

Application and Research of Virtual Reality Technology Based on Big Data in College Teaching Field

Chengxia Zhang, Ying Li, Chengcheng Cai

Weifang Engineering Vocational College, Qingzhou, Shandong 262500, China
22139309@qq.com

Abstract—Virtual reality technology (VR for short) is a new technology combining computer technology and simulation technology, which uses computers to generate a simulation environment and immerse users in the environment. Virtual reality technology can use virtual simulation software to model, build virtual instruments and scenes, and enable users to learn and operate simulation experiments in virtual scenes. Big data technology has been applied in various fields, and it can also be applied to education. Using educational data mining technology and learning analysis technology, the corresponding model in the field of education is constructed, and the special relationship between the acquired educational data is explored. This paper introduces the concept of virtual reality technology in detail, and discusses the application of virtual reality technology in college teaching and the significance of modern educational technology in college teaching.

Keywords—Big data, Virtual reality technology, College teaching, Application

I. INTRODUCTION

Today's society is a society with rapid development, advanced science and technology, information circulation, closer communication between people and more convenient life. Big data is the product of this high-tech era. In the era of "internet plus", the informationization of higher education has developed rapidly, which poses new challenges to the teaching methods and means of colleges and universities and the learning methods of students. Experimental class can deepen students' understanding of theoretical knowledge and enhance students' interest in learning and practical ability. However, due to the limitation of experimental conditions and environment, some experiments can not be carried out well. Therefore, the virtual laboratory based on virtual reality technology came into being and developed rapidly [1]. The so-called virtual laboratory is a laboratory that simulates or fictionalizes some scenes and equipment by using virtual reality technology, so that users can conduct experiments on computers [2]. It is a very important aspect to improve the traditional teaching methods to meet the needs of China's educational modernization construction, so as to realize the great rejuvenation of the Chinese nation and prosper China's educational cause. The "experience tower" of audio-visual education theory [3]. According to the theory of audio-visual education, students should first learn the "doing experience" at the bottom, gradually transition to the "abstract experience" at the top, and finally form a theory.

As an educational field that disseminates advanced

culture and technology, it should take the lead in realizing the impact and challenges brought by big data, make full use of the huge development space brought by big data to the traditional education model, and actively carry out self-innovation. With the help of real-time, continuity, universality and predictability of educational big data and the application of powerful big data analysis and processing technology, teachers' teaching decisions can be effectively improved under the guidance of educational big data [4]. Virtual reality technology has the advantages of low cost, easy maintenance and high reliability, which can effectively solve the shortage of physical operation and will become the development direction of teaching reform.

II. OVERVIEW OF VIRTUAL REALITY TECHNOLOGY

Virtual Reality (VR), which is also translated as Spirit and Fantasy, is a comprehensive integrated technology, involving computer graphics, human-computer interaction technology, sensing technology, artificial intelligence and other fields. Using computers to generate a realistic three-dimensional integrated virtual environment of seeing, listening and smelling makes people interact and experience the virtual world in a natural way by means of special equipment, so as to achieve the degree of mutual exchange and integration, thus creating an immersive feeling. In addition to the visual perception generated by computer graphics technology, there are auditory perception, tactile perception, force perception, movement perception, and even smell and taste perception, also known as multi-perception. Natural skills refer to head rotation, eyes, gestures, or other human behaviors. Or use keyboard, mouse and other input devices, you can enter the virtual space, become a member of the virtual environment, interact in real time, perceive and operate various objects in the virtual world, and thus get immersive feelings and experiences. Interact with the objects in the computer-generated virtual world in a natural way (such as the rotation of the head, the movement of the feet, etc.), and produce the feeling and experience as in the real environment. The other is directly through the computer desktop, using keyboard, mouse and other conventional input devices to enter the virtual space for real-time interactive operation [5]. It can not only save a lot of education funds, but also extend the experiment effectively in time and space, and give full play to students' initiative, enthusiasm and creativity in learning.

III. THE ROLE OF VIRTUAL REALITY TECHNOLOGY IN EDUCATION

A. Restricted by space and time

Using virtual reality technology, we can completely break the limitation of space, and students can enter the interior of objects for observation. For example, students can enter the interior of virtual molecules, atoms, space workstations, etc. to investigate the working conditions inside objects. Imagination is the key to get "doing experience". Users are immersed in the virtual environment, and through the interaction with virtual objects, they can get perceptual and rational knowledge from the virtual environment of qualitative and quantitative integration, thus deepening concepts, sprouting new ideas and making a cognitive leap. It breaks the traditional subject-based teaching mode and takes tiny knowledge points as the unit, which better solves the problems of scattered and random learning time for learners [6]. In the current era of big data in education, traditional teaching decision-making is limited by the teaching mode of thinking and understanding and the difficulty of technical data processing. Facing the lack of effective information in the instructional design stage, it has to rely on teachers' personal subjective experience judgment. Using virtual reality system can make up for these shortcomings. Students can do various experiments without leaving home and get the same experience as real experiments, thus enriching perceptual knowledge and deepening understanding of teaching content.

B. It provides a brand-new teaching method

Virtual laboratory is an application system that uses virtual reality technology to build virtual experimental instruments, equipment and scenes, realize hardware functions in the form of software, and simulate the actual physical experiment process. Virtual laboratory consists of experimental courses, virtual equipment library and online management system. Virtual reality technology can virtualize and materialize various hypothetical models put forward by students during their learning process, and the results or effects produced by this hypothesis can be observed intuitively through virtual system. Virtual laboratory is composed of virtual test bench, virtual equipment library and open laboratory management system. Virtual laboratory provides a brand-new teaching environment for offering various virtual experiment courses. Through the interaction between participants and the simulation environment, and with the help of people's own perception and cognitive ability of the things they contact, it helps to inspire participants' thinking, so as to obtain all kinds of spatial information and logical information contained in the virtual environment. In the era of big data, education should continue to develop in the direction of fairness, and the foundation of realizing education fairness is to realize the open development of education first. Therefore, the value contained in it should not be underestimated. At present, what we need to do most is to explore its value and make big data a tool for our application.

C. Create open online exploratory learning

According to the degree of interaction and immersion, virtual reality systems can be divided into desktop virtual reality systems, enhanced virtual reality systems, immersive virtual reality systems and distributed virtual reality systems.

By constructing experimental projects of the required disciplines through computer network, teachers and students can enter the virtual laboratory anytime and anywhere to carry out experiments and research, which has changed the previous education mode that only hardware can be used for experimental operation, and has strong application value. After opening the virtual laboratory, students can do some preparatory work on the virtual experimental platform, and after entering the traditional laboratory, they can directly carry out the main experimental process.

Compared with traditional rough and simple statistical data analysis, big data emphasizes comprehensive and detailed analysis of data, and finds out the complex causal relationship between data and the rational knowledge contained in it. Immersion, presence and real-time interaction are the substantive features of virtual reality. Realistic conception of space-time environment (that is, the process of enlightening thinking and obtaining information) is the ultimate goal of virtual reality, and it is possible to apply it to teaching [7]. Learning in a way and at a speed suitable for oneself is conducive to stimulating students' creative thinking, enabling learners to acquire knowledge through active exploration in specific situations, thus improving learners' motivation.

IV. THE METHOD OF CONSTRUCTING VIRTUAL LABORATORY

A. Constructing 3d virtual laboratory based on VRML

VRML (Virtual Reality Modeling Language) is a virtual reality modeling language, which uses HTML markup language to describe three-dimensional scenes and creates a virtual environment on the Internet through Internet and Web hyperlinks [8]. Interactive visual simulation and information exchange, which make it feel immersive, is an advanced digital man-machine interface technology. Virtual reality technology is a virtual environment created by computer, which makes people feel immersive. The desktop virtual reality system is composed of an ordinary computer system, which integrates computer graphics technology, human-computer interaction technology and simulation technology, and presents an environment similar to the objective world with a screen. This kind of teaching channel is relatively simple, lacking other auxiliary learning tools, and learners cannot convert the learning resources in videos into their own learning achievements (such as reading notes, learning experiences, etc.). Because the grammar rules of VRML language are complex and strict, and the workload of writing VRML files manually is huge, some 3D modeling tools (such as 3DSMAX) are used to create 3D space visually and generate VRML files automatically, which improves the development efficiency. However, the data of VRML files generated in this way is much larger than the files written manually.

B. Cult3D

Cult3D is a network VR technology developed by Cycore based on Java. It has a unique rendering method, which can dynamically display extremely high-quality images without relying on hardware such as 3D accelerator cards. The amount of text data generated is small, and the maps built in modeling tools can be preserved. It can also design various interactions and add sounds to 3D objects. Immersive virtual reality system refers to the operator's activities in the perceived virtual world, and the operator

and the real world are isolated, that is, the real world cannot be seen or heard. Moreover, teachers can show the whole process of classroom teaching by using visual data analysis tools, find out the problems in teaching in time, reflect on the shortcomings of their own teaching behaviors, and provide real-time objective support for the scientificity, rationality and effectiveness of teaching decisions. When the learner logs in to the virtual communication platform, the system will automatically assign a virtual character to the learner. As the body double of the learner, the learner can freely control the behavior of the virtual character and move freely in the virtual environment constructed by virtual reality technology. It can be seen that in the era of big data, the reform of teaching mode is not only the inherent need of students' individualized development, but also the inevitable need of the development of the times.

C. Flash

Flash is a vector diagram and Web animation technology developed by Macro media, which is a software integrating animation creation and application development. Images and contents needed for modeling can be created in Flash or imported from other applications. When making animation in Flash, you can not only draw vector objects in the development environment, but also import external vector graphics files, bitmap image files, sound files of various formats and even edit video files. Flash is now widely used to develop network interactive vector animation, and it can also be used to develop network VR. Every learner has a virtual character as a body double. After the course is finished, the learner can enter the corresponding communication center to communicate with the virtual teacher in real time, raise doubts and discuss problems together. Distributed virtual reality system is based on immersive virtual reality system, which interconnects users or virtual environments located in different time and space and realizes information sharing through network, so that users can work together in a higher environment.

V. APPLICATION OF VIRTUAL REALITY TECHNOLOGY IN PRACTICAL TEACHING

A. MOOC virtual communication center function module

As a supplement to the existing MOOC teaching mode, MOOC Virtual Communication Center can provide learners with teacher-student answering module, exploratory learning module and knowledge sharing module. The three major learning modules are shown in Figure 1.

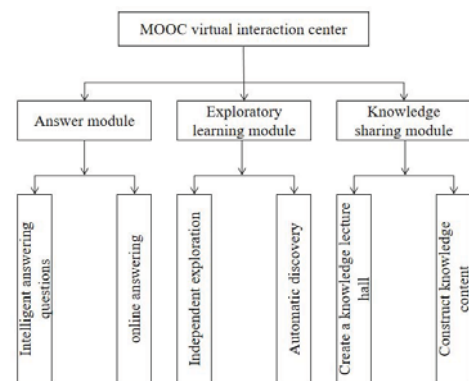


Figure 1 MOOC virtual communication center function module

Teaching design and preparation is the primary stage of classroom teaching. At this stage, teachers need to make a comprehensive and systematic analysis of the main elements in the teaching situation, such as teaching objectives, teaching contents, teaching resources and learners, and design a reasonable teaching plan and constantly revise and optimize it. When the learner enters the exploratory learning module, the learner controls the virtual characters to enter the virtual classroom of the existing MOOC course, previews the knowledge content of the corresponding course in the form of turning over the classroom, and explores the courses he is interested in. It's a new teaching mode, in which learning resources such as teaching videos are completed before class, and teachers and students complete homework answering, collaborative inquiry, communication and interaction together in class. According to different curriculum and experimental requirements, develop corresponding virtual laboratories. Virtual laboratories can be designed and developed by teachers and students themselves or developed by specialized companies. In order to solve the problems that teaching experiments can not be carried out due to experimental equipment, experimental sites, teaching funds and other reasons, virtual training can avoid the damage of experimental training equipment and the consumption of training materials, thus effectively saving education costs.

B. Constructing MOOC virtual communication center technology

The virtual MOOC teaching mode is constructed, the vivid learning picture is displayed, and various 3D modeling technologies are adopted. In order to enhance the immersion of teachers and learners in the "MOOC Virtual Interaction Center", virtual three-dimensional characters are constructed as teachers and students, which are used as body double in virtual scenes. The knowledge of this teaching case is comprehensive, which fully embodies the cooperative operation function of distributed virtual reality system, and requires certain operation skills, which can comprehensively examine students' mastery of knowledge. Because the traditional laboratory serves for teaching and scientific research, students can only come into contact with experimental equipment in experimental classes.

Virtual reality and simulation laboratory is open to students. Each group of students freely arrange time to practice collaborative operation, find and solve problems in practice, and finally get course scores through case exams and classroom performance (Figure 2).

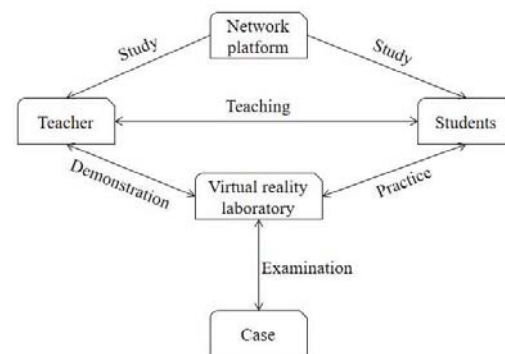


Figure 2 Teaching mode diagram

For a new experiment, it takes a period of time for students to familiarize themselves with the experimental instruments, but the classroom time is limited, which will waste valuable time in the laboratory. For a single special new experimental course, it can be designed and developed by itself, which can not only learn and master the technology of developing courses with VR technology, but also meet the experimental requirements and carry out virtual experimental operations; For the basic and common courses, because there are many experimental projects, a set of teaching system can be customized by specialized companies for experimental teaching of corresponding courses. By rendering the virtual scene model and characters, the virtual picture is closer to reality, and the experimenter who enters the system can control various behaviors of characters by pressing keys on the keyboard.

VI. CONCLUSION

The virtual laboratory based on big data and virtual reality technology is an innovation of traditional experimental teaching mode, which will certainly promote the reform of teaching concepts and teaching forms. It can enable students to enter the virtual laboratory through the network and computer anytime and anywhere, which stimulates students' interest in learning, improves students' learning efficiency, and reduces the cost of laboratory construction. Through the introduction of MOOC teaching mode, it is proposed to combine MOOC teaching mode with virtual reality technology. Practice has proved that the popularization and practice of virtual reality simulation system in teaching provides students with a strong cognitive

experience, and enables students to acquire and understand "doing experience" in a three-dimensional way. Virtual reality system has become a powerful system for multi-dimensional information processing, an assistant for people to think and create, and a powerful tool for deepening people's existing concepts and acquiring new concepts, which has brought great reform to people's lives.

REFERENCES

- [1] Deng Hai. A Preliminary Study on the Application of Virtual Reality Technology in College English Teaching. *Speed Reading (Late)*, no. 009, pp. 222, 2018.
- [2] Xiang Xin. Research on the application of VR virtual reality technology in college game design teaching. *Modern Vocational Education*, no. 016, pp. 168, 2017.
- [3] Li Xiangmin. Investigation on the status quo of the use of virtual reality in colleges and universities under the background of the big data era. *Times Report: Academic Edition*, no. 003, pp. 96-96, 2016.
- [4] Zhang Shuai. Research on the Application of Virtual Reality Technology in University Teaching. *Journal of Suzhou Education College*, vol. 021, no. 003, pp. 68-69, 133, 2018.
- [5] Li Yong. The application of virtual reality technology in college classroom teaching. *China New Telecommunications*, vol. 19, no. 014, pp. 134-135, 2017.
- [6] Ju Lu. Virtual reality technology and its application in chemical teaching in colleges and universities. *Chemical Management*, no. 1, pp. 125-125, 2016.
- [7] Liu Ying. Research on the application of computer virtual reality technology in college physical education. *Wireless Internet Technology*, no. 1, pp. 144-145, 2017.
- [8] Yang Huiyu. Innovation and practice of college oral English teaching model based on the application of artificial intelligence technology. *New Oriental English*, no. 002, pp. 77, 2019.