Application of Internet of Things and Artificial Intelligence Technology in Smart English Human-Computer Interaction Training System

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***Abstract*—The rapid development of artificial intelligence and Internet of Things (IoT) technology has brought about accelerated reform in China's education sector. The integration of various information-based teaching tools such as games, animations, micro-videos, and online teaching platforms has optimized the teaching process to meet the diverse learning needs of students, thereby improving the quality of teaching. In this context, this study aimed to construct a smart English classroom human-computer interaction training system based on artificial intelligence and IoT technology. The system facilitates a more interactive and immersive learning experience for students, leading to better teaching outcomes in the smart English classroom. Results from the study showed that the use of the human-computer interaction training system significantly improved the teaching effect, indicating the potential of the system to enhance the quality of English language education in China. Applying Internet of Things and artificial intelligence technology in designing human-computer interaction training system represents a promising direction for the development of smart English classrooms. The use of the human-computer interaction training system can lead to better teaching outcomes.**

Keywords—Human-computer interactive training system; Intelligent English classroom; Artificial intelligence technology; Internet of things

I. INTRODUCTION

The Internet of Things (IoT) has emerged as a promising information carrier based on traditional telecommunication networks and the Internet. It is closely related to other technologies such as sensor networks, mobile communication networks, and the Internet, and has the function of interoperability and interconnection. The IoT leverages information indexing to perform object search and retrieval [1]. With the continuous development of modern information technologies such as information systems, big data, and artificial intelligence (AI), there have been unprecedented opportunities and new ways of classroom teaching. At the same time, there have been higher requirements for teachers. Teachers should actively transform traditional teaching concepts, keep up with the trend of the times, and incorporate modern technology into the teaching process, especially making full use of AI and IoT technology. By combining high-quality online teaching resources, teachers can expand the teaching content, fully mobilize students' enthusiasm and initiative to learn, and construct efficient classrooms to improve the overall teaching effect.

In recent years, numerous studies have explored the potential of integrating AI and IoT technology into education. For example, Chen et al. [2] proposed an AI and IoT-based smart classroom system that can recognize student faces and monitor their emotions during class. Similarly, Huang et al. [3] designed an interactive English learning system that uses IoT technology to collect data on students' language abilities and provide personalized feedback based on the collected data. These studies demonstrate the great potential of integrating AI and IoT technology in education to improve the teaching and learning process. The integration of AI and IoT technology in the classroom provides new opportunities and challenges for teachers. By embracing modern technology and leveraging online resources, teachers can enhance their teaching methods, engage students, and ultimately improve the overall teaching effect.

II. OVERVIEW OF THE INTERNET OF THINGS, ARTIFICIAL INTELLIGENCE, AND THE SMART CLASSROOM

A. Internet of Things

The Internet of Things (IoT) as a network system based on computer networks and using RFID communication means to connect things. From the technical aspect, it is also called as sensor network. With the role of IoT, people and things and things can communicate and interact with each other anytime and anywhere [4]. Currently, IoT is widely used in various fields of social life, especially in the field of English teaching, which can bring a revolution sweeping the world.The meaning of the Internet of Things can be generally understood on two levels. One is the technical level, in order to promote the realization of comprehensive and thorough perception, the Internet of Things is installed through the installation of intelligent sensing devices. Then, using safe and reliable network transmission to access a specific information processing center, it can promote the realization of information interaction between people and things, so as to complete intelligent processing. Secondly, at the application level, the Internet of Things, by connecting to the Internet, allows all objects to form a connected one network, which contributes to the realization of the integration of the physical natural world and human society, thus improving the dynamics and precision of production lifestyles and management models [5]. Its technical processes are shown in Figure 1. Typically, there are three characteristics of the Internet of Things, as follows: (1) the processing characteristics of automatic intelligence, that is, the Internet of Things can process, mine, and search various data using artificial intelligence technology, information

capture technology, infrared sensing technology, and data mining and computing, which can enhance the improvement of perception of things in the real world and thus facilitate the realization of automatic intelligent control and decision-making [6]. (2) reliable and fast delivery characteristics, that is, through various communication media such as limited television networks, radio networks, and wife, it is possible to deliver various information on the characteristics of people and things to the Internet, and then use cloud computing servers for reliable, secure, fast, and efficient information sharing, delivery, and exchange [7]. (3) Transparent and comprehensive sensing characteristics, that is, the IoT allows comprehensive sensing of the characteristics of objects by collecting and capturing information between interconnected objects, using RF technology to be able to obtain transparent information and to interact and capture information about interconnected objects at any time [8].

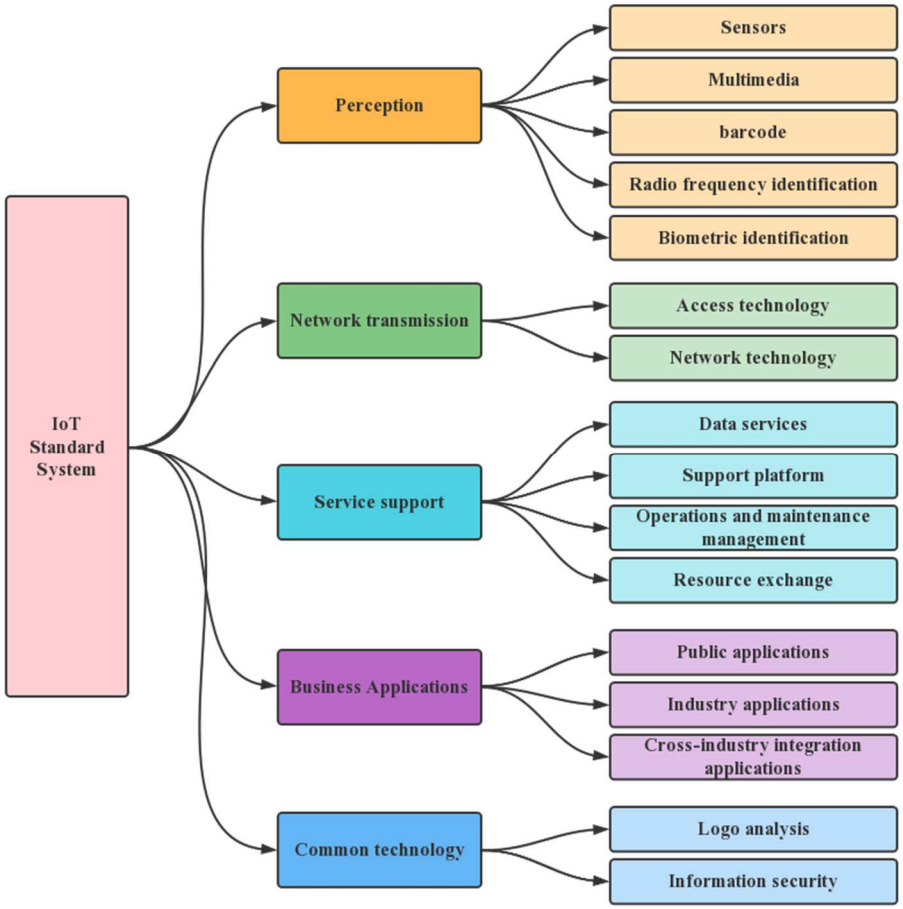

Fig. 1. IoT Standard System

B. *Artificial intelligence*

The term artificial intelligence refers to a new science and technology that develops and researches applied systems, technologies, methods, and theories for extending, extending, and simulating human intelligence. It is also a simulation of human thinking and consciousness processes. It is currently used in a wide range of fields such as finance, e-commerce retail, personal assistants, security, education, health care, and self-driving [9].

C. *Smart classroom*

Smart classroom is a new modern education tool and a more effective form of education. It is also a modern new intelligent teaching system based on device management, personnel attendance, intelligent teaching and Internet of Things technology in one, or a more important part of accelerating the future construction of schools [10].

III. A Smart English Classroom Model Based on Artificial Intelligence and the Internet of Things

A. *The basic functions of English smart classroom*

Generally speaking, there are three basic functions of English smart classroom, namely group collaboration, interaction and recording. As a quintessence of the flipped classroom, there are actually three of them at this stage: pre-class, in-class and after-class. In the pre-class phase, students pre-reading the knowledge points is the main focus. In the in-class phase, teachers provide a variety of teaching resources such as animations, documents, videos, and courseware. In the interactive classroom module, teachers and students can interact with each other using text and audio/video, thus facilitating remote tutoring and live question-and-answer sessions. The recording includes audio and video of students and teachers during the teaching process, as well as a multimedia lesson content explained by the teacher. At the same time, the teacher helps the realization of students' online communication and discussion by assigning extended assignments after class, including online tests and online homework, thus improving students' learning ability.

B. *Artificial intelligence-based smart classroom platform*

In general, the AI-based smart classroom platform is composed of two parts, which are the data smart classroom implementation process and the AI integrated platform, and also involves two layers, including the user implementation layer, the dynamic evaluation layer, and the resource services, as shown in Figure 2.

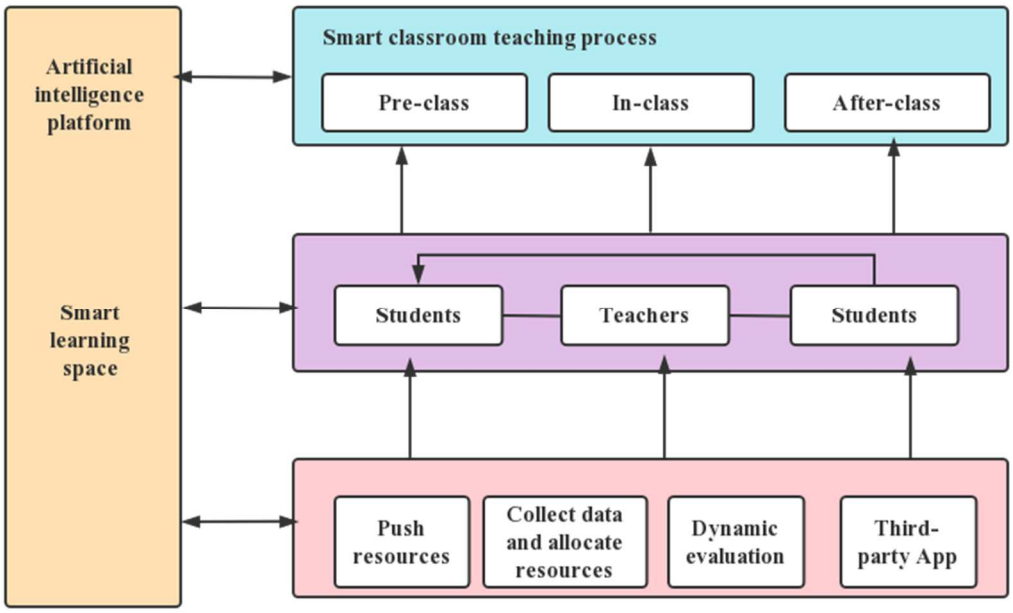

Fig. 2. Artificial Intelligence-based Smart Classroom Platform

IV. Building a Human-Computer Interaction Training System for Smart English Classroom Based on Internet of Things and Artificial Intelligence Technology

The intelligent English classroom human-computer interaction training system built based on artificial intelligence and IoT technology in this study consists of four parts, which are system management, classroom management, user management and course management. Its overall architecture is shown in Figure 3.

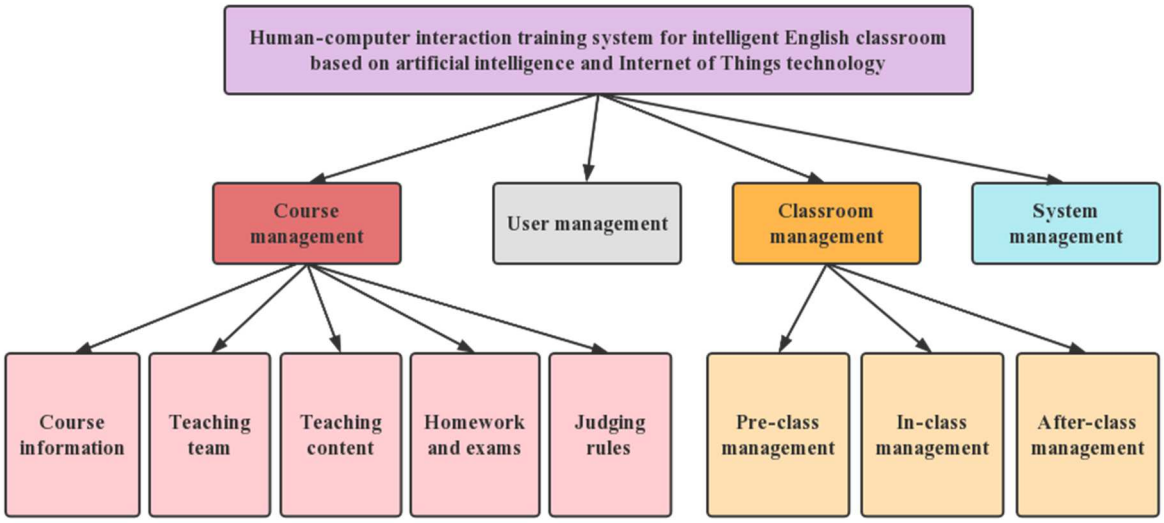

Fig. 3. Human-Computer Interaction Training System for Smart English Classroom Based on Artificial Intelligence and Internet of Things Technology

A. *Management side*

In this system, teaching monitoring platform, big data analysis platform, big data mining and analysis technology and building evaluation system are utilized to further deepen the application of education big data, which can promote the realization of various functions such as teaching management, government services and education business management.

B. *Mobile side*

This part can use Chaoxing Xuexitong, which can monitor students' learning situation. On the teaching platform, the lecturer can monitor students' learning situation by using various functions such as anti-window switching

function, anti-deployment of videos and anti-dragging, etc. on top of playing teaching resources. At the same time, in order to test the effectiveness of teaching, online interactive, discussion, quiz, homework and video breakthrough learning content is set. At the same time, the app also provides scholars with rich resources such as courses, topics, readings, journals, newspapers and books.

C. Classroom side

Usually, the teacher side of the smart classroom system mainly relies on the PanAsian platform. By making full use of the existing hardware system and then combining it with the app, English teachers can facilitate various functions such as teacher-student management, question and answer, communication and interaction, and online teaching [11]. At the same time, using this teaching platform, teachers are able to complete relevant lesson preparation work such as setting up course presentation templates. They can set up course credit assessment mechanisms, build question banks, improve course resources, and create courses online. The content of the lectures is then uploaded on the platform, which helps students to review and pre-review after and before class. In the classroom, teachers can also complete various teaching activities such as student feedback, grouping tasks, grading, quizzes, topic discussions, racing to be the first to answer a question, selecting people, voting and signing in. In addition, after entering the URL into the 360 browser, teachers can directly enter the cloud page, then enter your password and account number, and after passing the verification, teachers can complete the login.

V. Intelligent English Classroom Human-Computer Interaction Training Function in IOT Technology Environment

In practice, the English education system is often used as an auxiliary tool in the learning category, based on a needs analysis. On the one hand, it is necessary to ensure the effectiveness of the user experience, and on the other hand, it is necessary to provide an effective guarantee for the realization of its functions. There are three types of users of this system, namely student users, teacher users and system administrators, and there are certain differences in its functions. Smart English Education System is shown in Figure 4. Meanwhile, the functions of each of its modules are as follows:

Administrator user module: 1.announcement management, that is, the administrator can delete and modify the announcements published on the website; 2. discussion management, that is, for the messages in the discussion forum, the administrator is able to query and delete; 3. course management, that is, the administrator is able to modify and retrieve the content of online courses; 4. user information management, that is, the administrator is able to modify and retrieve the information of users.

Teacher user module: 1. personal information management, that is, you can query and modify the teacher's personal account; 2. test management, for the management and release of test paper information; 3. teaching resource management, that is, for the teaching video, courseware and other functions to view queries, delete and add; 4. course information management module, that is, management of teacher course information.

Student user modules: 1. message module, that is, providing windows for students to leave teaching messages; 2. test module, providing students with online test functions; 3. teaching information module, providing students with functions to view teaching information, such as viewing courseware, viewing teaching videos, etc.; 4. login registration module, that is, it can facilitate the implementation of student account registration and registration for login authentication identity and other functions [12].

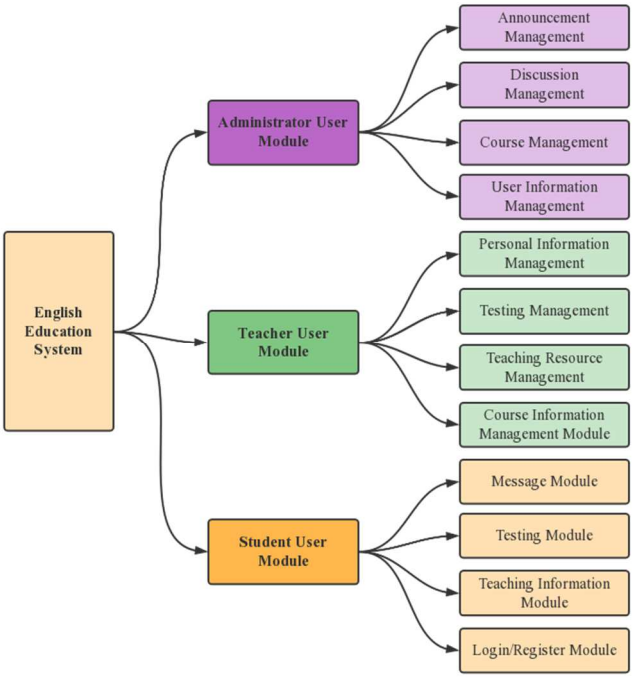

Fig. 4. Smart English Education System

A. Student management

In general, student management has a strong focus. It is carried out on the basic basis of students' learning contents. In English education, students' reading, writing and listening skills are fully considered, and various functions such as modifying and viewing personal information, login and registration are facilitated. In the smart English classroom human-computer interactive training system, students view test questions, video tutorials and courseware, and complete online answers in a timely manner is a core element. In this system, students can also view website announcements and reply to messages online. According to these functions, it can provide some guarantee for students to carry out their study smoothly after logging into the learning terminal. This system helps to achieve the purpose of independent learning. At the same time, if a user does not complete the registration process, he or she can only act as a "visitor". This identity is also available for browsing and learning in this English education system, and the system acts as an educational aid for students, allowing users to access online learning pages and course information. This system has restrictions on the online test module for better unified management. For student users who need to take online tests, they should first log in and fill in their passwords, names and classes correctly before logging in to the online education platform and completing class selection, which helps teachers to carry out targeted management, and teachers can use a variety of methods such as face-to-face courses and question and

answer sessions to understand the learning situation of students. Thus, they can fully play their tutorial role by using various methods such as face-to-face courses and answering questions.

The module on online learning is combined with various elements of this system such as learning tests, video tutorials and online question answering. This module of the intelligent English teaching system is based on student learning, that is, students register first, then select the appropriate class, study in classes, and are able to communicate and communicate with the teacher on the basis of their actual English level, and then take tests in conjunction with the stage review to achieve self-awareness. And this platform system is able to process student scores as a basic basis for reporting. Teachers and students then use the comprehensive data as a basic basis to analyze weaknesses and provide timely feedback on the length of study. Students are also able to upload teaching materials outside of the platform system and add extra-curricular learning content as appropriate, allowing the English education system to function to its fullest extent, thus promoting the improvement of students' English achievement levels. At the same time, the message board module in this system has functions such as message reply and online posting. Students are able to ask questions and communicate with their teachers. It can be used as a learning forum. On the message board, students are able to learn about relevant information, such as news announcements, class assignments, and grades. They can keep track of their own learning and communicate with each other along with their teachers and classmates to give full play to the functions of this system.

B. Administrator / faculty management

Among the backend functions, administrators and teachers are the more important "decision makers“. Both of them have the functions of entering, deleting and adding. For teachers, in addition to student rights, they can also manage test questions, teaching videos and courseware. The administrator's management includes the system information such as data, course information, student information and teacher information. Generally speaking, the administration center of the system is an important part of the basic information management for teachers, including online question answering management, adding assignments, courseware management and user management, while the message board management has various functions such as message reply and forum management. In terms of login functions, although the administrators and the teachers have certain similarities, the teachers are mainly responsible for teaching. Since the core of this human-computer interactive training system is curriculum teaching, the teachers are mainly responsible for managing teaching resources, teaching aids and learning tests, while the administrators are responsible for deleting, modifying and adding information.

VI. CONCLUSION

In recent years, with the continuous development of artificial intelligence and Internet of Things (IoT) technology, the development of education has been characterized by informatization and technology. This has realized the teaching of English in the online education platform and transformed the traditional English teaching mode. Therefore, this study designed this human-computer interaction system with students as the basic starting point, relying on the Internet of Things and artificial intelligence technologies. This system can provide personalized and targeted teaching services to students, including online question answering, online testing, and online learning. It also provides more communication channels. The results of the study show that by using the human-computer interaction training system in the English smart classroom helps to improve the teaching effectiveness.

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