

# Research of Computer-aided Instruction based on Virtual Reality Technology

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**Abstract:** As an emerging technology, virtual reality technology has been widely used in various fields at home and abroad. It has also played a huge role in the field of education and teaching, as a new teaching method for teachers and students. This paper begins with a brief introduction to virtual reality technology. This paper briefly discusses the computer-aided teaching research of virtual reality technology, and prospects the application of virtual reality technology in teaching.

## 1. Introduction

With the advancement of modern science and technology, our teaching methods have changed from the old model of a combination of traditional chalk, a blackboard and a three-footed platform to a new mode of teaching with various high-tech means. Computer-aided teaching technology is one of them. representative. In such a big environment, a term with a clear sense of the times is reflected in our eyes - virtual reality technology [1]. Since its inception, virtual reality technology has found its extraordinary role in the field of teaching. It can be said that in the future teaching environment, we will apply more virtual reality technology to our teaching. Virtual reality technology is an effective teaching aid and will bring epoch-making changes to our teaching. .

## 2. Virtual reality technology overview

Virtual reality technology is a new computer technology developed with multimedia technology. It uses 3D graphics generation technology, multi-sensor interaction technology and high-resolution display technology to generate a 3D realistic virtual environment. Users need to enter virtual through special interactive devices [1]. This is a new comprehensive information technology that combines multiple information technology branches such as digital image processing, computer graphics, multimedia technology, and sensor technology.

The feature of virtual Reality. 1) Multi-perception One so-called multi-perception means that in addition to the visual perception of general computer technology, there are also auditory perception, force perception, tactile perception, motion perception, and even taste perception and olfactory perception [2].

2) Immersion sensation—also known as presence or presence refers to the true level of the user's perception that the protagonist exists in the simulated environment, as if it were felt in the real world.

3) Conceptuality One emphasizes that virtual reality technology has a broad and imaginable space, which can broaden the scope of human cognition, not only to reproduce the real existence environment, but also to arbitrarily conceive an environment that does not exist or even impossible.

## 3. Analysis of advantages of virtual reality technology in teaching application

The progress and teaching of human civilization are inseparable. People are promoting the continuous development of science and technology through teaching. Let the latecomers learn from the experience and explore the higher fields. In today's teaching system, one of the important means of quality education for students is experimental teaching, which not only makes students more intuitively feel and understand the process of knowledge generation and development, makes knowledge visualization easy to understand, and more motivates students [1]. The curiosity is conducive to cultivating students' ability to innovate. The development of China's current teaching

system is uneven, and the teaching environment is far from meeting the teaching requirements. The shortage of funds has prevented a large number of experiments from proceeding. The reference to virtual reality technology will solve these problems to a large extent.

### **3.1 Traditional teaching methods are often limited to conditions and cannot achieve teaching goals.**

Through virtual reality technology, participants can conduct various experiments without worrying about teaching equipment, teaching venues, teaching expenses and so on. Use the virtual reality system to achieve sensory immersion [2]. Get the same real experience as traditional teaching methods while gaining the same convenience as distance education.

### **3.2 Virtual reality laboratory is an important carrier for the application research of virtual reality technology.**

It is the construction of the virtual laboratory that avoids the real experiment that brings a variety of damage. In the traditional teaching mode, these experiments that bring danger to the experimenter are often achieved through television recording. Students cannot experience first-hand perceptions. The existence of virtual laboratories has dispelled people's concerns about these problems [2]. In various experiments, experimenters can participate in immersively and personally. Whether it is anatomy in medicine, combustion in chemical experiments, or even nuclear reaction explosions can be done in virtual experiments.

### **3.3 Virtual reality fully mobilizes the initiative of students to learn.**

Through a distributed network, students can ask questions to the teacher at any time, and can also discuss with other students in the virtual classroom. Through the 3D model, the learning content will be absorbed more intuitively and visually by the students. In such an environment, time can be ignored, and space restrictions allow students to listen to their favorite courses, even if the teachers and students are separated by thousands of miles [3]. From the universe to the atomic particles, students can enter the interior of these objects in the virtual space for observation and experimentation. For example: nuclear fission, fruit fly experiments, and so on. It often takes decades or even hundreds of years of experimentation, and in a virtual environment, it can be fully presented to students in a class.

### **3.4 The "3I" feature of virtual reality technology is beneficial to students' skills training.**

Such as military combat capabilities, electrical maintenance skills, and car driving skills. Through the virtual skill training established by virtual reality technology, teachers can set and change the content of the course at any time according to the students' own ability, so that students can learn more efficiently [3].

### **3.5 Virtual reality technology creates a humanized learning environment.**

The virtual reality system can create a humanized learning environment by creating a virtual character image, enabling students to learn in an atmosphere that suits them [3]. For example, in a virtual classroom learning atmosphere, students can study and discuss various problems in learning with virtual teachers and students to conduct collaborative learning. Talk to a virtual psychiatrist and help yourself solve problems.

## **4. Application of virtual reality technology in computer aided instruction**

### **4.1 Using virtual reality technology to create learning situations.**

Using virtual reality technology to create learning situations. Using virtual reality technology to create learning situations has two aspects: First, re-exhibiting the natural phenomena or things that cannot be observed in real life, providing students with vivid, vivid and intuitive learning materials to help students understand the key points and difficulties in mastering learning [4]. For example, when learning geometry, virtual reality technology can be used to switch between three-dimensional

objects and two-dimensional views, so that students can better grasp the mutual correspondence between objects and views. When learning physics, through virtual reality systems, Students show that the electrons move around the atomic nucleus at high speed, and the current flows in the conductor, so we can't see or touch the physical phenomenon. We can also use virtual reality to easily realize the whimsy of the ancients, "the last nine days of the moon, the next five oceans." The second is to express the abstract concepts and theories encountered in the learning process intuitively and visually, which is convenient for students to understand and master the abstract concepts, as shown in Fig. 1.



Fig.1 Virtual reality technology creates learning context

#### **4.2 Virtual experiments are performed using virtual reality technology.**

Experimental teaching plays a very important role in daily teaching activities. It plays an important role in strengthening students' ability to understand and master knowledge, and to develop students' ability to discover, analyze and solve problems [4]. However, in experimental teaching, it is often impossible to carry out some teaching experiments that should be offered because of experimental equipment, experimental sites, teaching expenses, and experimental safety. The use of virtual reality technology can make up for the lack of experimental teaching conditions. For some external conditions, equipment and equipment require particularly high experiments, which are difficult to achieve in normal environments. In this way, students lose the opportunity to do hands-on, and they do not get a perceptual knowledge of the teaching content. At this time, they can be solved through virtual reality technology. In various virtual laboratories built using virtual reality technology, such as physics, chemistry, and biological laboratories, students are free to do various experiments without worrying about any limitations, as shown in Fig. 2.



Fig.2 Virtual reality technology for virtual experiment

The use of virtual reality technology can also avoid the dangers of experiments or operations in real-world situations. In the past, for those experiments that were dangerous or harmful to the human body, teachers generally organized students to watch TV videos instead of experiments or even

cancel experiments, so that students could not personally participate in the experiment to gain an understanding of knowledge. Using virtual reality technology for virtual experiments can eliminate this concern.

#### **4.3 Using virtual reality technology for skill training.**

The immersion and interactivity of virtual reality enables students to become a real participant in the virtual learning environment and devote themselves to the learning environment, which is very beneficial to students' skills training [5]. Using virtual reality technology, students can do a variety of skills training, as shown in Fig. 3. Specifically, various types of vocational skills such as aircraft driving skills, surgical skills, automobile driving skills, and teaching experiment skills are trained. Because these virtual trainings have no worries about conditions, costs, and dangers, students can practice repeatedly until they have mastered the operational skills [6]. For example, in the virtual aircraft driving training system, the trainees can repeatedly operate the control equipment to learn to take off and land in various weather conditions, and through repeated training, to achieve the purpose of mastering driving skills.



Fig.3 Virtual reality technology for skill training

#### **4.4 Usage of virtual reality technology for special teaching.**

The application of virtual reality technology in the field of teaching is also related to the teaching of special education and plays a pivotal role. Because virtual reality technology can provide users with the opportunities and conditions to interact with the virtual environment, this has a special purpose for special education [6]. For example, with the help of virtual reality technology, people with disabilities can communicate with others through their physical movements, and even communicate with others using only certain parts of the body.



Fig.4 Virtual reality technology for special teaching

## **5. The development direction of virtual reality technology in computer aided instruction**

With the advancement of technology, we can also realize the higher-end virtual reality technology of virtual reality technology in the teaching process. The advanced virtual reality system provides fully-integrated functionality, giving users a feeling of being in a virtual realm. It uses a head-mounted display or other device to enclose the participants' visual, auditory and other sensations and provide a new, virtual sensory space with location trackers, data gloves and other hand-controlled input devices, sounds, etc. Participants are born with a feeling of being fully engaged and immersed in a virtual environment [7]. Such a technology can completely eliminate the interference of the surrounding real environment, truly immersive, and give the educated people a completely "real" experience.

Virtual reality technology has become the three major means for humans to explore the laws of the objective world together with theoretical analysis and scientific experiments. Educators should be better at applying this advanced auxiliary teaching method, so that our knowledge and technology inheritance process is more direct, so that educators can more intuitively feel the knowledge content and better complete their studies [7]. Virtual reality technology will occupy an increasingly important position in the future education and teaching process, and become an indispensable element in the teaching process.

## **6. Summary**

The application of virtual reality technology in teaching is still a challenging practical application problem. The majority of educators and technology developers are also studying the application of virtual reality technology in teaching. I believe that with computer technology and interactive technology. The development of virtual reality technology will be more applied and developed in education and teaching.

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