The Core technology and Prospect of Virtual Reality Applying to the Electric Power Safety Training

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Abstract

With the development of science and technology, the level of automation and intelligence has been continuously improved. Virtual reality technology has appeared in the power industry and has played a good role in it. It has broad application prospects. The article briefly introduces the basic concepts of virtual reality technology, summarizes the basic characteristics and key technologies of virtual reality technology, and prospect the future development of virtual reality technology in the power industry according to the development trend of virtual reality technology so far.

Keywords

Virtual reality, power production training, environment modeling technology, integration technology.

1. Introduction

In recent years, the virtual reality technology (VR) has been applied to various fields including education, industry, medical industry, etc. However, it is rarely introduced in the field of power safety production training. As is known to all, pre-employment training for employees in power production is crucial. However, due to the large scale, complex structure and high safety risks of the power system, the equipment used in the training is always not a real device. Even if real equipment is provided, it cannot be operated in a live state, which makes the major safety accidents such as electric leakage, electric shock and explosion caused by disoperation cannot be truly experienced, greatly reducing the effectiveness of training. Thus, applying VR to electric power training is essential due to its virtuosity and economical efficiency, which will add much to the authenticity and experience.

Virtual reality is a combination of multiple technologies, including environmental modeling techniques, stereoscopic display and sensor technology, tracking technology for observers' heads, eyes and hands, as well as tactile/force feedback technology, network transmission technology, and system integration techniques.[1] Due to the particularity of the power system, the key technical problems when introducing VR into power production training are environmental modeling technology, system integration technology and data synchronization.

2. CORE technology of VIrtual REALITY

2.1 INTRoduction about dynamic environment modeling technology

Dynamic environment modeling technology is one of the core technology of virtual reality. Its purpose is to obtain the 3D data of the actual environment, and use the acquired 3D data to establish the corresponding virtual environment model according to the needs of the application. Using computer models to produce images is not too difficult. If enough accurate models and enough time are provided, we can generate accurate images of various objects under different lighting conditions. However, the key here is real-time. For example, in the high-voltage line inspection simulation system, the image refresh is very important, and the image should also be of high quality. In addition, the complicated virtual environment makes the problem quite more difficult. At present, the three-dimensional graphics technology has been relatively mature. In order to achieve real-time, make sure that the graphics refresh rate is not less than 15 frames / sec, preferably higher than 30

frames / second. Without reducing the quality and complexity of the graphics, how to improve the refresh frequency will be the hot issues.[2]

2.2 INTRoduction about integration technology

Integration technology includes information synchronization technology, model calibration techniques, data transformation techniques, data management models, identification and synthesis technologies, and so on. Since virtual reality includes a large amount of perceptual information and models, the integration technology of the system also plays a vital role.

Virtual reality is the construction of a realistic image in a computer. People interact with the model and produce the same feedback information as in the real world, giving people the same feelings as in the real world. In order to achieve the same feeling as in the real world, it is necessary to have a technology that can trigger various feelings. It is the easiest to achieve hearing; achieving vision is the most basic and most commonly used; the realization of touch is only needed in certain situations, and is now being perfected; the realization of the sense of smell has just begun. 80%-90% of the information people receive from the outside world comes from vision. Therefore, in the virtual environment, realizing the same visual experience as in the real environment is important for obtaining a sense of realism and immersion.

2.3 Introduction about data synchronization

Synchronized communication is a kind of communication mode that transmits data continuously and serially, and only one frame of information is transmitted in one communication. Unlike character frames in asynchronous communication, information frames here usually contain several data characters. When synchronous communication is used, many characters are organized into an information group, so that characters can be transmitted one by one. However, synchronous characters are added at the beginning of each group of information (usually referred to as frames), and empty characters are filled in when there is no information to be transmitted, because synchronous transmission does not allow gaps. In the process of synchronous transmission, a character can correspond to 5-8 bits. Of course, for the same transmission process, all characters correspond to the same digits, such as n bits. In this way, each n bit is divided into a time slice, the sender sends a character in a time slice, and the receiver receives a character in a time slice. In synchronous transmission, an information frame contains many characters. Each information frame starts with synchronous characters. Generally, synchronous characters and null characters are used in the same code. In the whole system, a unified clock controls the sending and empty characters of the sender with the same code. Of course, the receiver should be able to recognize synchronized characters. When a series of digits are detected to match synchronized characters, it is assumed that an information frame is started, and then the subsequent digits are processed as actual transmission information.

There are two main levels of data synchronization, one is data synchronization through background coding, the other is data synchronization directly acting on the database, and the other is data synchronization at the database level.

3. Prospect of Virtual Reality Applying to the Electric Power Safety Training

There are some differences between images in virtual reality and in the real world, which is that the image in virtual reality is required to display changes as the position of the viewer's eye changes. In addition, it is required to be able to quickly generate images for real-time feeling. For example, real-time production is not required for animation, and there is no limit to how much time it takes to generate each image in order to ensure quality. The picture generated during virtual reality is usually 30 frames/second. With such image generation capabilities, coupled with appropriate sound effects, you can make people feel immersive.

Power system training costs a huge amount of money every year. The annual training cost of a municipal company is about 4 million yuan. What's more, the training methods are mainly lectures and on-site visits. It is difficult for the trainees to fully understand and absorb, and there are not many

opportunities for hands-on practice. Applying virtual reality technology to operation training can not only reduce the hardware investment cost, but also give the operator a sense of realism and immersion, so that it can produce an immersive feeling and increase the their enthusiasm.

4. Conclusion

In China, governments at all levels actively promote the development of virtual reality. Virtual reality has been included in the "13th Five-Year Plan", China Manufacturing 2025, Internet+ and other major national documents. The Ministry of Industry and Information Technology, the National Development and Reform Commission and the Ministry of Science and Technology issued relevant policies. In addition, local governments in various provinces and municipalities actively built industrial parks and laboratories to promote the development of local virtual reality industry. By the end of 2016, nearly 20 provinces and cities in China began to deploy virtual reality industries.[3] Under the strong promotion of the nation's effective policy, the virtualization of power safety production training will have broad prospects.

References

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