Discuss the Application and Presentation of 3D Visualization Technology in Data Center

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Abstract. The 3D visualization virtual simulation technology performs professional 3D modeling of scenes and equipment at all levels in an enterprise data center. It is driven by the bottom of the 3D engine technology and presents data center infrastructure information on a large screen. Seamlessly integrate various monitoring systems and asset libraries, diversified charts customized to show the running trend and health status. With the new characteristic concept of operation and maintenance combined with 3D scene display and 2D data elements, we strive to make 3d visual virtual simulation technology better serve the operation and maintenance personnel of the data center. Supports the highlighting of alarm special effects in the equipment room scene, click the device alarm quick positioning, and handles the alarm event. Output the real-time operation data of the equipment in the form of three-dimensional curve charts to intuitively grasp the operating trend of the equipment. IT equipment loading and unloading in the cabinet does not require operation and maintenance personnel to visit the equipment room to check the distribution of equipment. 3D visualization technology supports the retrieval of the space, electricity, load bearing and information points in the cabinet as query conditions to generate construction orders, Solve the inefficient way of inquiring account books and planning by operation and maintenance personnel through scientific and technological means. Through human-computer interaction, the traditional tedious and boring single operation mode of operation and maintenance has been changed, and the operation and maintenance management level of enterprise data centers has been effectively improved.

1. Introduction

Faced with the gradual expansion of the current enterprise data center construction scale, the equipment room hardware equipment operation and maintenance management is becoming more and more complicated and the equipment information monitoring system has many indicators. The operation and maintenance personnel of the data center can still only adopt inefficient work methods such as manual inspection, excel ledger management and manual positioning of equipment failures. Aiming at the difficulties and blind spots faced by most enterprises and data centers in operation and maintenance, now the launch will be 3 d virtual reality technology and operational and maintenance work of the combination of new ideas, dedicated to helping operations staff to check the room layout, rapid
positioning problem, flexible and intuitive view data center infrastructure external shape and running status of way to change traditional operational and maintenance work. The operation and maintenance efficiency is effectively improved by means of modern science and technology, and the large-screen integrated display mode icing on the cake for the intelligent construction of the data center.

2. Thinking analysis

2.1. Problem analysis
With the expansion of data center scale, the number of infrastructure increases dramatically, and the difficulty of data center operation and maintenance management increases. In the aspect of operation and maintenance status monitoring of information equipment room, the existing management mode is to check the operation and maintenance status of the equipment room system by means of manual patrol network management system and moving ring system, which is time-consuming, inefficient, and lacks visual operation and maintenance information such as equipment operation, dynamic environment and pipeline layout [1]. How to avoid a series of problems in the process of operation and maintenance work, and how to effectively improve the operation and maintenance work efficiency. The main problems faced by data center operation and maintenance personnel are:

- How to master the distribution of device in the equipment room in the first time;
- How to master the distribution of wiring on the device in the first time;
- How to plan the loading position of the equipment in the cabinet in the first time;
- How to locate the location of the alarm device in the equipment room in the first time;
- How to associate the camera video with the live location;
- How to check the regional temperature distribution diagram of the equipment room in the first time;
- How to visually display the operating trends of key indicators of IT equipment;

2.2. Construction ideas
The 3D visualization virtual simulation technology is used to restore the scene of the scene with the same proportion. Scenes and equipment at all levels in the data center are presented in three-dimensional form to perceive the human visual channel with concrete information. Connect various types of monitoring system information, and use abstract data as logical layer to fill. The perfect combination of concrete and abstract has changed the traditional abstract digital driving model. When the monitored object fails, the alarm event can intuitively display the corresponding effect on the interface. For example, when a fire alarm occurs, the interface can simulate the linkage state of smoke, flames and firefighting equipment in the equipment room area [2]. The 3D scene operation mode of intelligent virtual simulation gradually replaces the operation mode that the operation and maintenance personnel must go to the equipment room to reduce the number of times the operation and maintenance personnel enter and leave the machine room. For the visit and display of data center leaders, the high-tech level of the data center is displayed intuitively through the integrated large-screen mode. Adopting scientific and technological means and supported by 3d system function, it perfectly solves various problems in daily operation and maintenance work.
Figure 1 is a detailed diagram of the 3D visualization technology in the data center. 3D scene modeling is performed through 3Ds max, and uses the skin animation, delayed rendering, skeletal animation, cascading shadow maps, multi-sample anti-aliasing, percentage filtering to soften shadows, high dynamic range images and other professional technologies for model optimization. Program development based on WebGL2.0, HTML5 and Node.js. WebGL is a 3D drawing standard that integrates JavaScript programs and OpenGL interfaces. Vertex arrays, shaders, rendering, and matrix transformations of geometric scenes are often defined programmatically to establish three-dimensional scenes [3]. At present, the mainstream browsers all support WebGL and js technology, B/S architecture design, users can access directly from the PC browser. The data storage uses the MySQL database to realize equipment asset management and wiring management, and connect video services, security monitoring, dynamic ring monitoring, IT equipment monitoring and business topology management. Realize multiple 3D visualization modules on the platform such as assets, capacity, environment, wiring, and alarms.

3. Strategy content
The deployment of 3D visualization platform of data center needs detailed explanation from five aspects: scene modeling, ledger management, software deployment, data testing and large screen integration.

3.1. Scene modeling
Professional data measurement, photographing, and information collection of the appearance of exterior scene, buildings, floors, equipment rooms, cabinets, IT equipment, power environment equipment, and security equipment and so on in the data center park. The on-site staff of the customer shall provide the CAD construction drawings and effect drawings of the exterior scene of the park, buildings, floors and equipment rooms, and the position point bitmaps of all kinds of equipment in the equipment room. Integrate various data, and professional modelers generate 3D models through 3Ds max. The professional three-dimensional scene editor is used to put the scene design at each level, and the 3D visualization bottom frame is generated to completely restore the data center scene. The virtual scene in the computer room is the basis for the design of human-computer interaction function of the 3D visualization platform. In particular, the creation of model objects, texture processing, detail optimization, and fidelity, etc. affect the rendering rate and operation performance of the system scene to a certain extent, so the established 3d scene model needs to be optimized [4].
3.2. Account Management
In the existing 3D visualization platform of the data center, according to the hardware account assets of the customer site, the modeled equipment is added to the 3D platform for asset management according to different additions. In order to verify the accuracy of the customer's ledger, the computer loads the three-dimensional scene to open the cabinet door and check the equipment model and position one by one to ensure that the assets in the three-dimensional visualization platform are completely consistent with the scene. Add the network wiring connected to the board card and port of IT equipment to the 3D visualization platform for management, and visually display the current port status of the equipment.

3.3. Software deployment
The 3D visualization platform passed by various functional performance tests was deployed to the server on the customer site, and accessed the data center intranet for system access operations.

3.4. Data test
Connect to various monitoring systems (IT equipment monitoring, dynamic ring equipment monitoring, security monitoring, video monitoring, etc.) of the data center, connect the data to the 3D visualization system, and display the operation trend of key indicators of the equipment dynamically and in real time through 3D charts. The device that generates alarm events locates the alarm source step by step by scintillation through special effects in 3D scenes. Access data such as access control, water leakage, and fire protection, and view personnel access information in real time. The camera video stream is associated with the three-dimensional scene to visually view the real-time status of the machine room.

3.5. Large screen integration
Monitor the large screen to access the three-dimensional visualization system of the data center. Various charts can be customized to intuitively display the operation status, power consumption value and various index curves of the data center equipment room. Various element methods highlight various types of information data. Without the need for operation and maintenance personnel to log on multiple product platforms to query and retrieve value information, the 3D visualization platform's 2D chart and 3D scene linkage perception present the situation of various software, hardware and business levels of the data center. Through the intelligent way of human-computer interaction, effectively improve the efficiency of data center operation and maintenance management.

3.6. Software and hardware configuration requirements
Client configuration:
- Workstation graphics card: NVIDIA GeForce GTX 1070 or 1080 is recommended;
- Notebook graphics card: GTX950M, GTX960M, GTX970M, GTX965M, GTX1080, etc. are recommended;
- CPU: i7 and above configuration
- Hard disk: 500G SSD
- Memory: 16G DDR4

Server configuration:
- CPU: CORE i5 or higher
- Memory: 16G
- Hard disk: 2T

4. Conclusion
The 3D visualization technology of the data center, from its own design positioning and functions, perfectly solves the operation and maintenance pain points such as real-time viewing of data center equipment distribution, rapid alarm positioning, and equipment shelf planning. Strive to bring convenience, ease of use and efficiency to the daily work of operation and maintenance personnel. Changing the status quo of traditional operation and maintenance, the 3D visualization of human-
computer interaction has become a new generation of operation and maintenance concept, which guarantees the escort on the road of operation and maintenance of data center.

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