Application of Immersive Virtual Reality Technology in Pharmacy Experiment Teaching

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ABSTRACT

With the development of virtual reality technology and somatosensory interaction technology, somatosensory interactive devices are constantly being updated. Today's immersive virtual reality technology has wearable devices that are more and more convenient, and the development of virtual reality systems is also supported by many software. The cost of programming is reduced. Pharmacy experimental teaching is the most important part of pharmacy, and the high cost of experimental materials makes it difficult to carry out pharmacy experimental teaching. Virtual reality technology can supplement the deficiencies in the teaching of pharmacy experiments, allowing students to conduct in-depth dangerous chemical experiments through the virtual reality system. This paper analyzes the virtual reality technology in detail, and puts forward the principles of virtual pharmacy experiment teaching system design, and tries to develop a virtual experiment teaching platform using the separation method of front and back ends. The platform constructed in this paper can provide students with simple exercises, help students improve their understanding of chemical agents, and optimize the teaching process.

Keywords: *Virtual reality technology; pharmacy; experimental teaching; immersion*

1. INTRODUCTION

Virtual reality technology can simulate objective things realistically, and has good interactivity, which provides a rich experimental environment for the development of pharmacological experimental activities. In the virtual reality experimental system, phenomena that cannot be observed in traditional laboratories can be observed. In traditional pharmacy experiments, students can only observe the experimental process through their eyes. In the virtual reality system, students can observe the experimental process from many angles at close range. The system can simulate macroscopic or microscopic, extremely fast or extremely slow experimental phenomena. Virtual reality technology is a very important auxiliary means of pharmacy experiment teaching, which provides a new technical means and teaching platform for pharmacy experiment teaching. The virtual experiment system can provide learners with functions such as tutoring, inspiration, feedback, and error correction. Through the interaction of the system, feedback can be formed to strengthen correct reflection and correct wrong responses. However, the virtual experiment system can only provide auxiliary functions for students' experimental operation learning, and cannot completely replace the real experimental learning.

2. VIRTUAL REALITY TECHNOLOGY

Virtual reality is the use of computer simulation to generate a three-dimensional virtual world, providing users with a simulation of visual, auditory and tactile senses, so that users feel like they are in the scene, and users can observe things in three-dimensional space in a timely and unlimited manner [11]. Users can experience the virtual world and interact with the virtual world through a simple wearable device [3]. Virtual reality technology includes computer graphics, simulation technology, multimedia technology, artificial intelligence technology, computer network technology, parallel processing technology, multi-sensor technology and other disciplines [9].

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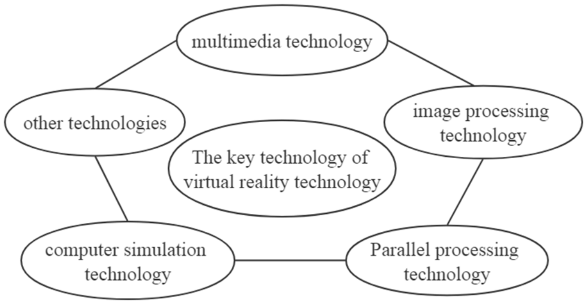

Figure 1: Science and technology included in virtual reality technology

Virtual reality technology has the characteristics of multi-perception, presence and interaction [4]. Multisensory means that virtual reality technology has sensory experience other than visual perception and auditory perception possessed by multimedia computers, as well as tactile, mechanical, motion perception, and even olfactory perception and taste perception. In the future development direction of virtual reality technology, virtual reality technology should have the perception function of all people [7]. The presence of virtual reality technology is that the user becomes the protagonist in the virtual scene. The future development goal of virtual reality technology is to make the virtual space use lighting, audio and other equipment to make it difficult for users to distinguish between true and false. The interactivity of virtual reality technology refers to the degree to which users can operate objects and get feedback in the virtual environment [10]. The autonomy of virtual reality technology refers to the degree to which objects in the virtual reality environment move according to the laws of physics. For example, when a user pushes a virtual object in a virtual space, the object will be moved by force [1].

3. PRINCIPLES OF PHARMACY EXPERIMENT TEACHING DESIGN BASED ON VIRTUAL REALITY TECHNOLOGY

3.1. Systematization

The knowledge system of pharmacy is not scattered, but systematic. When designing the virtual pharmacy experiment system, it is necessary to cultivate students' systematic concept and pay attention to the integrity of knowledge [4]. The virtual experiment system is an important part of experimental teaching, and the systematic content of the system can adapt to the needs of different training objectives. When designing the virtual experiment system, according to the teaching requirements of the pharmacy major, the teaching media and teaching content should form a complete whole.

3.2. Interactivity

The virtual experiment system is a simulation of the real experiment in the virtual environment. In order to achieve the effect of the real experiment, the virtual experiment system should achieve a highly realistic simulation of the real experiment in the design of the environment interface, so that students can conduct experiments in the simulation space. Operate as if you were manipulating the real thing [6]. The system should enable students who have never done an experiment to establish an intuitive understanding of the overall environment of the experiment and the overall structure used together through the simulation software [8]. The virtual experiment system should do a good job of interactive design, give real-time feedback to the students' operations, and correct the wrong steps of the students' operations. In order to improve students' enthusiasm for the system, the virtual teaching system also needs to provide corresponding incentives after students correctly complete an experiment.

3.3. Scientific

The design of virtual teaching system should emphasize scientificity and highlight the authenticity of three-dimensional space. In the virtual space, the experiments conducted by students must conform to scientific principles and very objective facts. In the system, the deployment of various chemical reagents and the use of medical instruments must be replicated according to real experiments in order to achieve the best teaching effect. In the teaching design, knowledge goals and ability goals should be taken into account, and the design of emotional goals should be paid attention to, which is in line with modern education and teaching theories. In the system, teaching activities should conform to the psychological and physiological characteristics of students and the cognitive laws of students [5].

3.4. Vividness

In the virtual teaching system, a variety of teaching methods should be flexibly used to change the traditional educational concept and make students like learning. Teaching methods such as experimental method, discovery method, comparison method, discussion method and comprehensive analysis method can all be applied to the virtual teaching system. The improvement of students' interest can improve the teaching efficiency and teaching quality. The development of computer technology and basic science and technology provides hardware and software support for the development of virtual teaching system, so that the system can vividly display the experimental steps, reveal the way things move and the interaction between things [2].

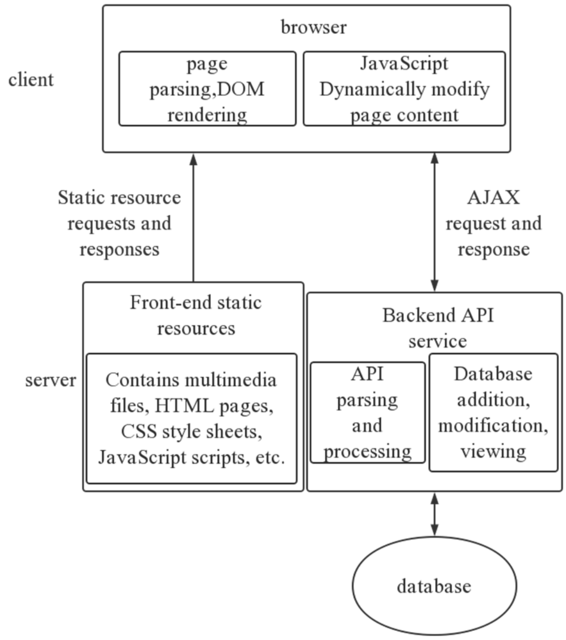

Figure 2: Pharmacy experiment teaching mode based on virtual reality platform

4. DEVELOPMENT OF VIRTUAL REALITY PHARMACY EXPERIMENT TEACHING PLATFORM

The virtual teaching platform proposed in this paper uses the method of separating the front and back ends to optimize the experimental operation experience. The overall architecture of the system is divided into three parts: client, server cluster and hardware.

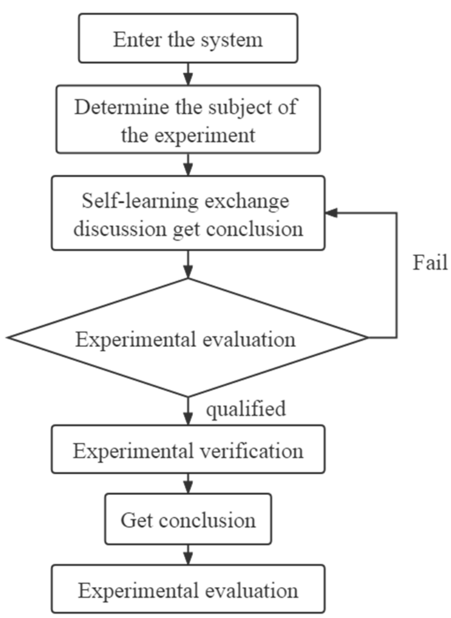

Figure 3: Architecture of virtual reality experimental teaching platform based on front-end and back-end separation

Considering the convenience of students operating on the virtual experiment platform, the virtual experiment platform constructed in this paper uses web browsers as the main target development platform, and does not require students to download additional application software, just enter the URL to conduct experiments. The gradual maturity of Web development technology also provides sufficient conditions for the construction of virtual experiment platform. Platform development can directly use HTML5 to add 3D animation, multimedia and user interaction to the system.

Server clusters can provide background resource support for user operations. The server cluster mainly includes proxy server, file server, experimental server and database server. The proxy server is used to reverse proxy the HTTP request, parse the HTTP request path and forward it to the file server or experimental server. The proxy server can also provide file indexing, load balancing and other functions. The file server deploys the entire front-end React project, mainly providing front-end static resources, including HTML pages, CSS style files, etc. The experiment server is used to process back-end API requests, as well as operations such as algorithm download, experiment start, experiment stop, and experiment data requests. The experiment server is directly connected to the database server, and the application data is swiped or stored from the database server. The database server provides data support for the experimental server to ensure high concurrent real-time response to data requests.

The hardware end user of the virtual experiment platform executes the laboratory algorithm downloaded by the user, and transmits the experiment status data to the experiment server. The hardware side in this paper is mainly the device controller. In the hardware side, the device control server is used to receive the algorithm from the server and execute the experiment, and at the same time transmit the state parameters in the experiment process to the experiment server. In control system bribery, the device controller acts as a controller, a sensor, and an actuator at the same time. The device controller is divided into application layer, operating system layer and hardware layer.

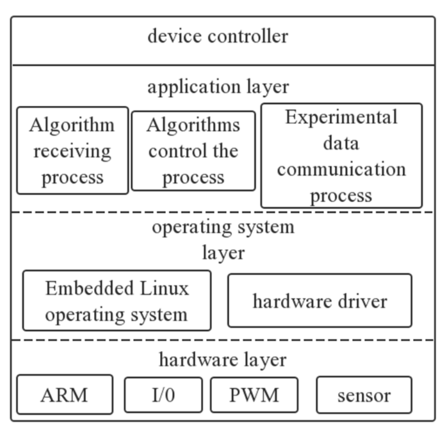

Figure 4: Device Controller Software Architecture

5. CONCLUSION

In traditional pharmacy experiments, colleges and universities need to prepare a large number of experimental equipment, and need to constantly update the experimental equipment according to the development of the times, and also need to avoid some dangerous experiments. However, through the virtual reality teaching system, colleges and universities can avoid these problems and conduct pharmacy experiment teaching at low cost and high safety. The system designed in this paper only requires the school to set up a virtual reality classroom and connect wearable devices with sensors on the computer. After wearing the wearable devices, students can conduct virtual pharmacy experiments in the virtual space. The platform developed in this article is still under continuous improvement, and will be further provided to users for specific operations, and will be continuously adjusted based on user feedback.

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