

Innovative Research on Constructing a Holographic Sports Intelligent Classroom Based on AI Technology

Huixing Zhou^a, Feng Wei^b

^ae-mail:zhouhuixing0729@163.com; ^be-mail:53170832@qq.com

Department of Physical Education, Ningxia Institute of Science and Technology, Ningxia, China

Abstract. This study aims to improve teaching efficiency and quality by combining the latest holographic technology and AI technology. The core of the holographic sports smart classroom is advanced optical technology, through which coaches can present three-dimensional images, simulated experiments, and virtual scenes to students. Holographic sports smart classrooms are typically equipped with gesture recognition technology and touch screen devices, allowing students to explore course content through gestures and touches, enhancing their sense of participation and interactivity. The holographic sports smart classroom employs advanced AI technology to simulate various sports environments and scenarios, enabling students to engage in more realistic sports training and skill learning in virtual environments. AI technology can customize personalized teaching plans for each student through functions such as data analysis and intelligent recommendations, making teaching more precise and efficient.

Keywords: AI Technology; Holographic Sports; Intelligent Classroom

1 Introduction

With the rapid development of artificial intelligence (AI) technology, its application in the field of education has gradually become a research hotspot. The combination of holographic intelligent touch screen technology, real-time motion capture technology, and intelligent recognition and analysis systems has brought new possibilities to physical education teaching^[1]. Among them, the holographic sports smart classroom based on AI technology has become a key research direction. The holographic sports smart classroom helps students to understand and master sports skills more deeply by providing realistic 3D images and real-time feedback. It also provides teachers with more comprehensive teaching data and analysis to optimize teaching methods and strategies. The emergence of holographic sports is an example of the combination of "technology + sports," providing not only new ways of sports but also new possibilities for sports training and entertainment. With the continuous advancement of technology, holographic sports may play an important role in various fields such as home entertainment, professional training, and even remote competitions. This study aims to explore the application effects and methods of holographic sports smart classrooms based on AI technology in physical education teaching, providing references and references for future physical education reforms^[2].

2 Overview

2.1 Overview of holographic sports

Holographic sports is a relatively new concept that refers to creating an immersive sports experience using holographic technology and related augmented reality (AR) or virtual reality (VR) technologies. This concept combines the latest technology with traditional sports to provide users with an immersive and interactive sports environment^[3].

2.2 Features of AI holographic sports classrooms

(1) Immersive experience: Holographic projection technology can generate realistic 3D images, and dual-screen interactive learning combines with gesture interaction devices to present courses in stereo, providing students with an immersive visual experience. Through this technology, students are immersed in virtual sports environments, making the learning process more vivid and interesting.

(2) Interactive teaching: Holographic sports classrooms use AI technology and sensors, allowing users to interact with holographic images. This interaction is not limited to visual effects but also includes auditory and tactile feedback. It enables real-time interaction between teachers and students, allowing students to simulate sports under the guidance of teachers, with the system providing real-time feedback and adjustment suggestions based on student performance.

(3) Diversified content: Holographic sports classrooms can provide a wide range of sports courses and scene selections to meet the needs of students of different ages and interests. From traditional sports to emerging forms of sports, all can be simulated using holographic technology, giving students the opportunity to experience and learn various sports.

(4) Scientific teaching and training: Holographic sports classrooms use advanced technology to achieve data management of students' learning situations. Teachers and students can easily view learning progress, performance analysis, and suggestions, thereby making targeted adjustments to teaching and learning^[4].

3 Technical design and application

3.1 Core module technology design

3.1.1 Overall software technology design

The software of the AI holographic sports smart classroom supports from bottom to top division into database, server-side, cache, courseware terminal (interactive large-screen courseware, courseware editor), and administrative system (desktop and mobile). The server-side includes courseware terminal services, administrative system services, and courseware resource hot-swapping services. The smart classroom can manage resources such as leads, students, and teachers through the administrative system. At the same time, the daily activities of the classroom provide data for the system. The database used is a MySQL cluster, and the cache used is redis. The core of the server-side uses netty technology, a Java.nio

communication framework, integrated with REDIS as a cache. It maximizes the server-side sending data while maintaining data stability. The message processing flow of the client is as shown in Figure 1.

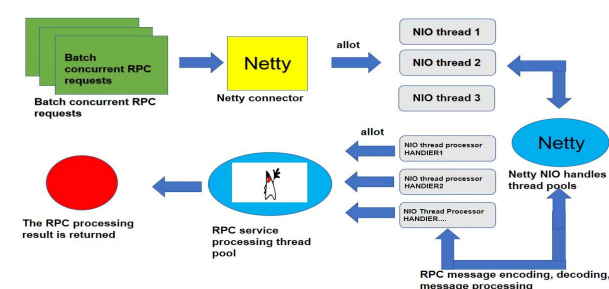


Figure 1-Message Processing Flowchart of the Client

The courseware terminal software utilizes the Unity3D engine as its core technology for product development, integrating functionalities like Vuforia and facial recognition. Unity engine, a cross-platform application development engine, allows our product to be deployed across multiple platforms. A comprehensive hot-update system is established, supporting complete hot updates from material resources to code, enhancing control over the terminal for convenient courseware deployment. After students and teachers register in the academic administration system, they can log in to the courseware using facial recognition, efficiently resolving the attendance issue for both students and teachers. This also provides a basis for subsequent course feedback^[5].

3.1.2 Overall hardware technical design

The hardware of the courseware terminal includes LED large screens, LiDAR, wireless quiz base stations/clickers, power amplifiers for sound systems, RGB cameras/Azure Kinect, lasers, and laser cameras, among others. LiDAR, lasers, and laser cameras serve as interactive devices for the large screen and can be flexibly configured according to the site conditions. Cameras/Kinect are used for facial recognition login. The use of Kinect also enables skeletal tracking and motion scoring functions in the courseware. Wireless quiz base stations/clickers allow students on-site to respond to questions or vote on the large screen, further enhancing interaction between teachers and students. The coverage area of a quiz base station is approximately 90 square meters, supporting a load of 200-1000 terminals.

3.2 Application of AI holographic sports intelligent classroom technology

3.2.1 Intelligent touch technology

The intelligent touch screen technology of the smart classroom is a display screen technology that integrates touch interaction and intelligence. This technology provides an intuitive and efficient human-computer interaction method, allowing students to access information, perform operations, and interact more conveniently during the learning process. The touch technology of the AI holographic sports intelligent classroom mainly involves how to interact with holographic content through touch screens or other touch devices. This technology usually relies on capacitive touch screen technology or infrared touch screen technology, both of which

can effectively detect user touch actions and convert these actions into computer-recognizable signals for user interaction with holographic content. In the holographic sports intelligent classroom, touch technology allows students to interact with holographic content by directly touching the screen, such as adjusting the angle, size, or other properties of holographic images, and even directly interacting with holographic images, such as interacting with holographic characters in holographic games. Additionally, the holographic classroom usually equipped with gesture recognition technology, allowing students to control holographic content through gestures, increasing the diversity of interaction^[6].

3.2.2 Real-time Motion capture technology

Real-time motion capture technology is used to capture student movements and conduct real-time analysis. By deploying high-precision sensors or camera systems in the classroom, the system can capture every detail of student movements, including the accuracy, fluency, and coordination of movements. These data are then fed back in real-time to the holographic image, helping students to correct movements and improve skills. Motion capture also requires equipment, such as wearable sensors or external cameras. They are responsible for capturing human body movements, such as joint movements and muscle contractions and relaxations. The data collected by motion capture devices are sent to computers for processing. The computer parses this data through specific algorithms, converting it into a format that can be understood and processed by the computer. The processed data is used to control the movement of holographic images. Thus, when a user performs a certain action, the holographic image can reflect this action in real-time, achieving interaction between the user and the holographic image. This greatly enhances the interactivity and realism of holographic images, enabling users to immerse themselves better in the holographic environment, improving the learning and entertainment experience^[7].

3.2.3 Intelligent recognition and analysis system

The intelligent recognition and analysis system is responsible for in-depth learning analysis of captured student movements. The intelligent sports classroom system can capture students' movement postures and action data in real-time through cameras and sensors. With the help of deep learning and machine learning algorithms, the system can accurately analyze and evaluate these data, including the accuracy of postures, the coordination of movements, and the mastery of sports skills, etc. The system uses AI algorithms to classify, recognize, and compare student movements to assess their skill levels and provide personalized feedback and suggestions. Through real-time feedback, students can understand their movement status in time and make adjustments and improvements in time. At the same time, the system can also mine a large amount of data to discover students' learning habits and potential problems, helping teachers to provide targeted guidance^[8].

3.2.4 AI sports course generator

The AI sports course generator can generate attractive sports courses based on students' personalized needs and interests. The system combines holographic projection technology and real-time motion capture technology to provide students with diverse sports scenes and interactive learning experiences. Furthermore, the generator can dynamically adjust the difficulty and content of courses based on students' learning progress and ability levels to meet

the needs of different students. The smart sports classroom system can also provide teachers with rich teaching resources and auxiliary tools. Teachers can set teaching goals and course content in the system, which will provide each student with a personalized learning plan and exercise suggestions. At the same time, the system can provide a wealth of learning resources, including demonstration videos, skill explanations, and professional analyses, to help students further understand and master sports knowledge and skills^[8].

3.2.5 Sports data cloud platform

The sports data cloud platform is responsible for centralized storage, analysis, and processing of students' learning data. The platform uses cloud computing technology to achieve rapid processing of large amounts of data and high-concurrency access^[9]. Teachers and students can access the cloud platform anytime and anywhere through mobile devices or computers to view learning progress, grade analysis, personalized suggestions, etc. Through big data technology, the platform explores users' sports rules and trends, providing more accurate sports guidance. Users can view their sports data reports through mobile apps or computer terminals to understand their sports status and progress, thereby conducting more targeted training plans. In addition, the cloud platform can also share data with external applications, facilitating integration and interaction with other educational systems^[10].

3.2.6 AI-assisted teaching evaluation system

The AI-assisted teaching evaluation system comprehensively evaluates students' learning processes and outcomes using AI algorithms and big data analysis technology. The system collects and analyzes students' learning data, grade records, feedback information, etc., to provide personalized learning suggestions for students. By statistically analyzing and analyzing students' sports data, the system can generate detailed learning reports, including sports performance, progress, potential problems, etc. These reports not only help students self-assess and self-adjust but also provide teachers with detailed reports on student performance, so that teachers can adjust teaching strategies based on this information. Moreover, the evaluation system can also provide teachers with optimization suggestions for teaching strategies to improve teaching quality and effectiveness^[11].

4 Impact analysis

4.1 Role of AI technology in holographic sports classrooms

4.1.1 Personalized training plans

AI can customize personalized training plans based on individuals' physical fitness levels, health conditions, and fitness goals. This ensures that each student can train at their own pace and difficulty. The training content can be dynamically adjusted based on students' progress and feedback. For example, if a student performs well in a certain movement, the system can provide more difficult training; conversely, if a student encounters difficulties in a certain movement, the system can reduce the difficulty or provide auxiliary training.

4.1.2 Real-time feedback and improvement

By using sensors and intelligent analysis technology, AI can provide real-time feedback to help students correct their posture and improve their sports performance. This immediate feedback mechanism is crucial for avoiding sports injuries and improving sports efficiency. It can collect and analyze students' training data to help coaches and students better understand training effects and physical changes. Through these data, training plans can be adjusted more accurately to ensure continuous improvement for students.

4.2 Impact of AI technology on sports effectiveness

4.2.1 Improved learning efficiency

The application of artificial intelligence can provide personalized physical training plans based on students' physical conditions and learning progress. This personalized smart classroom can more effectively meet the needs of each student and help them master and improve their sports skills faster. The personalized approach has been found to significantly improve students' learning efficiency and the accuracy of movement mastery.

4.2.2 Accurate movement guidance and correction

By using artificial intelligence, such as motion capture and posture recognition, students can receive real-time feedback on their movements. This helps them perform movements more accurately, reduces the risk of injury, and improves sports performance. The system can continuously track students' learning progress and provide detailed feedback. This not only helps students understand their strengths and weaknesses but also enables coaches to more effectively guide students.

4.2.3 Increased student learning motivation

AI smart classrooms can make physical education more interesting and attractive. This fun factor can increase students' engagement and enhance their sports abilities. Each student has different learning styles and preferences, and holographic sports classrooms can provide various learning scenes to meet different students' needs.

5 Conclusion and outlook

5.1 Conclusion

(1) The holographic sports intelligent classroom based on AI technology can provide a better interactive experience

Intelligent technology creates a standardized curriculum system, real-time interaction can enhance students' sports interest, online + offline course linkage, real-time data collection and output, AI data evaluation, multiple dimensions of sports performance; the course mode combining technology and vision, integrating holographic projection, depth-sensing interactive devices and other technologies. Holographic sports can enhance students' participation and motivation, and the interactivity and gamification elements of AI have been found to significantly increase students' participation and motivation in learning. Through virtual reality

(VR) or augmented reality (AR) technology, learning can become more interesting. Through dual-screen interaction learning, students can experience immersive teaching through dual-screen interaction technology combined with somatosensory interactive devices, and the learning motivation and effects are better.

(2) The holographic sports intelligent classroom based on AI technology has a more scientific sports system

Building an AI holographic sports intelligent classroom, using deep learning and machine learning algorithms for accurate analysis and evaluation, providing personalized teaching and learning support for students and teachers, improving the teaching effectiveness and learning experience of physical education classes, intelligently adjusting classroom content, and completing teaching goals with one click. It can provide personalized training plans based on students' physical conditions, learning speed, and preferences. This personalized approach has been found to significantly improve students' learning efficiency and the accuracy of movement mastery.

5.2 Outlook

It is recommended to further promote the application of holographic sports intelligent classrooms based on AI technology in more schools and physical education courses to verify their universality and effectiveness in different contexts. Continuous technological upgrades and optimizations, regular upgrades of the smart classroom technology to maintain its leading position in teaching. Cross-disciplinary cooperation with other disciplines such as psychology and education to further explore the impact of smart classrooms on students' comprehensive development. To better utilize the functions of smart classrooms, it is recommended to strengthen the relevant training of physical education teachers and enhance their ability to use new technologies.

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