Application of Virtual Reality Technology in Electronic Specialty Education

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Abstract. In order to improve the application ability of the students to adapt to the development of professional expertise in a limited amount of study time, shorten the time from the combination of theory and practice, and reduce long-term consumption of manpower and material resources in skill training, the virtual reality technology is proposed to be applied to electronic specialty education. Because of the outstanding characteristics of virtual reality technology, such as multi sense, immersion, real-time and interaction, it can enhance the learning effect, constitute an open teaching environment, and break through the restriction of time and space. The effective ways to apply virtual reality technology to electronic specialty education can be the constructions of virtual laboratory, information campus, and distance education network. The application of virtual reality technology in electronic specialty occupation education, students can not only adapt to requirements of the theory study of contextualization and interaction, but also better meet the needs of exercising and improving the practical ability of students.

1. Introduction

Electronic specialty education goal is to cultivate technical talents to engage in work related to the fields of electronic information technology, including information processing, communication technology, electronic technology and computer technology. It requires the graduates having the practical ability, solid professional basis, and adapting to their work quickly. The cultivation of these abilities requires the students not only studying the theoretical course, but also taking a large number of experiments, practical training, curriculum design, professional practice and other practical training. This means that universities and colleges need to spent a lot of manpower and material resources on education to meet the requirements of these practical trainings, such as arranging more than one tutor, many sets of electronic equipment and a large number of components and so on. In addition, the rapid development of modern electronic information technology and application, put forward higher requirements for the application ability of students in the teaching of electronic information technology. How to improve the application ability of the students to adapt to the development of professional expertise in a limited amount of study time, is a problem to solve for the electronic professional educators. Therefore, it is undoubtedly an effective method to change the old way of teaching and practical training, to shorten the time from the combination of theory and practice, and to reduce long-term consumption of manpower and material resources by using the latest technology rationally.

Virtual reality technology is a burgeoning high-end comprehensive information technology. It combines together computer graphics, multimedia technology, sensor technology, digital image processing, artificial intelligence and other information technology branches [1-5]. Along with the rapid development of virtual reality technology, it applies from the original network game domain to many fields including aerospace, architectural design, 3D medical imaging, electric power, chemical industry, education, manufacturing, and so on. Virtual reality technology has many outstanding characteristics, such as multi sense, immersion, real-time and interaction [6]. Virtual reality technology plays an important auxiliary role in electronic specialty education of cultivating professional and technical personnel with practical ability and professional skills.
2. The Characteristics and System Composition of Virtual Reality Technology

Virtual reality technology has the following characteristics of multi-sensation, immersion, real-time and Interaction [7]. Multi-sensation includes visual perception, auditory perception, tactile perception, taste perception and olfactory perception. Immersion refers to that the user feels as if they were participating in the 3D virtual environment constructed by virtual reality technology. Real-time means that the various objects in virtual environment can give a response in real time according to their own rules and the operations of users. Interaction denotes that users can investigate and operate the simulation environment through special devices or interfaces, and get feedback from the environment.

The basic means and goal to construct a virtual reality system is to create an immersive and interactive virtual environment using and integrating high-performance computer hardware and software and all kinds of advanced sensors, combined with computer graphics, image processing and recognition technology, man-machine interface technology, distributed processing technology, database technology and multimedia technology. Construction of the virtual environment requires the supports of hardware, including tracking system, touch system, audio system, image generation and display system, high performance computer processing system, etc., and software which refers to the general software support environment and the integrated environment calling and interconnecting a variety of databases and CAD software.

3. The Significance of Virtual Reality Technology Applied in Vocational Education of Electronic Majors

Virtual reality technology is one of the most advanced man-machine interaction technique which can effectively simulate various feelings and actions of the people in an environment. The local world it produces is not the real world, but an artificial and fictional world, but when the user enters the virtual world through man-machine interface, the feeling is basically the same with the real world. In the virtual reality world, users can directly participate and explore the roles and changes of virtual objects through the realistic experience of seeing, listening, touching and so on, thus generating the understanding and feeling of the corresponding real objects. The application of virtual reality technology in the field of electronic education, can well meet the situational and interactive learning requirements, so that students can obtain a deep impression and a deep understanding on the learning content in a relatively short period of time.

3.1 Enhance the learning effect

Because of the characteristics of virtual reality technology with immersion and interaction, the application in teaching can make the various senses of students fully mobilized, and fully immersed in the learning environment, through their own information on a variety of environmental experience to gain knowledge and skills. In the traditional mode of education, students acquire knowledge only through teaching materials and lectures. In order to achieve better learning effects, especially for some difficulties uneasy to grasp, the teacher in class needs to explain repeatedly in detail and the students’ needs to take a lot of practice, training and other aspects of the training in class and out of class. Every link in this process should be closely combined with the necessary. If any link in this process is not done well, or the link between each other out of line, the learning effect of the students will becomes worse. The teaching based on virtual reality can cover all aspects of traditional teaching, so that expressing the content abstract, boring and difficult to learn in the vivid form, can greatly improve the understanding and mastery of the students. For example, for the learning of relay contactor control system, in the traditional teaching mode, the teacher in the theoretical class can only illustrate its electronic control principle diagram to explain its control principle and it is abstract and difficult, usually need to repeatedly explain. In the experimental class, if you want to connect to establish a more complete relay contactor control system, you need a large number of intensive wiring. Not only the experimental equipments should be fully prepared, but also the students will be confused and disoriented. While using virtual reality technology, the selected circuit system only requires to be
connected in the simulating environment. After regulating the circuit elements, the relay contactor can control the circuit immediately. This can strengthen the students' understanding of the theory, and stimulate the students' interest in learning.

3.2 Constitute an open teaching environment

Using virtual reality technology can create a democratic, harmonious and equal teaching environment. Students are free to express their opinions and make bold attempts. Students can also design and select experimental methods themselves, and give full play to their imagination and initiative. Students are allowed and encouraged to explore possibilities and given full play to creativity. For example, constructing a virtual circuit of the real circuit, students can build various circuits in this system, such as the signal source, oscilloscope, DC power supply, multi-meter, and so on. A variety of electronic components can be found and used in virtual systems, and the same test results can be obtained in real environments. In addition, when there are some wrong connections, it also leads to corresponding bad results in the real environment, such as the destruction and explosion of some components. This not only makes the students intuitively feel the consequences of false connections, but also eliminates unsafe factors and avoids the consumption of components.

3.3 Break through the restriction of time and space and other factors

Using virtual reality technology, we can demonstrate some complicated, abstract natural phenomena which are far from people's daily life experience and inconvenient to observe, and some experiments with too high hardware facilities. For example, in the study of mobile communication, the traditional teaching mainly relies on the teaching of teachers, most of which match the multimedia demonstration of some related pictures, and the students do not have the intuitive and overall understanding. Using virtual reality technology to simulate mobile communication system, students can go directly into each part of mobile communication system, such as the base station and the base station controller, mobile switching center view, as well as view the billing system, etc. Thus, it can make students to have a clear, complete and intuitive understanding of the entire mobile communication system, and easily understand and grasp the structure and working principle of each component.

4. Application of Virtual Reality Technology in Vocational Education of Electronic Specialty

In the education of electronic specialty, the training of students' practical ability is the first. Virtual reality technology should also meet this training goal and focus on the actual operation training of students. Its specific application can include several aspects.

4.1 Construction of virtual laboratory

In the course of electronic specialty education, the training direction of each major should be equipped with the corresponding experimental training room, such as circuit and microcomputer lab, communication system lab, signal and information processing laboratory, etc. In these labs, students can practice their own hands-on skills. But to establish these laboratories systematically and perfectly and to keep them up to date with technological advances requires a large amount of long-term, constant funding and a large space to be used. The virtual lab can be a true representation of these realistic labs, as well as a virtual laboratory that is impossible in the real world. In the virtual laboratory, students can practice hands-on experiments and training. Students can achieve personalized education, and avoid a lot of money and waste of time.

Taking the virtual laboratory of communication system as an example, it can establish the same communication network, such as the fixed telephone network, mobile communication network, satellite communication network and optical fiber communication network as those in the virtual world. In reality, some of these communication networks can only be simplified into simple communication models. Students are unable to study in depth and are disconnected from the actual communication system. Some communication networks, virtual reality technology can only simulate a small part of them, thus, the students could not see the whole picture of them, or cannot understand the entire communication system between the various parts of the relationship and collaboration.
Some communication systems are even difficult to implement in reality labs. Students can only learn it on the basis of theoretical courses, teacher lectures, and other library materials. In a virtual laboratory, students can freely access any of the components of each communication network, check the working status of any link, and through hands-on operation (such as changing parameters, etc.) change the work status of related links, troubleshoot various failures, etc. In this way, students not only know the whole picture of the whole communication network, but also grasp the working principle of each component, and can skillfully analyze the causes of all kinds of faults and solve the problems quickly.

4.2 Construction of information campus

Virtual reality technology promotes the construction of informatization in higher vocational colleges, provides a high starting point for scientific research, makes the teaching staff and scientific research personnel in higher vocational colleges have a broader space to display their talents, and promote discipline construction to a new stage.

The education of electronic major needs to train the applied talents adapting to the development of modern electronic information technology. At present, due to the rapid development of electronic information technology, the existing experimental training equipment in various vocational colleges is relatively old and cannot keep up with the needs of technological development. Thus, it is difficult to train the talents needed for skilled jobs. In addition, the teachers have no space for their own progress and development in the face of these boring experiments and training equipment. Therefore, the use of virtual reality technology to build an information-based campus can enable students to benefit and make teachers progress, thus make teaching, research, learning at the same time to a higher level, and form a virtuous circle and speed up the pace of discipline construction.

4.3 Construction of distance education network

The application of virtual reality technology in the education network can realize the good interaction between teachers and students. No matter how far away the students are from the teachers, no matter how many students are there, they can talk to the teachers easily. It is beneficial to improve teaching effect and save investment in Education.

In addition to face-to-face learning with the teachers in class, students who study in the classroom may also visit the distance education network under the class (dormitory or off campus) to prepare, review and practice. In addition, the school can also recruit students studying outside with no boundaries, provinces and municipalities enrollment. Students can learn directly from their home saving accommodation, meals, and other expenses. Schools are also able to recruit more students on existing scale and equipment.

5. Conclusion

Virtual reality is a new technology with great potential. It has been applied more and more in the field of education, and has received good results. But at present, the application of virtual reality technology in vocational education of electronic majors is still in the initial stage of development, and many of the electronic specialties in higher vocational colleges have not yet applied any virtual reality technology. With the development of related technologies, virtual reality technology will play a greater role in the field of electronic vocational education.

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7. References


