, Bartlett spherical test and reliability test were completed respectively. Then, the common factors of three evaluation indexes of fixed and emergency disaster avoidance spatial distribution, namely, association strength, service intensity and safety intensity, are extracted by principal component method, and modified according to the feedback of expert questionnaire survey, and the hierarchical structure model is established.

**Keywords:** Emergency space · Fixed space · Analytic hierarchy process · Evaluation

## 1 Introduction

In recent years, with the frequent occurrence of urban disasters in the world, the form of urban disasters in China is becoming increasingly severe. Some data show that China has become one of the countries with the most types, the highest frequency and the most serious damage of disasters in the world, among which earthquake is the most harmful and widely distributed urban disaster type in China. From the distribution of earthquake areas, 58% of the cities with more than 500000 population are located in the seismic fortification areas with seismic intensity  $\geq 7$ ; about 70% of the large cities with a population of more than 1 million are located in the seismic fortification areas with seismic intensity  $\geq 7$ , and many major projects and economic projects are distributed in the seismic fortification areas. The strong ground motion caused by large earthquake not only directly causes the collapse or destruction of buildings, but also may induce

geological disasters such as landslides, mudslides, landslides and ground liquefaction in or around the city. In addition, the earthquake may also cause damage to some facilities, leading to the occurrence of secondary urban disasters such as explosions, fires, floods, and the spread of toxic gases. It is characterized by great destructiveness, instantaneity, chain, sociality and inevitability [1].

## 2 Hierarchical Single Ranking and Consistency Checking

In fact, the solution of weight value is to solve the largest eigenvalue and its corresponding eigenvector of the judgment matrix constructed by the Research Institute. It is mainly based on the knowledge of linear algebra, and can obtain arbitrary high-precision results based on computer [2].

- (1) Calculate the product  $M_i^k$  of each row element of the judgment matrix.

$$M_i^k = \prod_{j=1}^m a_{ij}^k, i = 1, 2, \dots, n \quad (1)$$

- (2) Calculate the n-th root of  $M_i^k$ .

$$\overline{W}_i^k = \sqrt[n]{M_i^k}, i = 1, 2, \dots, n \quad (2)$$

- (3) Normalized vector.

$$W_i^k = \overline{W}_i^k / \sum_{i=1}^n \overline{W}_i^k \quad (3)$$

- (4) The determination of the maximum eigenvalue  $\lambda_{\max}^k$  of judgment matrix  $A_k$  is calculated.

$$\lambda_{\max}^k = \sum_{i=1}^n \frac{(A_k \cdot W^k)_i}{n W_i^k} \quad (4)$$

- (5) Consistency test.

$$CI_1^k = (\lambda_{\max}^k - n) / (n - 1) \quad (5)$$

## 3 Evaluation on Spatial Layout of Earthquake Emergency Disaster Avoidance

GIS (Geographic Information System) is not only a geographic information system, but also a product of the combination and intersection of geography and information science. ArcGIS is a kind of spatial information system, which is established for

specific application goals. It can preprocess, input, store, query, retrieve, process, analyze, display, update and provide application of spatial data under the support of computer hardware, software and network. The definition of GIS mainly includes three aspects: ① tools used in GIS: computer software and hardware system; ② GIS research object: geographic distribution data and attributes of spatial objects; ③ GIS data establishment process: collection, storage, management, processing, retrieval, analysis and display.

In this study, GIS technology is used as a software tool to evaluate and analyze the spatial structure of disaster avoidance to realize the data and visualization of urban disaster avoidance spatial structure evaluation index [3]. It mainly uses three functions of GS Technology: buffer analysis, network analysis and overlay analysis.

### 3.1 Analysis of GIS Spatial Analysis Buffer

Buffer analysis is an information analysis method that automatically generates buffer area entities (influence range or service scope) within a certain distance range from a group or a class of point, line and surface entities selected in the spatial database according to the distance conditions set before, so as to realize the expansion of spatial data in two-dimensional space.

This study mainly uses the traditional buffer analysis method, according to the distribution of disaster avoidance space, geological hidden danger area (earthquake fault zone, debris flow, etc.), major hazard sources (inflammable and explosive storage points, etc.), respectively draw the buffer area around the distribution points to maintain a safe distance or service radius.

### 3.2 Analysis of GIS Spatial Analysis Network

Network is a kind of unique data entity in GS. It is a linear pattern formed by several linear elements connected with each other through nodes. It is the abstract representation of various network systems in the real world, such as transportation network, communication network, water supply and drainage network, etc. Network analysis is based on the linear model. Because vector data structure can better describe the connection form between linear elements, the network analysis function in GIS is realized by vector data. Network analysis is a basic model of operations research.

A network is a system of interconnected points formed by interconnected lines. The main elements in the network are linear, point and so on. In this study, the linear element is the road, the corner point of the point element is the intersection point of the road, and the center point of the point element is the entrance of the disaster avoidance space.

In this study, the network analysis method is used to calculate the travel space according to the actual road trend, and the network service coverage is obtained according to the service radius of its grade scale and type. The network service coverage refers to all accessible areas in the specified impedance (distance (m)) based on the actual road direction.

### 3.3 GIS Spatial Analysis Overlay Analysis

Overlay analysis means that under the condition of unified spatial reference system, two groups or more than two groups of geographical feature layers in the same area and scale are superimposed to produce a comprehensive layer, which has multiple attribute characteristics of spatial region, or establishes spatial corresponding relationship between geographical features.

In view of the fact that in the early stage of earthquake disaster, the victims may be injured due to the impact of building collapse and non resistance in the process of escape. The injured people need to escape to the nearest and safe emergency refuge space and wait for the nearest medical aid [4]. Generally, the rescue effect is the best in the golden time of rescue, which requires higher accessibility between the emergency refuge space and the nearest facility. The better the accessibility is, the more convenient it is to rescue and transfer the injured in time. Therefore, there should be accessibility evaluation index items between the emergency disaster avoidance space and the nearest medical and disaster relief facilities.

This study will use superposition analysis method to overlay the coverage area of network services in disaster avoidance space and urban population density distribution map to obtain the population number of network service coverage area of disaster avoidance space, and then obtain the evaluation index data such as the total effective utilization rate of disaster avoidance space, the service coverage rate of effective area of disaster avoidance space, and the population allocation gap of disaster avoidance space service.

Based on the superposition of the spatial distribution map of hazard avoidance with geological hazards and the distribution map of hazard buffer zone of major hazard sources, the proportion of hazard avoidance space with safe distance from geological hazard section and major hazard source is obtained respectively.

## 4 Conclusion

In this accessibility study, in the early and middle and late stages of the earthquake, the walking speed of the people escaping from disaster and the speed of the 120 emergency vehicle are only roughly estimated and assumed according to the actual situation and field investigation, and a large number of experimental data and behavioral psychological investigation are not conducted. At the same time, it only involves the distance on the ground and evacuation time, and does not consider the influence factors of different building height.

This study does not consider the impact of building quality differentiation on the number of fixed disaster avoidance demand, road traffic network congestion and the effective disaster recovery area within the disaster avoidance space under different earthquake magnitudes. The calculation of the effective disaster recovery area in the disaster avoidance space does not take into account the impact of vehicle parking. At the same time, the collected population data is not comprehensive, which represents the household registration population, only reflects the nighttime population distribution.

The evaluation index system does not consider the aggregation degree of disaster avoidance spatial distribution, but whether the spatial distribution of disaster avoidance is concentrated or balanced is closely related to population distribution. At the same time, both urban population distribution and disaster avoidance space are dynamic processes, which will change with the development, The future research focuses on the dynamic fit degree evaluation between the spatial distribution of disaster avoidance and population distribution based on the vulnerability dynamic evaluation of the overall building quality.

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# Artificial Intelligence Technology Based on Machine Learning Algorithm

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**Abstract.** This paper first introduces the background and research status of artificial intelligence and machine learning. Secondly, it briefly introduces the classical algorithms of machine learning in theory and puts forward some opinions. Finally, it thinks that deep learning is the research prospect of machine learning, and the development trend of machine learning is prospected.

**Keywords:** Machine learning algorithm · Vector machine

## 1 The Development of Machine Learning

There are many questions about the desk. The number of the bodies is not so easy to be able to find out how useful it is to be able to find out the best way to look at the first and foremost points of view. The method of the rate sect is one of the most remarkable. In this case, the method of drawing the model of the Monte Carlo is a way of thinking. In this regard, the desk is the science of science and the science of astrology, and the intersection of the two volumes is the same as the desk. At first, the number of the first Dan was fixed. The center of the study is to analyze and analyze the model of the original model for the purpose of solving the problem, and to understand the problem of the problem, the following is a detailed explanation of the basic contents of the descent, submission and expansion model, method of calculation, and the mathematical principle of the scientific research. The point of reasoning is the wisdom, the number of things that can be learned quickly, and the number of things that can be learned in the desk is just a few minutes. At the same time, the introduction of knowledge database, this stage of machine learning has made great progress. Since 1986, with the introduction of neural network and the need of artificial intelligence, people have studied the connection mechanism of machine learning. In recent years, the research of intelligent computer has made a lot of significant progress. The research on neural intelligent computer is a new example, which will make new contributions to the simulation of human intelligence. Neural computer can “think” in a similar way to human beings, and it tries to reconstruct the image of human brain. According to the report of MII of Japan, the feasibility study of neural computer system was completed as early as the end of April 1989, and the details of the long-term research plan of the system were put forward. In the United States, the United Kingdom, China and other countries, there are many research groups devoted to the study of “neural network”. It is predicted that the neural computer will enter the practical stage in this century, and some products will be

put on the market. The human brain, a magical organ, can replicate a large number of interactions, process extremely large amounts of information quickly, and perform several tasks at the same time [1]. So far, almost all computers have not got rid of the architecture of von Neumann machine, and can only “solve” a single problem in turn.

## 2 Correlation vector machine model

If the training set  $\{x_n, t_n\}_{n=1}^N$ , the target value  $TN$  is distributed independently, and the input value  $x_n$  is an independent distribution sample

$$t_n = y(x_n, w) + \xi_m \quad (1)$$

To represent the relationship between input  $x$  and target  $t$ , where is additional noise and satisfies the Gaussian distribution as follows:

$$\xi_m \sim N(0, \sigma^2) \quad (2)$$

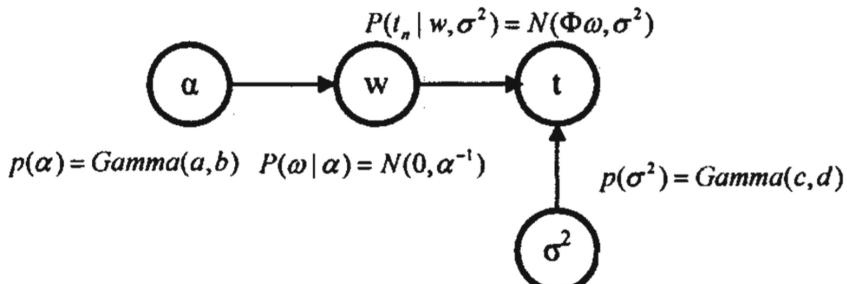
The expectation is 0, the variance is  $\sigma^2$ , and  $\sigma^2$  is assumed to be an unknown quantity in the model, and then updated iteratively during data training. It can be obtained from (1) and (2):

$$p(t_n | w, \sigma^2) = N(\Phi w, \sigma^2) \quad (3)$$

Where  $N \times (N + 1)$  is the structure matrix composed of kernel functions, where each row. In order to prevent over adaptation in the evaluation of O and O MLE, the ard prior probability distribution is defined Fig. 1 vector machine model.

$$\Phi = [\varphi(x_1), \varphi(x_2), \dots, \varphi(x_n)]^T \quad (4)$$

$$p(W|\alpha) = \prod_{i=0}^N N(w_i | \alpha_i^{-1}) \quad (5)$$



**Fig. 1.** Vector machine model

### 3 Artificial Intelligence Technology

There is no consensus on the goal of intelligence research. From the research and Feigenbaum put forward nine final goals of artificial intelligence to understand human beings. This goal studies how humans think, not how machines work. We should try our best to understand human's ability of solving problems and general decision-making process. 2. Effective automation this goal is to use machines to take on all kinds of tasks that need intelligence. The result is to build the intelligent expansion of the same program as human beings. This goal is to build the complement of thinking. Our thinking is more effective, faster, more profound and clearer. This goal is to build a super human Performance of the program. If this knowledge threshold is crossed, it can lead to further proliferation, such as innovation in the manufacturing industry, theoretical breakthroughs, superhuman teachers and extraordinary research. 5. Universal problem solving this research can enable the program to solve or at least try out a system beyond its scope. 6. Coherent conversation is similar to the goal of Turing testers. Conversation uses complete sentences, and sentences. 7. The goal of storing information is to store a large amount of knowledge. The system should have a knowledge base similar to encyclopedia dictionary, including a wide range of knowledge. To achieve these goals, we need to carry out the research on intelligent mechanism and intelligent construction technology at the same time. Even for the intelligent machine that Turing expects, although it does not mention the thinking process, the research on intelligent mechanism is still needed to realize this kind of intelligent machine. Therefore, revealing the fundamental mechanism of human intelligence and using intelligent machines to simulate, extend and expand human intelligence should be the fundamental goal of artificial intelligence research, or long-term goal. The long-term goal of artificial intelligence research is to manufacture intelligent machines. Specifically speaking, it is necessary to make the computer have the perception ability and interactive function such as watching, listening and speaking, writing, and have the high-level thinking ability such as association, reasoning, understanding and learning, as well as the ability to analyze problems, solve problems and invent and create. In short, it means that computers, like human beings, have the ability to automatically discover and utilize laws, or to acquire and utilize knowledge automatically, so as to expand and extend human intelligence. The long-term goal of artificial intelligence involves brain science, cognitive science, computer science, systems science, cybernetics and electric power, And depends on the common development of these disciplines.

### 4 Research Field of Artificial Intelligence

Artificial intelligence is an export-oriented discipline. It not only requires people who study it to understand the knowledge of artificial intelligence, It requires a solid foundation in mathematics, philosophy and biology. Only in this way can a machine that knows nothing can simulate human thinking. In order to ensure a good reading

experience, it is recommended not to scale the size of the reader. Because the research field of artificial intelligence is very broad, it is generally application-oriented. In other words, it can be used in any place where people are working, because the most fundamental purpose of artificial intelligence is to simulate human thinking. Therefore, we can select several representative aspects from many application fields to see what work needs to be done in the development of human intelligence.

The expert system was put forward when the research on artificial intelligence is in a low tide. The emergence of expert system and its great potential not only make the artificial intelligence get rid of the predicament, but also walk into the development period. The classification of expert system includes interpretation, diagnosis, prediction, design, planning, control, monitoring, maintenance, education and debugging [2]. In terms of system, it can be divided into centralized expert system, distributed expert system. There are many names, but the basic structure of the expert system is shown in the figure below.

## 5 Application Area

### 5.1 Main Application Fields

Finally, there is another application area, which is model recognition. I think it should be applied in knowledge mining, because there are more and more data obtained in engineering. It is not easy to determine a certain rule from these data artificially, let alone discover new rules in these data. Therefore, it is necessary to carry out data mining. Its application will be of great significance to decision support system. People can think, and artificial intelligence also needs to think, which is reasoning. If people can learn, artificial intelligence needs to learn.

### 5.2 How Machines Understand Knowledge

In terms of several methods of knowledge representation, knowledge representation is close to human expression, and there are representation methods that are far different from human expression. Generally, we can see a feature: the representation close to human thinking will cause some trouble for computer to express, but the representation close to machine can not completely represent the structure of human knowledge [3]. There is a difference between machines and people, and this difference may begin to prompt people to study new structures of computers, so as to minimize the differences between machines and human thinking. However, because the current structure of human thinking and the structure of human brain can not be clearly understood, it is not clear to what extent the thinking gap between human and machine can be reduced by such a machine. And at present, it is not realistic to replace so many computers, so it is necessary to adopt other methods to make the machine and thinking closer to the human mind.

## 6 Conclusion

Finally, let's summarize the various research fields of artificial intelligence. Referring to the functions of human beings in various activities, we can get that the field of artificial intelligence is nothing more than replacing human activities. Which field has the intelligence activity which the human carries on, which domain is the artificial intelligence research domain. The purpose of artificial intelligence is to use artificial intelligence to help human beings. The purpose of artificial intelligence research is to simulate the function of human nervous system.

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# Autonomous Simulation of Entrepreneurial Innovation Based on DQN Enterprise

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**Abstract.** In order to survive and develop in society for a long time, an enterprise should not only have reasonable management mode, but also have continuous innovation. If an enterprise wants to develop from entrepreneurial growth to a certain scale, it must have technological innovation and management innovation. As the times continue to change, many enterprises have taken the action of enterprise autonomy, which is adaptive simulation using artificial intelligence DQN algorithm. Finally, this simulation experiment shows that the self-adaptive enterprise is far more likely to develop than the self-adaptive enterprise, and can better estimate itself through the social environment State, as well as the future direction of development, can guide better business plans.

**Keywords:** Autonomous simulation · DQN · Adaptation

Autonomous simulation is a kind of simulation experiment tool, which introduces innovative theory into autonomous model to carry on the experiment. It is a kind of top-down modeling idea. Using the autonomous simulation system, we can understand the development direction of the enterprise more macroscopically, grasp the opportunity accurately, and promote the development of the enterprise more effectively. DQN is the abbreviation of English Deep Q Network. It is a powerful weapon in reinforcement learning. The method of reinforcement learning is a relatively traditional way. Nowadays, with the development of science and technology, machine learning is gradually appearing in our life, and all kinds of machine learning methods are also integrated intersecting. Briefly DQN there is a memory bank that is used to learn various previous experiences. In the DQN simulation of entrepreneurial innovation, we only need to understand that DQN is a kind of reinforcement learning, which is used to learn all kinds of experience before.

## 1 Economic System

China's current economy has a good development, with the increasing world trade transactions, China's import and export economy continues to expand, China's economy has a great development. Now credit is expanding rapidly, and many young people are starting their own businesses. More and more college students have also entered the entrepreneurial brigade, China's economy is developing rapidly, network

economic transactions are being carried out on a large scale. Everyone only needs a mobile phone, pay directly, and shop online, which brings great convenience to modern people's life.

(1) Self-employment

With the rapid development of the network and the economy, the opening of national policies, young people have learned to start their own businesses through the network. Now more and more people carry goods live and become anchors. This gives young people more employment opportunities and expands the market for self-employment.

(2) Entrepreneurship market demand

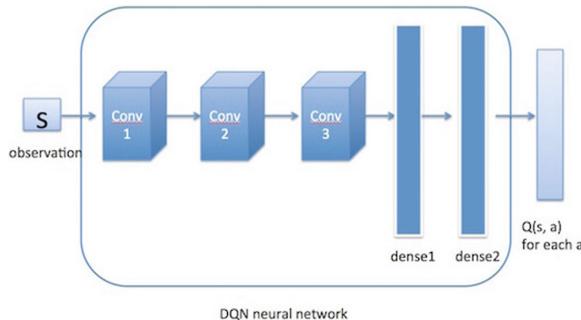
Before starting a business, market analysis is very important. In this society, entrepreneurs are finding market demand and finding market bright spots. Market demand is divided into “explicit market demand” and “implicit market demand”. “Explicit market demand” refers to those that have been discovered business opportunities and have been developed in the market, for example, to open Internet cafes need computers, and “hidden market demand” refers to business opportunities that have never been discovered. First by you, find “hidden market demand”, then the direction of entrepreneurship must not be wrong.

(3) Enterprise innovation

Enterprise innovation refers to organizational innovation, management innovation, market innovation, business model innovation and so on. If an enterprise wants to develop rapidly and persistently, it can not be separated from innovation, and the innovation of a product will bring vitality to an enterprise. Nowadays, as a kind of technological and economic activity, innovation has reached a certain degree of optimization, which can bring more value to customers and more benefits to enterprises [1].

## 2 DQN Simulation Experiment Adaptive Learning

Adaptive learning system refers to the enterprise through each system evaluation results, according to the data to formulate a suitable enterprise development, can better improve the enterprise plan, so as to achieve a set of plans. Adaptive learning, such as names, generally adjusts learning methods through self-learning to find more suitable solutions. DQN functional network, also known as value function approximation, its calculation principle, such as figure:



These algorithms are somewhat complex. Then the DQN simulation experiment in adaptive learning is calculated by DQN algorithm, and the evaluation results are obtained more accurately in adaptive learning.

### 3 Simulation Results and Analysis

According to the simulation experiment, the enterprise autonomy with adaptive behavior has got better marketing in the market, and they can use the DQN algorithm to calculate the product problem and the error and risk in the enterprise decision before the product has the problem. Through the environment and their own evaluation, enterprises can change and adjust in time. Without adaptive behavior, enterprise autonomy is prone to errors and greater losses. Enterprises with adaptive learning behavior use DQN, algorithms to reduce some of the mistakes in marketing, which is undoubtedly a great benefit for newly started enterprises or small enterprises [2].

#### (1) Parameter determination

There are two networks with exactly the same structure but different parameters in the DQN. The network Target Net of network prediction  $Q$  estimation uses the latest parameters, while the prediction  $Q$  realistic neural network parameters are used a long time ago. When the agent takes action on the environment, the parameters can be calculated according to the formula and copied.

#### (2) Return function settings

The loss function of the DQN is as follows, which indicates that the network parameter is the mean square error loss. We estimate the value function by the method of function approximation:  $\Delta Q(s, a, w) \leftarrow Q(s, a, w) - Q(s, a, \pi(s, a))$ .

#### (3) Experimental SMEs

By using DQN algorithm, small and medium-sized enterprises can better adjust their decision according to the environment and their own evaluation results. China's small and medium-sized enterprises also account for the majority, these enterprises provide employment opportunities, not only stimulate economic development, but also provide employment opportunities for a large number of

talents. At this time, enterprises with adaptive learning can adjust according to the change of market environment and the change of their own enterprises.

(4) Focus on capital and profits

Now the state policy is open, the state encourages enterprises to innovate. Now people's venture capital will be their own products to find investment companies, some schools to provide venture funds. Either way, entrepreneurship is not an easy thing, need to start and talent assistance. Reasonable allocation of capital to maximize the use of each fund. Profit is also the most important part of an enterprise, starting a business not only to have a better job, but also to have a considerable income. Therefore, the adaptive enterprise autonomy has a great role in the development of enterprises [3].

(5) Emphasis on technological innovation

Innovation is the result of a variety of comprehensive actions, enterprise product innovation, technological innovation and so on. The innovation system of enterprises needs to learn, change, find and choose constantly. The innovation of enterprise technology level is the innovation and diffusion of knowledge. The arrival of information age brings many challenges and opportunities for enterprises to survive in the network environment. The network changes rapidly and changes all the time. The traditional technology can not keep up with the present society, so the innovation of technology is the inevitable result. Technology does not innovate, means backward, backward enterprises will be eliminated.

(6) Experimental enterprises that attach importance to the three

Attach importance to the three experimental enterprises, according to the formula into adaptive learning. Enterprises that attach importance to capital and profit and technology level innovation have good enterprise management in the market. How an enterprise survive well in the social environment is very important. Enterprises that attach importance to these three, coupled with adaptive learning system, can better evaluate their own state, increase technological progress, product innovation, and have huge marketing in the market. Experimental enterprises, invested in a higher cost of research, the results are more reliable. Independent innovation and simulation innovation are different, you can know the different needs of experimental enterprises and other enterprises, real What the enterprise needs is more innovation, has the bigger play space. From the data, it is concluded that the experimental enterprises have a inextricably relationship between cost, profit and technology. It is believed that technological innovation can increase profits and reduce costs On the contrary, the increase of profits can also promote better technological innovation.

## 4 Conclusion

By using the algorithm of DNQ and so on, this paper studies the simulation of enterprise innovation and entrepreneurship, which makes the enterprise innovation more diversified and intelligent. Even if the training time of DNQ is too short and time-consuming and laborious, it is obvious that it can far exceed the autonomy of other

ordinary experimental enterprises, thus increasing the confidence and basis of entrepreneurial innovation.

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# Analysis of Security Audit Solutions Based on Association Rule Technology for Architecting in a Cloud Environment

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**Abstract.** The continuous development of modern cloud computing technology has generated a large amount of data and information for various industries and fields, which are important intangible assets for enterprises. At the same time, it can also provide high quality and flexible services, giving enterprises an advantageous position in the fierce market competition. It should be noted that cloud computing platforms will face corresponding network security issues, so it is crucial to strengthen network security audit work, this study will also explore the cloud environment based on the association rules technology security audit design scheme.

**Keywords:** Cloud environment · Association rule technology · Security audit scheme

## 1 Introduction

The role of the network security audit in the security management process is very clear and it is a function that needs to be supported as a priority for the security of the network environment. Data security audits with expert feature detection methods are commonly used at home and abroad, but the method is inefficient and has poor security adaptation to some unknown behaviours. This knowledge discovery method can be a major research direction for security audit solutions in cloud environments.

## 2 Relevant Aspects of the Safety Audit Programme

The network security audit in the cloud environment refers to the process of recording and analysing the user's network behaviour, which is an important measure to ensure the security of network data information. From the perspective of the basic flow of the audit process, including the information processing of data and the coordination function of the audit response, after recording the main body of the event behaviour and access, the information will be compared and integrated according to different attributes, to carry out reasonable control of some illegal and unreasonable access behaviour, to achieve the protection of key data. Overall, network security audits are

able to perform precise targeting and screening on the basis of data comparison, and make predictions on some access behaviours that cannot be determined, which not only improves the safety of users when using the network, but also ensures the scientific degree of network application. From a network security perspective, a complete information security audit function should comprise the four components shown in Table 1.

**Table 1.** Network information security audit model

Information security content	Role
Data acquisition and processing	Achieving integration and optimisation of data
Intrusion detection defence	Locating unauthorised access
Audit response	Responding to audit actions
Rule-based learning feedback	Formation of association rules to reduce audit size

Audit rules are a prerequisite for security audits, which are based on user access behaviour and related policies for securing the network, such as mathematical and statistical analysis rules. The main advantages of such rules are that they guarantee high accuracy, do not take up a lot of system resources, are easier to implement and make reasonable judgements about the security of user behaviour. However, these rules also have certain disadvantages. For example, if the access behaviour to some unknown attacks cannot be predicted accurately, this will inevitably lead to missed or misjudged behaviour.

In contrast, an audit response is a different way of responding to dangerous event behaviour by means of a security analysis engine for network data. If it is a safe time, it is filtered directly during the data cleansing phase, and if the event itself is dangerous, on the other hand, the corresponding information is logged within the audit database, where the administrator determines the degree of danger and sends the information about the event to the administrator area.

### 3 Linked Rules Technology

The learning problem of association rules can actually be divided into two sub-problems, the first is to count the percentage frequency of occurrence of an item and at the item level, and the second is to find frequent item sets that meet the minimum support level to generate initial association rules, after the rules are formed, the association specification is analysed according to the given minimum confidence level and metrics, and compared until the strong association rules in all transactions are counted [1].

The association rule mining learning algorithm is mainly divided into two types, one is a layer-by-layer search iteration to produce frequent item set algorithm, and the other does not produce candidate frequent item set algorithm, in the cloud environment we are mainly the classical Apriori algorithm as the object of study. This algorithm uses layer-by-layer search iterations to complete the learning process of discovering

association rules and generating rules according to a framework of support and confidence levels. In this way the algorithm is able to mine potential association knowledge from large datasets, but it should be noted that during the mining process the algorithm may need to scan the database several times and, with a minimum support level, may generate a large number of redundant association rules, which may lead to a decrease in accuracy.

The main approaches to association rule mining learning include the two types of algorithms mentioned earlier, and since the advent of association rule mining algorithms, research into the algorithms themselves and their shortcomings has been a key focus for the industry. Faced with large amounts of data in a cloud environment, we are asked to consider the learning process of mining frequent item sets by reorganising the relationships between data items and transactions using a matrix structure in a single scan of the transaction database. For example, when D is the transaction database and min\_sup is the minimum support count.

After sorting and counting by the number of occurrences of T-items in transaction D, an array can be used to represent the frequency of occurrence of each data item present in the transaction and the data relationships can then be converted into a matrix. Using logic and results, pruning the transformation matrix reduces the footprint and allows the resulting database data to satisfy the minimum supported set of frequent items, selected according to valid association rules [2]. In terms of manipulating objects, it is possible to numericise objects, i.e.

$$\begin{aligned} 01 &= TABLE1, 02 = TABLE2 \\ 1 &= insert|0 \\ 2 &= delete|0 \\ 3 &= update|0 \end{aligned} \tag{1}$$

$$\begin{aligned} |D| &= n \\ \min \sup &= x\% \end{aligned} \tag{2}$$

$$\begin{aligned} \sup port(X) &= \frac{\sigma_X}{|D|} \times 100\% \\ X \subseteq Y, \sup port(X) &\geq \sup port(Y) \end{aligned} \tag{3}$$

## 4 Security Audit Solutions in Cloud Environments Based on Association Rule Technology

**System architecture.** Massively parallelised computing on cloud platforms can provide important IT services to customers, providing a computing environment with distributed storage across computer clusters, and providing services in a standard API interface, object-oriented model. In a typical architecture, the cloud computing platform generates log-related data while providing services to consumers, which can be used as reference input data for security audits of the cloud platform, and can be used as the basis for establishing security audits. Model. During the design of the system architecture, we take into account the requirements at different levels, including the user

layer, the business layer, the storage layer and the collection layer. The sources of audit information include network data and other log information, the user layer uses a cloud platform for audit information management and rule-based information management, the business layer performs post-auditing according to the rules, the storage layer is responsible for encrypting and decrypting the information in the database, and the storage layer is responsible for encrypting and decrypting the information in the database. The collection layer formats and performs audits based on the data content.

Data acquisition and data processing. The data acquisition and data processing module is the fundamental module of the entire security audit system. This module consists of a host computer and a network that format the collected data and pass it on to the security audit engine to analyse the data behaviour. Due to the sheer size of data in modern society and the difficulty of standardising formats, data redundancy issues may arise and the data collected in real time is processed in such a way that, for example, redundant data needs to be integrated in order to reduce the size of the data. In terms of the host's system logs and security application logs, there should also be a common format to facilitate auditing and the learning of association rules. The security and authenticity of the data is of paramount importance for data mining and the learning of association rules, as audit analysis engines can cause serious damage and system risks when receiving altered or disguised security information. This requires increased protection, backup and transfer storage of databases, and encryption to improve overall security [3, 4].

## 5 Conclusion

The security audit solution proposed in this paper to improve the association rule technology is based on the typical architecture of a cloud platform and uses algorithms for the overall architecture, which not only optimises the data mining process as a whole and reduces the frequency with which redundant subsets or databases are connected, but also safeguards the execution efficiency of the algorithms and the operational load level of the security audit system. With the rapid spread of web applications, network security issues will be studied in depth based on data mining or other techniques, and more rational judgements and operations will be made based on practical work requirements.

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# Research on the Application of Data Mining Techniques in the Audit Process

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**Abstract.** How to accurately locate the meaningful audit doubts in the massive data has become the main problem facing the current audit work. Especially in the era of Internet data, data mining technology is developing very fast, and the analysis methods are becoming more mature, which are widely and successfully applied in various fields. Therefore, it is of great practical significance to apply data mining technology to the audit process, which can clearly locate the degree of correlation between different statistical index variables, evaluate certain abnormal data or abnormal correlation performance, and serve as an important supplement to the audit work.

**Keywords:** Data mining techniques · Audit process · Application

## 1 Introduction

Data auditing by computer is to ensure audit quality, which requires the establishment of a comprehensive audit framework and the justification of the data involved in order to draw scientifically valid audit conclusions. However, there are still some shortcomings in the current auditing process, which are mainly reflected in the subjective and one-sided nature of computer data analysis. Data mining techniques can use modelling and algorithms to find relationships between different data, thus objectively reflecting data patterns, removing redundant data in the process of data cleaning, extracting valuable information and saving overall audit time.

## 2 Audit Subjects and Audit Process

At present the main means is low click type and the lever type, low click type is on the bottom of the ball through attack the ball flew over obstacles, this method is able to pick the ball's advantages and makes the energy loss in institutions least, the shortcoming is the ball high requirement of the shape of the electromagnetic valve [1]. Therefore, the development of a high-performance control system of soccer robot has become an urgent desire for soccer robot fans.

Subject of the audit. Specific information on the subject of the audit is shown in Fig. 1.

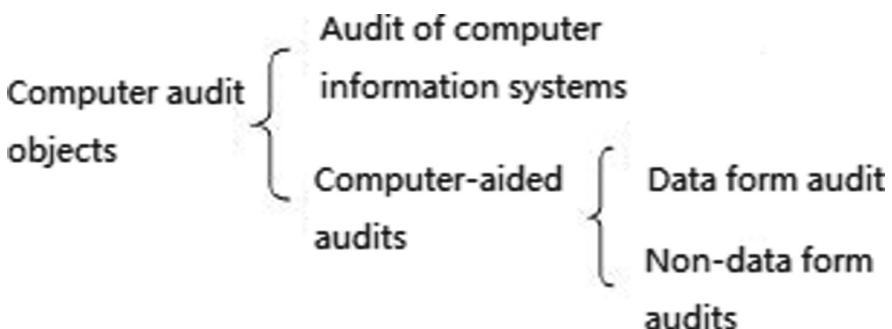


Fig. 1. Classification of audit subjects

The object of this study is auditing in the form of data, including the direct use of electronic data. In addition, in-depth research has been carried out in this area in China, and different types of audit software have been developed.

## 2.1 The Audit Process

The current computer audit process differs significantly from other audit processes in that research and data collection are followed by data cleansing and the creation of intermediate tables. In order to obtain audit data, the business logic and relevant regulations are analysed and the auditor's experience is used to determine whether the data is valid or anomalous. If there are anomalous data, the audit suspects should be located for extended implementation and forensic work. If these data are not cleansed and processed in a timely manner, this will not only lead to data distortion and increased audit risk, but will also affect the overall quality of audit work. For example, the further extension of the discovered audit doubts at the end of the on-site audit can clearly identify the key points that have been judged to be valid, which is the ultimate guarantee of audit quality. Of course, it should be noted that the development of information technology and electronic technology has made certain data issues more hidden, so with the help of data mining technology, new audit doubts can be formed through precise positioning, information expansion, feature correlation or cluster analysis in the midst of massive amounts of data.

## 3 Basic Processes of Data Mining Techniques

### 3.1 Data Mining Process

The data mining process itself is characterised by its completeness and diversity as it involves data screening and data analysis, followed by data modelling and the drawing

of conclusions and evaluations. Essentially, based on large amounts of data and the creation of correlation models between variables, it is possible to reveal regular features of the data and internal variables and then extract useful information from the data, which can be accomplished with the help of models and algorithms. On the basis of a number of algorithms, the data can be subjected to a multidimensional relationship, and mining methods and tools can be integrated to explore different conjectures about the data for internal law verification. In the context of information technology at this stage, with the emergence of large amounts of business data, the use of data mining techniques can effectively improve audit efficiency and reduce the risk of the audit process [2]. Specifically, data characterisation audits can summarise the general characteristics of the target class of data and, after differentiating the data, apply them to daily audits to gain a comprehensive understanding of the relevant characteristic information involved in the audit data. From this point of view, data classification is in fact a process of understanding the common features of different objects from a database and accumulating and integrating these common features. In the case of common cluster analysis, this method enables the overall similarity and difference in the nature of the data to be grouped together according to the characteristics of the data itself, without specifying criteria in advance, and the structural features of the different individuals within the group are similar. In addition, in modern auditing sessions, due to the significant increase in the frequency of audits, the use of the correct data mining process, can quickly locate anomalous audit data, and take measures to deal with it.

### **3.2 Data Mining Techniques in Auditing Processes**

If we incorporate data mining techniques into the general audit process, we can identify audit projects and complete the data collection and transformation process to obtain audit data. Based on the results of the profiling and correlation analysis, different mining algorithms are selected and the analysis model is developed and planned, resulting in two types of results. The other is to obtain normal data directly, including patterns and validated models, which will be used as reference criteria for subsequent audit decisions.

## **4 Concrete Application of the Data Linkage Rule in the Audit Process**

In the case of the SPSS Modeler, for example, where association rules integrate specific conclusions and conditions, the main advantage of the association rule algorithm in a data mining algorithm is that any property can be associated as a basis for finding additional rules. In other words, association algorithms can be used to locate rules by generating and testing them, to verify their feasibility based on differences in the data set, and to effectively filter rules that meet the storage conditions. Usually we take certain data from a set of data to be tested and then optimise the rules before using an effective delivery method to establish the correlation of the sequence. In the day-to-day work of modern companies, many have established costing information systems or other data transfer information systems, but there may be data discrepancies in the audit

preparation phase, so auditors should focus on the review of data within the company. Particularly in the context of large amounts of business data, the detection of anomalies is of great practical importance for the sustainable development of the business [3].

#### 4.1 Business Understanding Process

The correlation rules themselves are based on indicators from different events to present the characteristics of the correlation, and the key rules themselves are based on a large amount of data to construct mathematical and statistical rules that recognise the core value of certain data in terms of relevance. Business understanding, on the other hand, is the translation of the information in the domain into the language of data mining through communication between data miners and business people. In terms of information characteristics, business logic and precision are required to be able to optimise the management of some technical parameter terms. It is important to note that the overall goal of data mining is to eliminate relevant factors and then to understand how the different data relate to each other. To do this, we create an audit database, analyse the data variables for indicators and consider their validity, then select a data mining method and scientifically filter the sample size. After generating visual reports, a data model is created and the process of validating and evaluating the model is completed, e.g. Table 1 shows the data indicators that can be used in an HIS system.

**Table 1.** HIS data indicators

Types of data indicators	Corresponding information
Data number	Data content
Personnel information	Person's name, work number
Project codes	Number and characteristics of projects

Data mining projects are about finding quantitative correlations between data by means of correlation analysis models in order to locate anomalous data for comprehensive management. Since some data and data only correspond to each other, the two indicators will still be informationally equivalent and can be used as a reference.

#### 4.2 Acquisition and Processing of Data

Once the data has been collected from the HIS system, the collected data is then filtered to identify those that meet the requirements for mining and the data with invalid and missing values is cleaned. Due to the correlation between certain data, the target data for all interest screening should meet certain special conditions, such as the need for comprehensive analysis of a larger sample size of data. Once all of the SQL files exported from the database have been imported into an Excel spreadsheet, they can be analysed in the SPSS Modeler software, selecting the filter option to filter out indicators that are not relevant for this data mining process [4].

### 4.3 Data Modelling

The purpose of data modelling is to determine the relationship and visualisation characteristics of the data associations. If the network nodes in the graphics tab are added to the workflow interface and connected to the original data nodes, the fields in the network nodes can be set to the data information that needs to be set. After all of the above processes have been configured, click on the Run button to generate a visualisation in which the red and blue dots correspond to two types of data and the different colours reflect the strength of the relationship between them.

### 4.4 Model Analysis

In order to validate the model and filter out the data and the true relationship between the data, we can select a correlation coefficient for categorical variables to measure the strength of the correlation between the two, i.e. the Spearman correlation coefficient. This can compensate for the lack of sensitivity to large amounts of data during computer audits, and with the support of large data samples, it is possible to select the appropriate modelling method for those parts where the parameters are set low, which is a key support for the audit.

### 4.5 Audit Doubt Analysis

If a point does not match the data presented at any other point, then these points may be an anomaly or are known as wild points. After analysis of the relevant factors, we can locate patterns in the data and, by means of residual analysis, identify data that do not fit the pattern and then carefully extend the analysis to determine whether these data are at risk. The model residuals are obtained after analysis of the regression results. If a large residual corresponds to an observed value, it indicates that there is a large discrepancy between the data fitted to the regression equation and the real data for that point area, and the data can be identified as anomalous. In the later application of the model, you can consider adding actual data to improve the existing model and look for relevant features and correlation characteristics between the data indicators. After calculating the focal evaluation target by means of an outlier detection model, if cluster Q1 exists in data set D, the distance from any object p to an object in cluster Q1 is calculated in conjunction with Bayes' theorem as:

$$P(H|X) = \frac{P(X|H)P(H)}{P(X)} \quad (1)$$

$$P(X|H) = P(A|H)P(B|H)P(C|H)$$

$$d(p, Q_1) = \min(d(p, q_1), d(p, q_2) \dots d(p, q_n)) \quad (2)$$

$$q = \sqrt{(x_p - x_{Q1})^2 + (y_p - y_{Q1})^2} \quad (3)$$

## 5 Conclusion

By collecting data from business systems and using data mining technology to carry out unified analysis, it is possible to comprehensively assess and confirm certain query doubts. The in-depth application of data management information systems within the industry allows the role of data mining technology to be effectively played, significantly reducing audit risk and ensuring the quantity and quality of audit work. In future practice, more complete and standardised operable implementation procedures should be established, taking into account the scope of application of data mining technology algorithms and the adverse effects of human model parameters.

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# Design and Performance Optimization of WebGIS Front End Class Library Based on HTML5

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**Abstract.** With the development of Internet and mobile Internet technology, especially the maturity of HTML5 technology, WebGIS Application development has been changed from server to client. The front-end development has become the focus of WebGIS and mobile Internet GIS application development. In this paper, a lightweight WebGIS front-end class library (GMap V3.0) based on HTML5 is designed and implemented for the WebGIS platform software ECNU GeoServer developed by ECNU spatial web laboratory. At the same time, the web front-end storage technology, mashup technology, browser compatibility and front-end performance optimization are discussed.

**Keywords:** WebGIS · Geoserver2013 · HTML5 · Performance optimization

## 1 Key Technologies of WebGIS Front End

### 1.1 HTML5 Technology

HTML5 is a new generation of web standards, including audio and video, canvas, web workers, geolocation and other new features [6], which makes the front-end development reduce the dependence on third-party plug-ins and make full use of the browser's native functions. HTML5 browser is supported by the current mainstream browsers. Among them, canvas, web workers, front-end storage, offline application and multi-threaded function can provide convenience for the development of WebGIS front-end class library. Based on these technologies, this paper develops the GMap V3.0 front-end class library.

### 1.2 Canvas Technology

Canvas technology is mainly used for vector graphics rendering (path, rectangle, etc.), raster image and text rendering. It supports color, texture filling and transparency, including many advanced methods, such as RGBA () , HSLA () translucent filling technology, using global alpha to set the transparency of drawing objects, setting fillStyle attribute with createpattern, and so on [1].

Because canvas is a bitmap canvas in essence, it can be used to develop WebGIS applications that contain an edit layer and need to use click and drag to achieve interactive functions. Its advantage is that the performance of rendering 2D graphics is

better, it does not need to use DOM to save primitives, and it is suitable for vector data that needs to be drawn or refreshed frequently. Real time road conditions, real-time meteorological information display and geographic elements digitization function based on Web.

### 1.3 Front End Storage Technology

HTML5 front-end storage technology mainly includes web storage, filesystem, indexeddb, websql database, etc. Among them, indexeddb and web sqldatabase are suitable for storing relational and structural data, while web storage and filesystem can be used for key value pair storage. Their basic characteristics are shown in Table 1:

**Table 1.** Comparison of HTML5 local storage technology characteristics

Technical name	Web SQL DB	IndexedDB	Web Storage	FileSystem
Storage format	Binary	Binary	Text	Binary
Structural data	Support	Support	I won't support it	I won't support it
Capacity	Unlimited	Unlimited	2.5–5MB	Unlimited
Is it W3C	Stop developing	Alternative recommendations	Recommended standards	Edit draft

According to the different persistence, web storage can be emptied only by using JavaScript code or by calling the cache clear function. The technology has rich and easy-to-use interfaces. The storage mode is key value mode, which does not support cross domain access. It is not suitable for storing private data, such as account password, but can store user personalized data, such as web application interface tool layout and explicit and implicit settings, user's working status and progress before last logoff.

The front-end of the file system is used to store and write data in the form of directory [2]. It uses sandbox technology to realize virtual path, which is divided into temporary mode and persistent mode. After authorized by users, persistent mode 0 can be used for persistent storage to effectively protect the security of other path files in user's hard disk. The interface uses fileentry to call FileReader and FileWriter to read and write arbitrary binary format files. It supports large file reading and writing. It is suitable for caching large video, music and image files. It can be used to develop upload, download and offline storage tools, or web applications that need more offline resources.

## 2 Geoserver2013 Basic Service Interface

Geoserver2013 is composed of two parts: background GIS Server and front-end Script Library (GMap V3.0). The front and back stations communicate through the group interface based on JSON. The basic service interfaces of geoserver2013 include dynamic map service, sliced map service and geographic element service. Based on the key technology of HTML5s, this paper researches and develops the front-end script library GMap v3.0.

### 2.1 Dynamic Map Service

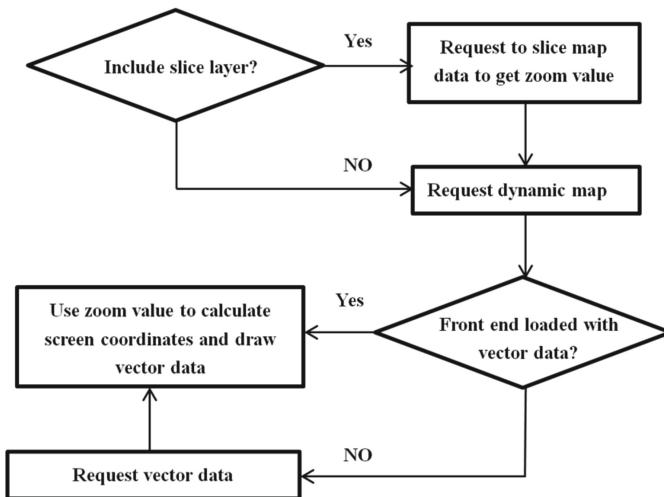
Dynamic map is a service that dynamically generates all kinds of thematic maps on the server according to the user's request parameters (including field of view, central point geographic coordinates, including layer information). The map service of this mode is dynamic and real-time by the server, and it returns a map image with geographic location information. We can use HTML5 front-end caching technology to extend some functions. If the cached image is used for print output, the previous browsing state is cached to support the “back” and “forward” operations.

Because the map is dynamically generated by the server, it is not easy to store it in advance for offline use. Therefore, in the application of HTML5 local storage technology, state type screenshots can be stored for specific needs, such as output thematic maps, read and annotate in the front end for printing, or used to save the operation status of the last map, so as to facilitate the backward and forward operations of map browsing. Specifically, it uses `todataurl` interface of client canvas technology to obtain its Base64 data, and then uses web storage to store the relevant data of screenshots to cache map image data.

### 2.2 Geoserver2013 Front and Back Station Communication Process

Map browsing mainly includes map zooming and panning. This paper discusses the implementation details of this function in WebGIS Application [3].

The order of map request is: firstly, set the series and center point coordinates, request the related JSON data and slice frame data of the sliced map, and then request the dynamic map data according to the returned field of view (zoom) and other information. Vector data can also be used to calculate the new screen coordinates through zoom, centerx, centery and other information, classify and redraw them, and overlay them on the graph for users to browse through zooming, panning and other operations to view the overall situation or detailed information. The flow chart is shown in Fig. 1.



**Fig. 1.** Map service request process

When browsing a map, you can usually use the mouse wheel, click the zoom toolbar and double finger touch mode to zoom the map. Dynamic map, slice map and vector data change with the operation, in which zoom operation. Therefore, in addition to using the mousewheel event attribute to determine the direction of the wheel to control the zoom in or zoom out operation, the touch event can also be monitored according to the event.touches. The array obtains the contact information, including serial number, coordinate value, etc. from touchstart to touchend events, when multi-point touch zooming is carried out, the operation of narrowing or enlarging is determined according to the change of offset and spacing of finger position.

### 3 Geoserver2013 Front End Architecture

According to the experimental environment of this paper, the web server is used to read and write the vector data stored in the background, and the map server is used to output dynamic map and slice map image, perform query and analysis functions, and provide relevant interfaces[4]. The front-end needs to realize the display and interactive operation of various WebGIS data, and enhance the function combined with browser features.

#### 3.1 Development Environment Operating System and Hardware Configuration

Windows 32-bit operating system

CPU: Intel Core (TM), i3-2100, 3.10ghz memory: 4.0g

Hard disk: wdc3200320g

Development tools: Sublime Text3, Adobe brackets.

### 3.2 Server Side Software

- (1) Apache 2.0: Web server for publishing WebGIS Application System
- (2) Php5.2: server-side development environment, used to expand WebGIS Application development.
- (3) Basic data files: mainly including:
  - 1) Text file: it is used to store vector data obtained by digitization, agricultural land audit records, etc., and is stored in different files according to the locality and type.
  - 2) ShapeFile file: basic geographic data needed by dynamic map service.
  - 3) Image file: pre prepared remote sensing image base map slice, classified catalog, for use.
  - 4) Mysql database: it provides spatial data and system related data storage services, which is used to save user information, territory information, etc.
- (4) Geoserver2013: the WebGIS server independently developed by the laboratory can provide sliced map service, dynamic map service, element service, thematic mapping service and basic spatial analysis function.

## 4 Conclusion

This paper uses JavaScript as the front-end script language, based on HTML5 technology, the WebGIS class library as the secondary development foundation, and combines with the background server to realize data transfer, and realizes the basic operation and data editing functions of various maps in the data acquisition module.

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# Research on Network Communication Security Based on PKI

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**Abstract.** Based on the analysis of the connotation and function of PK, combined with the realization of network communication security, this paper puts forward the methods of improving network communication security from three aspects of network equipment physical security, network communication operation security and network communication management security, so as to provide reference for people who pay attention to this topic.

**Keywords:** PKI · Network communication · Security

## 1 Introduction

In the background of rapid development of computer network communication technology, there are constantly viruses and hackers invading the network, causing people's attention to network communication security. It has been widely used encryption system. The public key system is built on the basis of PK. The key management and verification are carried out by the trusted third-party certificate authority, and the public key is effective by issuing digital certificate. The application of the public key in network communication security can enhance the security of network communication and promote the health of network technology.

## 2 Overview of PKI

PKI is a public key infrastructure, which is the English abbreviation of public key infrastructure. As a key management platform, pkl needs to follow the established standards and provide cryptographic services such as digital signature and encryption for network applications. Different from symmetric key encryption technology, PKI needs to provide key and certificate management system, which is asymmetric encryption system. It needs to use CA database as server, and establish X500 national record database with management subsystem, which can manage public key, private key and digital authentication. The client of PKI needs to run various protocols such as psec of VPM, secure multi-purpose Internet mail extension protocol, etc., and query the authentication and related public keys by using the directory [1]. Therefore, from the overall point of view, PKI can mainly play the functions of data encryption and digital

authentication creation, providing technical support for the realization of network security communication.

### 3 The Theoretical Basis of PKI – Public Key Cryptography

In 1976, Whitfield Diffie and Martin Hellman proposed the public key cryptography algorithm, which is the main cryptography technology adopted by PKI symmetric cryptography technology, digital fingerprint technology, digital signature technology and data verification technology constitute the technical basis of PK. Public key cryptography algorithm, also known as double key cryptography algorithm, refers to the encryption key and decryption key are two different key cryptography algorithm, it uses pair key, one is used to encrypt information, the other is used to decrypt information. The private key must be kept secret, while the public key must be kept secret [2]. Data encrypted by public key can only be cracked by using the corresponding private key, and vice versa. The former can be used for digital encryption and the latter can be used for digital signature. At present, there are RSA algorithm and Diffie Hellman algorithm.

#### 3.1 Diffie Mellman Algorithm

Diffie Hellman is the most widely used key exchange protocol in the world. The biggest advantage of Diffie Hellman key exchange protocol is that both sides of the key exchange do not need to agree in advance, and realize the key exchange by using the intractability of discrete logarithm. This protocol is widely used in famous software such as openssh.

In DH algorithm, the authority structure selects an odd prime number  $p$  and a certificate  $q$  as the base, and satisfies  $0 < q < p$ . the authority can also select an integer  $l$  as the bit length of private value, and the length  $k$  of prime  $P$  calculated by octet string should satisfy  $2^{8(k-1)} < P < 2^{8k}$ .

The D-H key agreement includes the following three steps:

$$y' : y = \sum_{i=1}^k 2^{8(k-i)} PV_i, \quad PV_i(i = 1, 2, \dots, k) \quad (1)$$

Is a single octet power operation that makes up pr.

Calculation z:

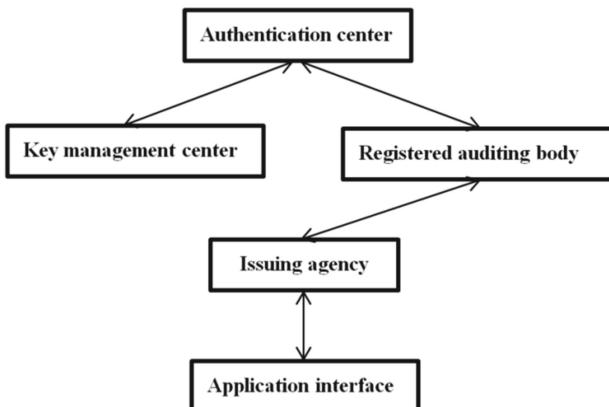
$$z = (y')^x = (q^x)^x = (q^x)^{x'} = y^{x'} \bmod p \quad (2)$$

integer to octet string conversion:

$$z = \sum_{i=1}^k 2^{8(k-i)} SK_i \quad (3)$$

### 3.2 Composition of PKI System

First of all, PKI must have a trusted certification authority (CA), which can generate, manage, archive, issue and revoke certificates based on public key encryption technology. It also includes hardware, software, human resources, relevant policies and operation specifications to realize these functions, as well as providing all security services for members of PKI system, such as identity authentication, data confidentiality, integrity and non repudiation services. The functional structure of PKI is shown in Fig. 1.



**Fig. 1.** Functional structure of PKI

## 4 Network Communication Security Based on PKI

### 4.1 Physical Security of Network Communication

In terms of network communication, users need to use the certificate server for certificate registration, which is authorized by the CA of the audit authority to register, revoke and update the user's real identity. In order to ensure the security of the electronic key system, the U-Key is used as the only security key in the network. In order to store the equipment used to realize the cancellation and update of digital certificate in the control room with shielding performance, so that the system can strengthen the 24-h monitoring of the system by using the specific physical environment, and the existing problems can be found in time. Therefore, the physical security of network communication can be ensured by eliminating the hidden danger of equipment [3]. At this stage, the development of PK infrastructure is relatively mature, which can provide security platform for network communication, provide authentication, integrity and other services.

## 4.2 Network Communication Operation Security

In terms of network communication operation, data files and network transmission encryption should be done well to provide security guarantee for users to log in to the system and store data. The encryption algorithm is used to process the data file, and the file download is completed by obtaining the key. To take this measure, the key security should be ensured in the operation process, that is to use the hardware encryption machine to generate all kinds of server-side keys. After the key encryption, the encryption device that keeps the key needs to use the firewall to strengthen the protection, so as to ensure that the key is only used in the hardware encryption machine device. For the client's signature key, considering that the key is generated by USB key, the encryption key 2 should be generated and saved by the encryption machine. In the process of network communication, external communication should carry out client certificate verification, shut down unnecessary services, use built-in software firewall to provide security for network communication operation. For Ca, Windows 2000 and above operating system should be used to shut down unnecessary services, remove security risks, and complete the installation of the latest patch. In terms of data storage, encryption is required, Strictly prevent external personnel from entering the local access, you can obtain the encrypted data content in the database. In the process of user login system, the identity authentication is completed by inputting password. Enter the key and the user's account will be locked.

## 4.3 Network Communication Management Security

Aiming at PKI system, we should take measures to improve the security of network communication in the aspect of network communication management. As an administrator, it is necessary to complete the scientific setting of network communication authority and log in the account on the specified server. In practice, network communication system administrators are divided into security administrator, system administrator and audit administrator, which have different functions and need to manage different objects. The audit administrator is responsible for viewing and managing the system log [4]. By confirming the log content, it can determine whether there are problems in each link of system operation, and determine the user login time. Therefore, the audit administrator can supervise the operation of other administrators and provide security guarantee for system management.

## 5 Conclusion

In the case that network communication is not restricted by bandwidth, network communication security will become a more complex problem. In order to ensure the security of network communication, it is necessary to strengthen the application of PK. Effective measures should be taken to strengthen the physical security of network communication equipment to provide security guarantee for network communication and management, so as to improve the security of network communication.

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# Application of Artificial Intelligence in Computer Network Technology in Algorithm Age

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**Abstract.** This paper first analyzes the Internet plus era and computer information processing technology, and expounds the existing problems of computer information processing technology under the background of “Internet plus”. Finally, it puts forward five optimization strategies against the shortcomings of computer information processing technology at present.

**Keywords:** The Internet plus era · Computers · Information processing technology

## 1 Analysis of the Connotation of Computer Information Processing Technology in the Era of Internet Plus

### 1.1 Internet Plus Era

Internet plus is a Internet network system that covers the whole world. In the era of Internet plus, it is a collectively called the era of full coverage of computer networks. Under the background of “Internet plus” era, the information resources collected by the Internet cover the global collection, and the information results after the aggregate are stored in the database through digital information. The Internet is a whole network group, which has a core and must have branches. Under this, many network branches perform their own duties and try their best to integrate the collected information resources and transmit them to the core information reserve database faster and more accurately. The literal meaning of the Internet is an interconnected network system, and its main functions and purposes are also the same [1]. The mutual exchange, transmission and sharing of information resources is the original intention and enthusiasm of the Internet era. The Internet integrates the information collected by separate and scattered subnets into a system, so as to make the public shared information resources more orderly and orderly.

### 1.2 Computer Information Processing Technology

Computer information processing technology is also the product of the development of the times. The technical conditions that emerge at the historic moment make it widely used in a wide range, and the computer information processing technology is favored

by more people with its own advantages. The main workflow of computer information processing technology is the acquisition, transmission, analysis and processing of information resources. Its powerful technicality can efficiently integrate the scattered and unsystematic information resources. As a total branch, computer information processing technology contains many branches. With the help of computer technology, communication technology and network technology, computer information technology can play a greater role. Computer information processing technology can make its function more perfect by exerting and utilizing the advantages of these advanced technologies, It is also the computer information processing technology can integrate the advantages of advanced technology to occupy an irreplaceable position in the social scope.

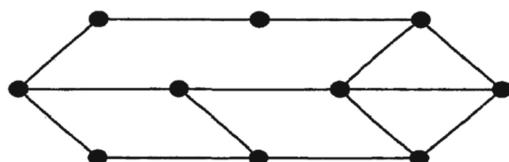
## 2 Green Internet

### 2.1 Introduction to Green Internet

With the continuous increase of the mesh size, the number of network modification increases rapidly, and the corresponding equipment power consumption increases rapidly. The energy consumption problem caused by this has become the focus of attention. Therefore, the concept of green Internet, which is used to study energy consumption, was first proposed in the literature. In low load time, reference estimates the energy-saving potential of the network after switching off the router line card. It tests the change of traffic with time by different methods, and measures the p-layer and WDM layer in the network respectively [2]. The results show that the energy-saving potential of p-layer is greater than that of WDM layer. Literature analyzes the actual network in the European energy-saving project, and evaluates the potential impact of green technology on economy and environment in the next generation cable network from the aspects of telecom operators and client equipment.

### 2.2 Green Internet Network Model

The network model can be simplified as a connected graph  $G(V, E)$ , as shown in Fig. 1.  $V = (v_1, v_2, \dots, v_n)$  Each vertex represents a network node, which is the router in the network;  $E = (e_1, e_2, \dots, e_n)$   $E = (E_1, E_2, \dots)$ , represents a set of edges, and each edge represents a link in the network.



**Fig. 1.** Green Internet network model

$$P_{total} = \sum_{i=1}^{|V|} P_{node}^i \times NodeSt_i + \sum_{j=1}^{|E|} P_{link}^j \times LinkSt_j \quad (1)$$

### 3 Existing Problems of Computer Information Processing Technology in the Era of “Internet Plus”

#### 3.1 Lack of Relatively Perfect Information Technology

With the rapid development of the times, people have gradually entered the era of information resources and technology. Science and technology brings more unprecedented experience to people at the beginning of their lives, which makes many people have a certain sense of dependence on computer information technology. With the improvement of people's living standards and the increase of social pressure, people are more and more picky about information technology. With the continuous change of people's social role and the continuous fluctuation of work and learning intensity, people have more subjective and humanized fantasies about information technology. The existence of these illusions will gradually reduce the satisfaction of people brought by the current information technology. At present, there are more and more advanced technologies, and people's demand for traditional sorting, classification and analysis is also gradually reduced. With the change of people's life roles and the fluctuation of work and learning intensity, the expectation of transmission, sharing, prediction and other functions is gradually becoming stronger and stronger. However, the computer information processing technology at this stage is obviously unable to meet the diversified needs of users. The lack of relatively perfect information technology is also pulling down people's satisfaction.

#### 3.2 The Security Performance of Network Platform is Low

The establishment of information network platform has broken the traditional offline communication mode, and the virtual space also makes interaction and communication more convenient and frequent. Although the construction of network platform can break the limitation of time and space to a certain extent, people's new worries also follow, and the virtual space lacks face-to-face authenticity. Some people who are not in the right mind will take advantage of the virtualization of the network platform to publicize false information or carry out illegal activities. With the emergence of real cases of network security, people have to be vigilant about the security of the network platform [3]. For example, when people browse some websites for shopping, communication and other activities, personal information may be leaked invisibly, which may be used by some lawless elements to carry out fraud and other illegal activities. In addition, some unjust hackers will use computer technology to invade other people's computers or network systems, which is easy to cause the loss of information resources or virus invasion. Thus, the security of network platform is still the focus of attention.

## 4 Strategies for Optimizing Computer Information Processing Technology in the Context of “Internet Plus” Era

### 4.1 Strengthen the Acquisition, Transmission and Processing Technology of Data Information

In terms of information acquisition, relevant computer information processing technology personnel should screen and collect various and uneven network information in a reasonable way. Computer operators should set the search engine system manually to make the information search process more in line with the user's inner needs. When integrating information, we should also pay attention to filtering junk information. For example, advertising screens and windows, and unhealthy information mixed in them should be processed in the information acquisition link, so as to minimize the factors that interfere with users' query. In the aspect of information processing, the first thing we need to do is to understand the basic needs of users and their online query habits. By distributing questionnaires and other ways to understand the needs and query habits of users, so that the system can automatically match the corresponding query methods and effective query content for users, and the scope of query can be further reduced through the classification function of computer network system.

### 4.2 Innovating the Security Technology of Network Information

In order to create a safe environment for the network platform, first of all, computer information processing technicians are required to be very proficient in the operation principle and process of the network system. When maintaining the computer network, some useless information or unhealthy information can be deleted in time, and for the information with very bad influence, its IP address can be located and tracked through technology. Relevant computer information processing personnel can cooperate with network supervisors and police to crack down on illegal and immoral behaviors. In addition, computer information processing technicians should also keep pace with the times, take measures to prevent them. Unsafe factors on the Internet platform are enough to show that the computer information processing is not in place [4]. Due to the loopholes in the Internet platform, there are opportunities for illegal division. Therefore, relevant computer information processing technicians should strengthen the research and development of network information security maintenance technology, Production of higher safety coefficient of technical products, so as to purify the network environment, create a safe network space.

## 5 Conclusion

In the era of “Internet plus”, computer information technology is bringing more convenience to people. At the same time, it will inevitably cause people some concerns. For example, whether the network information platform has enough women's full protection, the speed and quality of data transmission and screening of network

information has not been given a clear answer, so, Returning a satisfactory reply to the times and users is exactly the development direction of computer information processing technology.

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# Explore the Use of Google Cloud Computing Platform to Build a New Environment for Online Education

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**Abstract.** In this paper, we use cloud computing, but as we all know, cloud computing is a future development direction, so in the future, how to use cloud computing well is an important topic in front of us. In the future education, cloud computing is also a development direction, and integrating resources is also the future development direction. But how to combine the two is one of the directions that people should think about in the future. This paper is in such an environment to think about the combination of the two to serve us or to integrate educational resources for the future.

**Keywords:** Cloud computing · Universities · Ideological and political education network

## 1 Research and Development Status of Cloud Computing

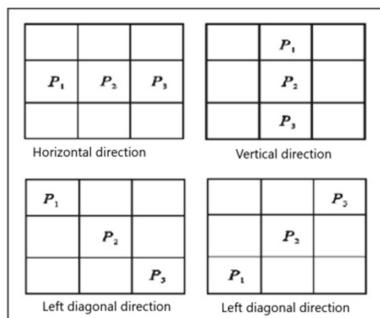
As early as the 1960s, the idea of cloud computing has been born. After all, the idea of cloud computing is closely related to the famous saying of foreign scholar John MC Carthy that “computing will become a kind of public infrastructure sooner or later”. It can be said that this sentence gave birth to the emergence of cloud computing. At the same time, it also means that people can buy, sell and lease non physical things such as computing power, services and applications in the form of commodities. Back in the 21st century, Google first proposed the concept and theory in “Google 10 plan” in 2006, pointing out that cloud computing is a new business model after distributed computing, parallel computing and network computing. In October of the next year, the old BM and goge seized the opportunity to take the lead in the research of computing, which set off a wave of cloud computing research all over the world and ushered in a brand-new reform of the Internet. At the same time, many well-known foreign technology companies have also developed cloud computing related products. In January 2009, subsidiaries of domestic Internet.

## 2 Cloud Computing in Non Continuous Level Data Mining of Ideological and Political Education in Colleges and Universities

In the context of cloud computing technology, we can consider building a discontinuous hierarchy data mining model to pave the way for the subsequent wave clustering discontinuous level data mining method improvement. First of all, the overall design of data mining model should be developed, and the content of  $\lambda$  discontinuous hierarchy data interaction center should be integrated into large cloud storage database to effectively select the control operating system of interaction center. In Fig. 1, points P1, P2 and P3 can respectively represent the transmission nodes and data frames of cloud computing discontinuous hierarchy data intersection. They all take the nearest neighbor points as the center to construct a new vector quantization feature coding model for discontinuous hierarchical data [1]. For example, we can use P2 as the data clustering structure of optersim structure, and then set the initialization level set function as  $\varphi$  to obtain a single retrieval node in a large cloud storage database, and finally get the fitness function. In the fitness function, it is necessary to reflect the data feature clustering and extraction process of four data interaction channels in four load areas, and make multi-path gradient data graph of discontinuous hierarchical data, and obtain the input  $\lambda$  channel model of data semantic ontology model, which is represented by  $x_1, x_2, x_3$  and  $x_4$ , respectively. The model is as follows:

$$\begin{cases} x_1 = p_1 - m \\ x_2 = p_2 - m \\ x_3 = p_3 - m \\ x_4 = p_4 - m \end{cases} \quad (1)$$

The model construction is shown in the figure below:



**Fig. 1.** Data transmission channel model of discontinuous hierarchical data residence interaction center structure based on Cloud Computing

### 3 The Development of Cloud Computing Technology and Network Ideological and Political Education

Through the network, we can quickly and accurately understand the thoughts and emotions of teachers and students and the hot issues they care about, and communicate with each other; we can timely obtain, and make use of the characteristics of network openness, interactivity and timeliness to carry out various and the development and popularization of network technology also brings some new problems, such as the mixed information on the Internet, which increases the difficulty for people, especially young students, to distinguish the true from the false. The irresponsible information and comments published by some people on the Internet are easy to cause some ideological confusion. Hostile elements use the network to incite, which may affect the political stability of colleges and universities and society. It has become a very important and urgent task for ideological and political work in Colleges and universities to occupy the network position with correct, positive and healthy ideology and culture and prevent some people from using the network to spread wrong ideas.

According to the forecast of IDC, the global cloud computing related it expenditure will reach US \$42.3 billion in 2012, with an annual compound growth rate of 27.3%, and the development rate is more than six times that of the traditional IT industry; At present, China is in the early stage of the development of mobile Internet and the policy discussion period of integration of industrialization and informatization. The concept of cloud computing is just emerging and has great potential in the future. It can be said that China will usher in the golden decade of cloud computing development.

### 4 Practice of Strengthening Ideological and Political Education in Higher Vocational Colleges by Using Google Cloud Computing Environment Under Cloud Computing

#### 4.1 Building Ideological and Political Education Platform Based on Google Cloud

To take advantage of Google's cloud environment, we must first create a portal based on Google cloud platform. First sign up for a Gmail email, and then create an account. After successful creation, you can log in to Google's cloud platform through a website [2]. The login interface is shown in Fig. 1. In this interface, we can create our own website.

According to the internal characteristics of Google, a distributed system infrastructure is proposed, and its functions can be well implemented. After repeated experiments, the system we designed is feasible.

#### 4.2 Effect Analysis

Before the social hot issues contained in the ideological dynamic, class work is very smooth, students can actively participate in class activities, class cohesion further enhanced. Class attendance rate is high, and there are few cases of absenteeism and

leaving early for no reason. This model has been affirmed by school leaders and is being further promoted in the whole school. In short, Teaching management system is actually to achieve the strategic objectives of colleges and universities and the future teaching positioning of colleges and universities. The strategic goal is the future development direction of colleges and universities determined by the decision makers of colleges and universities after repeated argumentation, and the specific module design needs to solicit front-line workers, because they are the direct users of the system. Therefore, in the process of obtaining the description of the future system, we can not copy the module design of other colleges or software service providers. We must combine the development strategy of colleges and universities and the actual conditions and needs to design a system that conforms to its own development characteristics, suit measures to local conditions and seek truth from facts [3, 4]. This is the key to ensure the successful implementation of teaching management system. All members of the university participate in the discussion, give suggestions, repeated experiments, and finally determine the scheme.

## 5 Conclusion

At present, many higher vocational colleges are or plan to implement teaching management informatization. Based on the above analysis, the idea of integration will be implemented implementing informatization. With the realization of school enterprise docking as the guidance, the informatization process and teaching reform can be organically combined, which teaching system and achieve the goal of talent cultivation in higher vocational colleges. Implementation of ERP strategy, which has empirical significance for the implementation of teaching management informatization in higher vocational colleges.

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# Design and Research of English-Chinese Translation Platform Based on BP Neural Network

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**Abstract.** College English translation is an important part of English curriculum. Due to the influence of many factors such as single teaching mode and outdated teaching method, there are many problems in English translation teaching mode. Nowadays, highly developed information technology has been widely used in various fields. Through the construction and algorithm of BP neural network model, this paper systematically introduces the application status of BP neural network theory in teaching, and gives the construction method of BP neural network teaching model. The combination of information technology and College English Chinese translation course teaching mode is helpful to improve teaching efficiency, create efficient classroom, and further promote the teaching reform of English Chinese translation course.

**Keywords:** Information technology · English Chinese translation · Teaching mode · BP neural network · Model construction

## 1 Introduction

With the rapid development of economic globalization, English translation plays an important role in international cultural exchanges. However, due to insufficient attention to translation teaching and outdated translation teaching mode, translation talents can not meet the needs of the society for high level translation talents, which is becoming increasingly prominent. “College English curriculum teaching requirements” has established new teaching objectives, proposed a new teaching mode, highlighted the implementation of advanced, to meet the interests of students’ education philosophy, cultivate students’ Comprehensive English application ability [1]. In the information technology environment, how to fully integrate multimedia with network communication and English translation teaching, improve teaching efficiency, and achieve the training objectives, is an important issue facing the current.

Through the analysis of the existing teaching indicators and methods, an effective teaching model is established, and the corresponding online teaching evaluation system is designed. Combined with BP neural network, a nonlinear teaching evaluation model is given. The trained BP network teaching model can get the teaching results of the

object according to the evaluation data, and realize the effective combination of qualitative and quantitative.

## 2 The Shortcomings of Traditional English Chinese Translation Teaching

### (1) The teaching mode lacks innovation

The traditional teaching mode of College English-Chinese translation is mainly taught by teachers and passively accepted by students. Scholars' research shows that most of the current translation teaching is teacher-centered; in knowledge dissemination, teachers only pay attention to the final result of translation, that is to test the learning effect from students' translation. In this teaching mode, teachers mainly explain translation theories and skills, and lack of effective communication between teachers and students, and the traditional translation teaching goal is to train students to master the conversion ability of vocabulary and sentence, not to let students master the language application ability, which is unable to cultivate students' practical application ability of English translation.

### (2) Old translation textbooks

At present, the English Chinese translation textbooks used by many colleges and universities are aging and almost the same in content. Even though some textbooks are newly published, they are lack of new ideas, which can not meet the needs of the times that can closely combine theory with practice and keep pace with the times. In the classroom teaching, English teachers mainly teach according to the existing textbooks. The exercises designed in the textbooks are only for reviewing and consolidating the vocabulary and sentence patterns involved in the article, which can not improve the practical application ability of the workplace. It is difficult for students to be interested in English translation because of the defects in compiling such textbooks and the separation of teaching training from practical requirements, which is not conducive to the improvement of students' translation application ability.

### (3) The teaching time is short and the amount of class hours is small

Under the current teaching mode, there are too few English Chinese translation teaching hours, and some of them are just for the examination, which can not fundamentally achieve the goal of improving translation ability, let alone impart necessary translation theoretical knowledge to students. In addition, English learning needs a certain language environment, including natural environment and classroom environment. The single classroom environment makes the learning of English translation subject to time and space constraints, and the in class and extra-curricular learning are separated, thus affecting the quality and efficiency of teaching.

### 3 Advantages of Information Technology in English Translation Teaching

The application of information technology in English translation teaching can make up for the shortcomings of traditional English translation teaching. (1) With the development of information technology, multimedia tools are widely used in the teaching of various subjects. The use of multimedia teaching tools will show the course content in video, audio, pictures and other ways, making the course teaching more vivid and lively, and increasing the amount of teaching information. The most important point of multimedia teaching is to reform the traditional teaching mode and enrich the teaching methods. Through multimedia, translation teaching situation can be created, so that students can integrate into the context and receive the influence of English. (2) Translation teaching is not only limited to classroom teaching, but also to extracurricular learning. With the development of information technology, the emergence of various translation tools and the implementation of auxiliary teaching, the efficiency of translation teaching has been greatly improved, such as the use of corpus. Corpus is a database for storing language materials. The characteristics of the target language are studied by storing the original corpus text or the annotated text [2]. Through the multimedia teaching tools, the text in the corpus can be displayed with illustrations, which can further improve the teaching efficiency. Information technology can be used not only as a teaching aid, but also as a learning tool. The creation of a new teaching environment based on the application of information technology can promote students' ability to acquire information, apply knowledge and solve problems, and guide students to learn independently. For example, we can use wechat, QQ group and other advanced communication tools to discuss translation problems, or simulate translation scenes to stimulate students' autonomous learning.

### 4 BP Neural Network Model

- (1) Input/output node. The input/output node is directly related to the sample. According to the teaching quality evaluation index system of Shenyang University of technology, the secondary evaluation index is taken as the input neurons of the model, so the number of input neurons in the system is the number of secondary indicators. The evaluation results are used as the output of the network, and the number of neurons in the output layer is 1.
- (2) Number of layers. Since the function of BP network is actually completed through the calculation of network input to network output, the more hidden layers, the slower the learning speed of neural network. But BP network with only one hidden layer can approach any nonlinear function. Therefore, this paper selects a relatively simple three-layer BP network, that is, there is only one hidden layer.
- (3) The number of neurons in the hidden layer. The number of hidden layer elements is directly related to the requirements of the problem and the number of input and output units. Too many hidden layer elements will lead to long training time,

difficult error control and poor fault tolerance of neural network. The number of neurons in the hidden layer is calculated by formula (1).

$$S = \sqrt{0.43 nm + 0.12 m^2 + 2.54 n + 0.77 m + 0.35 + 0.51} \quad (1)$$

- (4) The nonlinear approximation ability of activation function BP network is reflected by S-type activation function, so S-type activation function is generally used in hidden layer, and linear or S-type activation function can be used in output layer [3]. The S-type activation function is:

$$f(x) = 1/(1 + e^{-x}) \quad (2)$$

The value of this function varies sharply in the range of  $[-1, 1]$ , and beyond this range, it is in the insensitive region, and the change is quite gentle. Therefore, in order to change the error function into the insensitive region, exit the insensitive area quickly, ensure the rapidity of the training network, and make all the input values in the sensitive change section as far as possible, it is necessary to introduce parameters into the formula. The neural network algorithm is improved in this part.

## 5 Construction of BP Neural Network Teaching Mode

- (1) Classroom teaching content

The focus of classroom teaching content is how to better integrate the teaching of English Chinese translation into College English comprehensive classroom. In the limited classroom teaching time, let the students master a variety of knowledge, teachers need to prepare the teaching content carefully. The integration of English Chinese translation course teaching and College English comprehensive course content mainly starts from the following aspects: first, English teachers should explain the translation theory, common methods and skills of English Chinese translation according to the text, and connect with the current information. Second, in vocabulary teaching, teachers should focus on explaining polysemy, common words and common methods. Thirdly, in the teaching of British and American culture, teachers can add relevant contents in combination with class hours.

- (2) Teaching content of network platform

With the development of information technology, various network teaching platforms appear in the public vision. The use of network for autonomous learning is conducive to the improvement of classroom teaching efficiency. Generally speaking, the contents of each module of the network platform are as follows: translation professional knowledge, including translation skills and methods, professional knowledge, professional knowledge, etc.; translation resource library, including professional scene simulation, excellent translation appreciation, test questions, translation materials, etc.; translation learning aids, such as translation software, online dictionary, forum discussion area, etc.; teaching management, including homework Submission system,

learning records, etc.; online exchange forum, providing online communication between students and students or teachers.

- (3) Constructing a comprehensive and systematic evaluation system for students' translation competence

The construction of evaluation system is an important feedback in the teaching of College English-Chinese translation. Scientific, reasonable and objective evaluation system is the guarantee to achieve the goal of classroom teaching. The evaluation system of College English English translation course based on network platform teaching is diversified and more objective. The basis of diversified evaluation mainly refers to the network teaching platform and students' classroom performance; the network teaching platform has the function of recording students' extracurricular learning, and the platform can automatically summarize students' learning situation according to the preset operation, and form learning files. These data can help teachers and students to evaluate.

## 6 Conclusions

English Chinese translation course is an important medium of cross-cultural communication, but at present, the translation ability of college students is not optimistic. Educational idea and teaching mode should keep up with the pace of education and keep pace with the times. Today's era is a period of rapid development of information technology, information technology has gradually penetrated into education, and English-Chinese translation teaching is no exception. This paper mainly discusses how to combine the advantages of information technology and BP neural network to establish a teaching evaluation model and College English translation course. By reforming the existing teaching mode, building a comprehensive teaching mode, stimulating students' interest in learning, and carrying out self-learning, the teaching objectives can be realized, and the training can meet the requirements of the current society for translation talents.

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# A Study on Teaching Evaluation of Random Simulation Algorithm

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**Abstract.** When we evaluate the traditional teaching, there are a lot of teaching evaluation methods to highlight their own advantages in view of the absoluteness of traditional teaching evaluation and the inconsistency of various evaluation conclusions. In the evaluation, the random simulation algorithm based on probability is used to evaluate the advantages and disadvantages of the evaluation objects by calculating the superiority degree of each evaluation object. The effectiveness of the method is verified by an example, and the evaluation conclusion with probability information is obtained.

**Keywords:** Multiple evaluation · Advantage · Type

## 1 Introduction

Through teaching evaluation, we can know the teaching level of a teacher, but this evaluation is not a single one, it should be multifaceted, so we should establish a multifaceted evaluation system. Although there are many evaluation systems that have existed in China for many years, and the final evaluation mechanism is consistent, the problem is that the evaluation is relatively single. Therefore, we have proposed a multi-evaluation system, which can evaluate one in all directions. How teachers are in class requires our evaluation system to be scientific and effective. Looking at the current evaluation system, it is incomplete and unfair to some young teachers, but people generally believe that this evaluation mechanism is reasonable, so we must also find a mechanism to make this system more reasonable. Therefore, this article proposes a random concept so that a relatively reasonable and reliable evaluation system can be found to make it easier for young and middle-aged teachers to be evaluated [1].

## 2 A Stochastic Simulation Algorithm for English Evaluation

We proposed an indexed concept  $u_1, u_2, \dots, u_n.m$  and  $x_1, x_2, \dots, x_m$   $x_{ij} = x_j(x_i)$  ( $i = 1, 2, \dots, n; j = 1, 2, \dots, m$ ) as the evaluation object  $u_i$  [2]. We know that in order to get high precision, it is necessary to simulate a model repeatedly. If the output data of the simulation model is very large, the simulation efficiency of the algorithm will be affected. Faps0 algorithm can effectively solve this problem, In order to improve the

efficiency of RRA algorithm, this paper proposes an improved RRA random modulus algorithm (fapsrra);

$$A = [x_{ij}]_{n \times m} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \cdots & \cdots & \cdots & \cdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix} \quad (1)$$

The specific arrangements of the paper are as follows: the accurate stochastic simulation algorithm (SSA), RRA algorithm and finally all possible step-by-step methods (FAPS) in biochemical reaction system are introduced; the improved RRA algorithm (fapsrra) proposed in this paper is given; The effectiveness of the proposed algorithm is proved by two specific biochemical reaction systems. Finally, the paper is summarized.

$$y_i = f(x_{i1}, x_{i2}, \dots, x_{in}), \quad i \in N \quad (2)$$

### 3 Gardner's Evaluation Theory of Multiple Intelligences

Gardner's concept of multiple intelligences not only pays attention to the multiplicity of intelligence and the development of relevant teaching strategies and teaching models, but also pays attention to the transformation of traditional education evaluation. Gardner's evaluation theory of multiple intelligences challenges and criticizes the traditional education evaluation from its unique theoretical perspective, and provides us with a set of new ideas and methods of education evaluation. Gardner believes that, as an individual, each person has eight kinds of intelligence which are relatively independent at the same time. Each person's intelligence has its own characteristics because of the combination of these eight kinds of intelligence in different ways and to different degrees [3]. A person with higher intelligence may be a writer, a singer, a mathematician, a painter or an athlete. (Gardner, 1993:45) in view of this. This "individual centered" evaluation method is actually a challenge to the phenomenon that only a small part of students' intelligence is valued and most of students' potential is ignored in traditional education. It advocates starting from identifying individual's intelligence strengths and giving full play to individual's potential.

The educational concept of multiple intelligences is: education is not the concentration of all kinds of information that has been mastered, and then returned to or applied to non situational occasions, but the development of creativity and thinking potential. These skills need to be completed by long-term thematic assignments. According to this point of view, teaching evaluation should be carried out without any trace in the process of daily activities as much as possible, and should be carried out "easily" in the context of individual participation in learning. In other words, the evaluation theory of multiple intelligences advocates that teaching evaluation should become a part of the school landscape, should be evaluated in learning, and learn in

evaluation, so as to obtain the real situation of students, rather than isolating and separating teaching evaluation from other teaching activities as before [4, 5].

Since the 1990s, Gardner's Multiple Intelligences Evaluation theory has become an important theoretical basis for teaching evaluation in the United States. Multiple teaching evaluation has been widely used in various disciplines of the school, and has become an important strategy to evaluate the teaching quality and students' learning level of the school. The American educational community hopes to promote the education and teaching reform through the diversified teaching evaluation, and promote the integrity of the diversified teaching evaluation, that is, to devote to the overall evaluation, and to give students a flexible and humanized development space. Now, the practice of multiple assessment has been carried out in an all-round way. A variety of assessment tools, such as observation, interview, portfolio items, anecdotal records, etc., have begun to appear in the curriculum standards.

## 4 The Basic Model of Diversified Teaching Evaluation

Diversified teaching evaluation emphasizes the diversification of evaluation forms, evaluation participants, evaluation tools and contents. Its purpose is to evaluate students' potential and academic achievements comprehensively and truly, so as to provide information for teaching improvement and promote students' overall development. Campbell (1996:23–24) once summarized five basic principles of diversified teaching evaluation: 1) evaluation is multi perspective; 2) evaluation focuses on the growth of students in different stages; 3) evaluation should reflect teaching information; 4) formal and informal evaluation are equally important; 5) students are active self evaluators. Diversified teaching Assessment includes many different evaluation modes, such as Diagnostic Assessment, Summative Assessment, Formative Assessment or Process Assessment, and Performance evaluation. The integration of these evaluation models constitutes the core of diversified teaching evaluation. Due to the limited space, the author mainly discusses the application of formative assessment and behavioral performance assessment in College English teaching assessment.

## 5 Formative Assessment Characteristics and Implementation Methods

In the past, students are regarded as passive recipients, ignoring the dominant position of students in the evaluation; self-evaluation and mutual evaluation of students are ignored; while in the former evaluation, only the amount of knowledge acquired by students at a certain stage is examined, and the evaluation of learning process is ignored, It ignores the examination of students' learning attitude, learning interest, learning strategy, sense of participation and spirit of cooperation, ignores the cultivation of students' ability to discover and solve problems, and ignores the function of evaluation serving the growth and development of students. This kind of evaluation takes the discipline as the starting point, completely neglects the particularity of students as different individuals, and ignores the individual differences in the development

level of students. It is not in line with the current “people-oriented” education purpose of quality education. Formative evaluation refers to the evaluation of students’ learning progress through observation, activity, test, questionnaire survey, discussion, consultation and other forms. In the process of interacting with students, our evaluation system is friendly, so that knowledge can be evaluated in a more rational way, which can also produce a positive attitude towards students, and students can also enjoy the learning process. In order to have fun, the integration of various cultures is also essential. Students also learn the importance of cooperation in the process of participation. The positive feedback of students is also a good feedback to the teacher, which can also increase the teaching effect and make students and teachers learn more easily.

It is precisely because formative assessment has the characteristics that the previous evaluation methods do not have, and fully reflects the humanistic spirit of respecting students’ personality. Its implementation in junior high school English teaching can play an irreplaceable role. The implementation of formative assessment can develop and strengthen students’ interest in English learning and turn it into a stable learning motivation; cultivate students’ sense of learning responsibility and correct learning attitude; enhance students’ sense of participation and teamwork spirit, fully tap their learning potential; cultivate students’ self-evaluation ability and self-learning ability; cultivate students’ ability of self-evaluation and self-learning; To help students form effective learning strategies in line with their own characteristics, so that they become the master of learning.

## 6 Conclusion

In a word, evaluation and teaching influence and promote each other. The diversified teaching evaluation with the characteristics of paying attention to the multiple intelligences of students, the learning process and practical performance of students, the self construction of students’ knowledge, the connection between evaluation and real life.

**Acknowledgments.** Special Scientific Research project of Shaanxi Provincial Department of Education: Research on the Translation and Introduction of “Hua’er” in Western China Project No. 17JK0675.

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# Opportunities and Challenges in Cloud Computing Multimedia Teaching Environment

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**Abstract.** In the cloud environment, we use an interactive mode to communicate with the network, which will involve cloud services and other content, so we have added some virtual resources to facilitate synchronization services with us. Cloud computing has low requirements for the equipment of the client, which determines that cloud computing will be very popular in schools. This paper analyzes the advantages of cloud computing architecture in the teaching platform and the related technologies of applying cloud computing technology to multimedia teaching platform.

**Keywords:** Cloud platform · Ideological and political theory course · Teaching mode

## 1 Introduction

Virus rampant Internet, the security and reliability of data storage is more and more important. The problem of information security is particularly prominent in schools where professionals are scarce. Cloud computing can provide reliable and safe data storage center for schools, realize resource sharing and unified management. The emergence of cloud computing has opened up a new way for laboratory teaching and multimedia teaching in schools. At present, cloud computing technology has been relatively mature. As a new hot spot in the education industry, the investment scale of cloud computing is also increasing year by year. There are great advantages in applying cloud computing technology to multimedia teaching environment, and it is also the inevitable trend of the development of teaching platform in the future.

In the cloud environment, we use an interactive mode to communicate with the network, which will involve cloud services and other content, so we have added some virtual resources to facilitate synchronization services with us. Cloud computing has low requirements for the equipment of the client, which determines that cloud computing will be very popular in schools. Cloud computing can integrate the memory, storage and computing power of a large number of distributed computers into a virtual machine resource pool, and provide computing services for users through the network. Compared with the traditional multimedia teaching platform, the multimedia teaching platform based on cloud computing architecture has more prominent advantages [1].

## 2 Analysis on the Current Situation of Teaching Mode of Ideological and Political Theory

- (1) There is prejudice in the understanding of Ideological and political theory course in Open University.

There are some limitations in the understanding of adult education and Open institute. The emergence of Open institute has certain utilitarian factors: on the one hand, it is to make up for the lack of ordinary higher education resources, to meet the needs of the people who are eager to improve their academic qualifications and learn knowledge, but are rejected by the general higher education for some reasons; on the other hand, because enterprises and institutions pay too much attention to diploma and academic degree, people have a crazy pursuit of diploma. Based on the above reasons, social members and even the students of open university start from pragmatism, and take the acquisition of diploma and the improvement of knowledge and skills as the only goal. We obtain our curriculum theory and technology through open research institutes, but few people regard this kind of place as a place of study, and only want to improve their quality of life through this relaxed way. This idea is wrong.

- (2) There are some deficiencies in the mode of Ideological and political theory

In recent years, teachers engaged in Ideological and political theory teaching at all levels of TVU system have made certain achievements in teaching mode innovation. However, under the impact of cloud platform environment, there are still deficiencies. First of all, there are many problems in the ideological and political theory courses of RTVU at all levels, such as repeated transmission of online resources, low efficiency of receiving resources, untimely and inaccurate synchronous updating of resources. Secondly, the teaching content of Ideological and political theory course is mostly around the examination content, mainly theoretical propaganda, which is out of touch with the actual life of students, which makes their education and social reality contrast greatly, which leads to the decline of the attractiveness and persuasiveness of the course. Thirdly, the ideological and political theory courses in TVU system are not divorced from the essence of “teachers instilling students to accept”, nor do they get rid of the “one-way” teaching mode, and students fall into a passive acceptance situation [2].

## 3 On the Mode of Ideological and Political Theory in Open University Under the Cloud Platform Environment

- (1) Analysis of cloud platform, cloud computing and other related concepts [3].

“Cloud” is the image of the Internet appellation, is the data storage and application service center. As the existing computing resources can't meet people's needs, and the cost of developing new servers is too high, the concept of “cloud computing” comes into being by using the existing cooperative computing capabilities to replace the independent computing capabilities of high-end computing resources. Cloud platform is the abbreviation of cloud computing platform. It is a

powerful “cloud” network, which can provide super computing, storage management and other services. “Computing” has the characteristics of convenient use, wide range of services, low cost and open sharing of resources.

(2) Ideological and political theory in Open University under the cloud platform environment

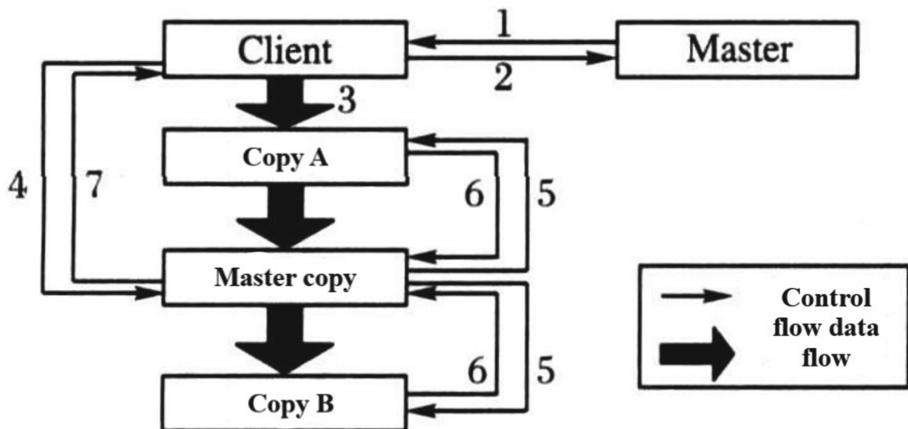
First of all, deepen the understanding of the nature of cloud computing platform. In teaching activities, only by exploring the advanced ideas hidden behind educational technology can we flexibly use the technology. Cloud computing in education not only represents convenient services and huge resources, but also highlights its essence, that is, it can learn at anytime, anywhere, at will and at will. The understanding of this essence in the teaching field of Ideological and political theory can break the prejudice of social members and students on Ideological and political theory of Open University, make them further realize that life-long learning will move from possibility to reality, change their utilitarian view of University, and help them to establish a scientific outlook on university knowledge and life development.

Secondly, combined with the characteristics of cloud platform environment, the mode of Ideological and political theory in Open University is constructed.

## 4 Key Technologies

Among the many cloud computing algorithms, we have been using various algorithms for its services, and the virtual machine is one of them. When this algorithm or technology becomes an architecture, we must use it conveniently and support our current technology. Some people think that cloud computing is illusory, but some people think that this idea is wrong, because these people who think the right are all technical personnel, which is what we call programmers. They have achieved cloud computing and have always been Cloud computing work. Our purpose of using cloud computing is to reduce our own costs, but the existing technology cannot be the main factor in reducing costs. We regard this cloud computing service as a commercial company that serves us, So that we can buy their services. By locating different customers, we can improve our resource allocation, which will help us buy their cloud services.

The GFS write operation separates the write control signal from the data flow, as shown in Fig. 1.



**Fig. 1.** Write control signal and write data stream

## (2) Naive Bayesian Chinese text classification algorithm.

The text classification problem is described as the maximum value of the solution.

$$P(c_i \setminus d_j) = \frac{P(d_i \setminus c_j)P(c_i)}{P(d_i)}$$

Here, for all given categories, the denominator is a fixed value of  $P(d_i)$ , so the maximum value of the above formula is converted into the maximum value of Eq. 3.4

$$P(c_j \setminus d_i) \propto P(d_j \setminus c_i)P(c_j)$$

Naive Bayesian classifier is “naive”, that is, the text feature vector attributes  $w_1, w_2, \dots, w_r$  are independent and identically distributed, and its joint probability distribution is equal to the product of the probability distribution of each attribute feature. Using this hypothesis, there are:

$$P(d_j \setminus c_i) = \prod_{k=1}^r P(w_{ik} \setminus c_j)$$

## 5 Conclusions

Currently it belongs to the cloud platform, and our teaching is the same. In addition to enjoying the benefits of the cloud platform, we also need to see that this environment has a great influence on our future teaching, so this way The teaching method is very necessary. This new teaching model adds cloud computing to the previous traditional teaching model, but this model will have a more profound impact on the future.

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# Education Teaching and Evaluation Under Data Mining Algorithm

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**Abstract.** The evaluation of education and teaching effect is an important measure to deepen the education reform. To carry out an education reform, we must first evaluate the feasibility of the reform scheme. In the process of reform, we must strengthen the formative evaluation, and at the end of a certain reform, we must go through the final evaluation. Only in this way can we avoid blindness and ensure the healthy development of education reform. The evaluation of education and teaching effect is an important means to improve teaching quality in an all-round way. Through the evaluation of education and teaching effect, we can get feedback information about the effectiveness of school's education and teaching work and the development of students in all aspects, summarize the achievements in time and correct the deviation, so as to keep the education and teaching work in a good state all the time, so as to promote the improvement of school education and teaching quality. The evaluation of education and teaching effect is an important content of educational science research.

**Keywords:** Data mining · AHP algorithm · Teaching quality evaluation index · Ideological and political education

## 1 Introduction

In the teaching evaluation system, many evaluation indexes are often used for quality evaluation, and the average value of each evaluation index is taken. In fact, the single factor evaluation of the comprehensive evaluation problems encountered in practice is often fuzzy, which is not suitable to be expressed by a numerical value absolutely, especially in vocational education, which should focus on the the evaluation. Therefore, people integrate the information of various indicators. Evaluation of teaching quality, we use scientific methods to establish a set of teaching evaluation indicators suitable for vocational education system, and use the AHP method of data mining to allocate weights to various indicators [1].

The first is to build a new system of teachers' evaluation based on the existing situation of teachers and promote the formation of a new system of teachers' management. Analyze the association rules in the student achievement database. The results of students can clearly reflect the situation of students, which homework students learn well, which homework students are poor. It can be found that there is a certain connection between the courses. Using association rules analysis, find out the association

between courses, and take it as the guidance reference material of the continuing teaching work [2].

## 2 Construction of Evaluation Index Hierarchy Model

The evaluation of teacher education and teaching effect is to help teachers understand students' learning situation and classroom teaching situation through objective, fair, timely and reliable evaluation of the quality and effect of teachers' teaching work, discover the advantages and disadvantages in teaching activities, and better improve teaching work, so as to promote teachers' own development and teaching level. At the same time, it is conducive to stimulate students' learning enthusiasm and provide basis for the smooth development of school management. It is of great significance to improve the quality of education and teaching. The evaluation of teacher's education and teaching effect is an indispensable part of modern education. Education and teaching effect evaluation is an important part of education management. Without evaluation, there will be no scientific management. Without evaluation, any management is not perfect and unscientific.

The "teaching attitude", "teaching content", "teaching method" are constructed. The hierarchical structure of three to four secondary indicators (q11–q14, q21–q24, q31–q34, q41–q43) corresponding to the first level indicators (Q1–Q4) of "teaching effect" and each first level indicator is shown in Fig. 1 (Table 1).

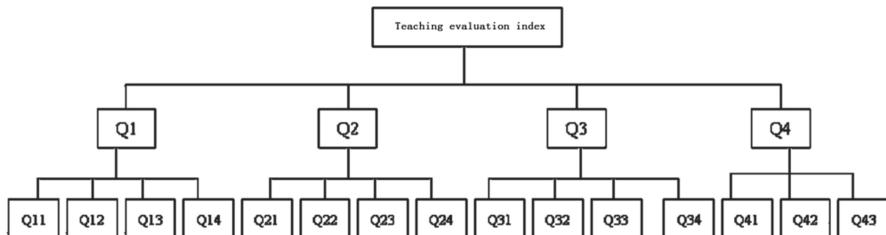
**Table 1.** Evaluation of teaching quality in Colleges and Universities

First level indicators	Secondary index
Teaching attitude	<p>1. Abide by the teaching discipline, start and finish classes on time, do not change classes, suspend classes and abide by the teaching progress</p> <p>2. Whether to bring all the teaching plans, textbooks, roll lists and roll call</p> <p>3. Clean appearance, proper dress, civilized classroom language, natural teaching style, full of spirit, good image of teachers</p> <p>4. To be a teacher, to teach and educate people, to care for students, to guide and help students, to embody the mutual benefit of teaching and learning</p>
Content of courses	<p>1. Clear teaching purpose, fluent expression and free teaching</p> <p>2. The teaching design is scientific, the content is clear, the concept is accurate, and the examples are appropriate</p> <p>3. Enrich the teaching content, highlight the key points and difficulties</p> <p>4. Combine theory with practice, and be proficient in practical training (Experiment)</p>

(continued)

**Table 1.** (continued)

First level indicators	Secondary index
Teaching method	<ol style="list-style-type: none"> <li>1. Using Putonghua, the language is clear, fluent and logical</li> <li>2. The typeface of blackboard is standard, the layout is reasonable, and the layout is neat</li> <li>3. Proper use of multimedia teaching resources, standard ppt production, skilled use of modern teaching equipment</li> <li>4. Guide students to think, pay attention to students</li> </ol>
Teaching effectiveness	<ol style="list-style-type: none"> <li>1. Students can accept and understand most of the teaching contents in class</li> <li>2. The lecture is vivid, the classroom atmosphere is good, the lecture performance has the bigger influence and the attraction to the student</li> <li>3. The classroom is well organized and managed, the classroom discipline is good, and the students feel that they have gained a lot</li> </ol>

**Fig. 1.** Teaching evaluation index

### 3 Calculating Weight by Standard Column Average Method

In the structure of the teaching quality evaluation, there are two levels (i.e. the first level index and the second level index), and the weight of each level index is calculated by the same calculation method. The specific steps for calculating the weights of the first level indicators are as follows:

$$Q_{ij} = \frac{Q_{ij}}{\sum_{k=1}^n Q_{kj}} \quad (1)$$

Use formula (1) to calculate the result and substitute the result into formula (2):

$$W_i = \frac{1}{n} \sum_{j=1}^n Q_{ij} \quad (2)$$

The evaluation system of Ideological and political education teaching based on AHP algorithm adapts to the development of domestic education. The evaluation indexes are taken from the previous average value, and the weight value is divided by

scientific analytic hierarchy process, which highlights the importance of practical teaching quality, and focuses on the cultivation quality of teachers for students' comprehensive quality [3].

## 4 Teaching Evaluation of Ideological and Political Course in Colleges and Universities

Students do not copy the content taught by teachers in a uniform way, but according to their own learning needs, purposefully and selectively absorb the information taught by teachers, and combine their own practice to process, organize and internalize the information, so as to show their personalized and creative understanding of the information to meet their own needs Growth needs. From this point of view, "indoctrination" and "brainwashing" are no different from spiritual slaughter and are inhumane. According to the self-organization of students' learning process, the teachers of find out the order parameters in the process of students' learning, carry out targeted value guidance according to actual situation of students' learning, so as to help students become ideological and moral subjects and ensure their correct development direction [4].

The standpoint of evolution refers to the sum of all forms of motion in a given space-time. Complex under the synergistic effect of various factors in a certain time and space. It is a process of continuous evolution and clarification of knowledge, a process of continuous competition and cooperation among teachers, teaching objectives, teaching conditions and students, and a continuous collaborative process of people's informed will and action as the main body. It is a gradual development process from quantitative change to qualitative change, and an evolution process from unorganized to organized, from simple organization to complex organization. At the same time, due to the permanence of time evolution process, the ideological development of college students is also an irreversible process.

## 5 Conclusions

This paper constructs the evaluation index system, and makes quantitative analysis, and gives the weight of each first level index and second level index to the quality objective of talent cultivation. In the actual evaluation, we should strengthen the reform of the factors with higher weight and the "short board" with lower scores, such as practical teaching, practical teaching, etc. The overall structure and quality control of teaching staff.

From the above analysis, we can see that the research on the evaluation standard of new normal talents training in China needs to be further deepened. There are some problems to be solved in the formulation of evaluation standards, the software development of evaluation system, and the development of evaluation practice. In a certain level, it will improve and improve the training of normal talents in local sustainable development of education.

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# Research on the Shaping of Image Processing Technology in Web Page Making

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**Abstract.** In the 21st century, China's society has entered the information age in an all-round way. The Internet has become the main platform for modern enterprises to show themselves and communicate with the public. In order to improve the quality of web design and cultivate high-quality web design talents, secondary vocational school has set up a web design course, which can improve the overall effect of web pages by using Photoshop software. This paper analyzes the practical skills of Photoshop in the process of image processing, taking Photoshop as an example to complete image capture and image size control, website logo production and artistic font production.

**Keywords:** Image processing technology · Webpage making · Application

## 1 Introduction

In the 21st century, China has entered the information age. Modern information transmission mainly relies on computer network, multimedia and other ways. The development of modern enterprises depends more on the network. With the rise of various websites, website construction and webpage design have more and more broad development space. In modern society, the demand and professional skills of this new type of talents are more and more high. Webpage design has become an important part of computer application professional courses in secondary vocational schools. In the current teaching of web design course in secondary vocational school, many students can only learn the fur of web design, and can not be competent for the task of web design. On the one hand, it is related to the general decline of the quality of secondary vocational school students at present, on the other hand, it is also related to the teaching strategy adopted by teachers that can not stimulate the learning interest of secondary vocational school students. In order to improve the ability of making web pages and their comprehensive professional quality, it is necessary for teachers to innovate in the course of web design. Image processing technology plays an important role in web page production. The improvement of web page production level and the construction of high-quality web site are inseparable from superb image processing technology. This paper will take Photoshop as an example to briefly introduce the practical skills of Photoshop in the process of image processing in web page production [1].

## 2 The Role of Computer Image Processing Technology in Web Page Design

- (1) increase the aesthetic feeling of webpage and enhance the visual attraction effect. According to the needs of the website, we can design the pictures that meet the needs of the website by using computer image processing technology. Using this technology can improve the visual communication effect of web pages. And the image will attract more viewers' eyes, which can increase the page views. When designing a web page, we need to pay attention to many problems, such as the content, size, location of the image, the layout of the image and the text, and the color matching between the image and the web page, which will affect the overall design of the web page. When the content of the two web sites is almost the same, the visitors will definitely browse the web page with rich image content and good image effect, because it is very important for the visitors More visual experience.
- (2) play the role of information guidance. Because when people browse the web page, they generally see the image content of the web page first. When designing the web page, they should design the content of the image more fully, let the viewer know the main content of the web page through the image, and play a good role in guiding the image information, let the viewer quickly find the required content only through the image guidance. The convenience brought by the image guidance function can make users like the web page better, especially in this fast-food reading era, it is difficult for users to carefully browse all the contents of the web page, just want to find the content they need as soon as possible, so the design of image guidance function is particularly important. And the image can not only let users quickly find their own content, but also let them relieve their emotions and let people relax in this fast reading environment. Therefore, in the web design, we must add the image content combined with text, so that people can enjoy the image and get the content they want at the same time.

## 3 Typical Application of PS Image Processing Technology in Web Page Making

PS image processing technology can be used to plan and adjust the layout of the web page, improve the overall effect of the web page, and effectively improve the click through rate of the website. In order to meet the needs of their own publicity, modern enterprises sometimes need to place promotional videos and picture materials on their web pages. In order to enhance the compatibility of corporate promotional materials and web pages, they use PS to process the pictures and video materials, unify the picture format, and ensure the quality of web page animation. Due to the lack of image processing function of Dreamweaver software, which is used to make web pages at present, on the basis of preliminary processing of web page images by Dreamweaver software, we also need to use PS to complete the post effect production. In a word, the use of image processing technology in web page production can not only further improve the overall structure of the web page, fully display the advantages of the web

page, and comprehensively improve the quality of the web page, on the other hand, the image processed by PS technology is more standardized and better in quality, which can not only provide users with a smooth visual experience when browsing the web page, It can also improve the image download speed and the page click rate [2].

## 4 The Practical Skills of Photoshop in the Process of Making Image of Web Page

### 4.1 Using Photoshop Can Complete the Image Capture and Control the Image Size

The overall effect of the web page is directly affected by the size of the image, so we should pay attention to the layout of the image in the web page production. In comparison, large-scale images and small-scale images have their own advantages. Large-scale images are more intuitive, contain more rich content, and have more fine and clear advantages, which can successfully attract the attention of web page viewers, while those images with larger personalized size play an important role in foil the overall effect of the web page. Therefore, we can use Photoshop to capture the image and control the image size in the process of making web pages. In the process of image processing, Photoshop is more convenient. After opening the image to be edited, you can use the corresponding screenshot tool in the Photoshop toolbar to complete the processing of image shape. After image capture, you can use “style” to complete the setting of screenshot size and set the image to the appropriate size; Then you can use the selection box with the set size and shape to move to the appropriate part to be intercepted, copy the intercepted local image with the command of  $Ctrl + C$ , paste the intercepted and copied local image on the canvas based on the command of  $Ctrl + n$  to create a new canvas, and then it can be saved as the image of the size and shape required by the web page.

### 4.2 Using Photoshop to Make Logo of Website

In the process of making web pages, considering the difference of the purpose and location of different websites, it is very important to make and add logo representing website logo for different websites. In order to create a logo that can reflect the connotation of the website and transmit the concept of the website, we can use Photoshop to complete the drawing of the website logo. The web site logo can be created by the following steps: (1) according to the size of logo, use the brush tool to draw a general outline on the new canvas. (2) Use the tool of conversion point to adjust the straight line in the contour path to a curve with certain radian. (3) In the process of further fine adjustment of curve radian, the “direct selection tool” is used to adjust the position of some anchor points. (4) Press  $Ctrl + enter$  to fill in the selection area to complete the production of logo website.

### 4.3 Using Photoshop to Make Artistic Fonts

Using Photoshop can not only complete the image processing, but also complete the creation of special effect artistic words through layer path and so on. (1) Enter the text you want to edit and select the appropriate font for it. (2) First, the text is converted to a path, and the new glyph is converted to a selected area after the modification of the text outline. (3) In the new layer, fill the selected area with the required color, and use “style” to make the text into crystal, glass and other different styles of art fonts. (4) If it is necessary to further process the artistic character to produce hollow or transparent effect, it is necessary to put the text with modified shape in the channel for adjustment, and then return to the layer to further process its style or color to produce the required text effect.

## 5 The Function of Computer Image Processing Technology in Web Design

- (1) construct a variety of image combinations. In the design of computer web page, we should pay attention to the format of image first in the process of image processing. Because there are many formats of computer image, such as GIF, JPEG, PNG, etc., they have their own characteristics, so we should choose the appropriate format according to the design standard of Web page. If you want to design a lively and interesting web interface, you can choose GIF format, because this format of image can be changed from a static image to a dynamic image. If you want not to reduce the running speed of the web page, you can choose PNG format, which will not destroy the quality of the image in the process of compression, keep the original clarity, and generate a small space for the image file.
- (2) control the size of the image in the web page. A web page will have many computers to open, and the size of the computer is different. The length and width of different computer display screen will affect the display effect of the image. Therefore, to control the size of the image, do not let the image exceed the length or width of the display screen. In addition, the sharpness of the image will be affected when zooming in or out of the image. Zooming in the image will reduce the sharpness of the image, while zooming out the image will cause the design of the image to be inconsistent with the design requirements of the web page. So we need to control the size of the image, but also to grasp the clarity of the image, because the high-definition image will affect the speed of the web page. Computer image processing technology can balance the clarity of image and the loading speed of web page, and improve the quality of web page.

## 6 Conclusions

All in all, in the network society, in order to design the web page, the basic element of the network, more unique and perfect, we can use image processing technology to further process and improve the web page. This requires secondary vocational school

students to master the Photoshop based graphics processing tools, further improve the aesthetics and artistry of the web page, and promote the overall improvement of the web design level of secondary vocational school students.

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