Research on the Function of Substation Training Simulation Patrol Function Based on Computer VR Technology

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Abstract. With the development of computer VR technology, our country has applied VR virtual technology to the scale of power grids. This allows the system to achieve self-intelligent inspection when no one is on duty, and the detection data will be displayed efficiently. This paper mainly studies the intelligent inspection scenarios and system processes of substations.

Keywords: Substation, Virtual Reality, Intelligent Inspection, Research

1. Introduction
In our country, the development of economic provides favorable conditions for the power grids, there are more and more unattended substations. The grid system relies heavily on information technology. Information technology has become an important part of the power grid. Intelligent inspection of substations can effectively solve a large number of problems in traditional inspections, it mainly relies on virtual reality technology to survey the actual situation of the substation [1].

2. Virtual reality technology
Virtual reality technology is an inevitable result of the development of information technology. It mainly uses high-tech methods in computer development to construct a virtual realm, so that participants feel the same as the real world. Virtual reality technology integrates many aspects of content, including digital image processing, multimedia technology and other aspects. The virtual reality system uses advanced technical means to design realistic effects, allowing participants to have an immersive feeling and feel the real world from the virtual. The intelligent substation inspection scene design is mainly based on the refined three-dimensional modeling of the substation. Through the virtual reality technology, the staff can conduct surveys in the virtual substation and check according to the precautions of the inspection [2]. And check the relevant equipment in the substation model one by one, and display the data in these equipment with the help of virtual reality, so that the relevant departments can effectively grasp the information, so as to supervise the substation according to the information content, and the staff can deal with the existing problems. Find out solutions in time and provide visual information support.
3. Research on intelligent inspection scenarios of substations

3.1. Research on Intelligent Inspection Scenarios of Substations
The intelligent inspection scene of the substation mainly includes two parts. One is the intelligent control combining virtual and real, and the other is the intelligent display of information fusion. Intelligent substation inspections use virtual reality technology as the starting point to monitor the actual situation of the substation in real-time in the three-dimensional model, so as to understand the relevant information of the substation, and effectively extract the displayed information content, and select the information that is beneficial to the substation. Abnormal sounds can be monitored, so that the information content can be displayed to the staff in a visualized scene. In terms of information display, it broke the mode of business personnel querying multiple information systems during inspections. Intelligent inspections of substations are mainly based on equipment, which integrates equipment-related information and data, and then unified display, according to the robot The information collected on site is presented, which not only reduces the workload of the staff, but also enhances the user's sense of experience, enhances the user's sense of identity with the substation, and promotes the long-term development of electric power enterprises. The intelligent inspection scene of the substation mainly uses the visualization carrier to effectively integrate the two parts of intelligent control and intelligent display to realize the visualization of virtual and real combination and human-computer interaction [3,4].

3.2. Intelligent control design
The intelligent control of virtual and actual combination is to study the integration and coordination of intelligent inspection and simulation technology of substation robots, that is, the introduction of patrol robots in real substations, which can not only ensure the accuracy of information and data, but also the normal operation of substations. The introduction of simulated robots into the three-dimensional simulation scenes of substations can ensure that the simulation environment of the robots is consistent with the actual situation on site and enhance the authenticity of participants. After the patrol robot gets the instructions, it operates in accordance with the relevant requirements, which not only enables the data to be displayed accurately, but also establishes an integrated mechanism to transfer and convert the data, which provides greater convenience for the staff. The data displayed in the visual scene mainly includes external data and internal data [5]. Internal data refers to relevant data taken from the company, and external data refers to data taken from external data sources, such as micro-meteorology. A unified command issued by the three-dimensional controller can effectively control the simulation robot and the inspection robot. The two parties transmit positioning information through information communication, thereby providing a reference for the integrated information of the virtual scene, thereby ensuring the smooth progress of the substation work.

3.3. Smart display design
The intelligent display of information integration is to effectively display the real-time operating data of the equipment integrated during the inspection of the simulated robot in the simulation environment under the dual-screen display mode to effectively display the information mastered by the patrol robot. The staff can superimpose the information collected by the robot and analyze the actual situation of the substation reasonably, so as to formulate a feasibility plan to keep the substation in real-time operation. This will not only enhance the ability of on-site space detection, but also achieve collaborative work The purpose of improving the work efficiency of the staff. Among them, the core analysis points of the intelligent inspection scene of the substation mainly include several aspects: First, real-time data display. The staff locates any equipment in the simulation environment, and can understand the operating data, environmental information and other aspects of the equipment, so that it can be visualized on the virtual equipment. Second, real-time image data monitoring [6]. The staff can monitor the camera and other instruments, and cooperate with the automatic patrol function, so that the staff can realize the data storage in the background.
4. Design of three-dimensional demonstration system for substation based on VR technology

4.1. Design of three-dimensional demonstration system for substation based on VR technology
Quest3D takes the channel as the basic unit. A channel is a basic function, a model grid, a basic parameter, or a data storage unit, which are connected with each other in a parent-child relationship. The parent channel is the child channel to transfer control and operation, and the child channel is the parent channel passes the result. Complex channels are connected by simple channels [7]. Each channel can still be directly quoted. All data and interactions are expressed in channels or channel sets. The entire program adopts a tree structure. The program flow starts from the root node and starts from the left. To the right, flow through each branch.

4.2. 3D Virtual reality system module design
From the perspective of modularity, it is divided into data module, menu module, and animation interaction module. The design of the data module mainly considers the processing of the texture picture, the production of the model, according to the configuration of the target hardware, setting the format and resolution of the texture, and controlling the model and data format and organization structure. The design purpose of the menu module is to reduce the difficulty of use, with user experience as the core. The animation interaction module design should try to keep the logical structure clear and easy to maintain, as shown in Table 1 [8,9].

| Function module               | Content            | Description                                                                 |
|------------------------------|--------------------|-----------------------------------------------------------------------------|
| Data module                  | Model              | Vector data saved in X format                                               |
|                              | Material           | Pixel data for blending texture, lighting, and transparency attributes       |
| Menu module                  | Perspective switch | Switch the camera in the active scene                                        |
|                              | Display blanking   | Set the material's alpha value or visual rendering state                    |
|                              | Animation control  | Send instructions to activate animation playback                            |
| Animation interaction module | Material animation | Generate animation by controlling material properties or texture coordinates |
|                              | Displacement animation | Generate animation by controlling the model space matrix               |

5. Equipment inspection system process based on VR technology
In order to make the use of the system closer to the actual production, the system fully considers human factors, and the human-computer interaction is very friendly. During the training process, each student will naturally enter the system set-up equipment inspection process (see Figure 1). And easily complete the inspection process of the entire equipment [10].
Figure 1. Equipment inspection process

6. Conclusion
With the emergence of the intelligent substation inspection system, the work content of the substation is simple and intelligent, which greatly improves the work efficiency of the substation staff. And it improves the accuracy of the inspection while solving the problems of traditional inspection. This technology provides a powerful guarantee for the operation of substations, and it also makes the substation can operate normally.

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