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Research Article

Preliminary Study on the Navigation System of 3D Virtual Museum

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Abstract

Based on the importance of the museum and its future development, the construction, development and promotion of virtual museums are of great significance. Observing the current diversified museums, art galleries, etc., it is found that the exhibitions of physical exhibition halls are vulnerable to time and space constraints. This encourages researchers to think about using virtual museums to add video and audio information. The user interacts with the surrounding environment, becomes more involved in it, and gains a deeper experience. This research discusses the use of virtual reality technology to make historical sites and cultural heritage permanently preserved and valued, and through game-based learning, the navigation effectiveness of the system and the user's navigation intent are improved, achieving a combination of culture, digitization, and learning.

Keywords: Virtual Reality; Navigation System; Environment

Introduction

Virtual reality has been in development for more than ten years, but scholars have different opinions on the definition of virtual reality. It is the use of existing physical sound, images, graphics, text, etc. Technology, to integrate several improvements, let users have the feeling of being in the real world. Virtual reality is an event or entity. It has real effects and is not a real entity. The prerequisite is that the human senses must believe that this is a real environment. Virtual reality is a three-dimensional virtual space simulated by a computer. In this environment, sensory simulations such as vision, hearing, and touch are provided, allowing users to act as if they were in a real environment. Virtual reality is a three-dimensional model built by a computer, allowing participants to interact with real environmental objects and observe from any angle, and have the real feeling of "participating". The characteristics are described as follows: (1) Immersion: The visitor blends into the situation and experiences a so-called "sense of presence". If you exclude the influence of the outside world, you will even reach a state of selflessness. (2) Imagination: Visitors are stimulated by sound, light, and image effects in the virtual scene, creating another imaginary space. Because everyone's imagination is different, the result of the imagination space will vary from person to person. (3) Interaction: Generally speaking, it refers to the operation and feedback of the human-machine interface, such as when walking in a virtual scene, the scene angle, light and shadow, distance, etc., will change with the user. In addition, you can also touch objects in the scene at will to achieve a highly interactive effect. Virtual reality is an integrated application of software and hardware that integrates various

computer-related technologies, including 3D computer graphics, multimedia audio and video, dynamic capture, tactile feedback and other human factors engineering, mechanical control platforms, and human-machine interfaces. Virtual reality is a sensory combination between human and machine. Through the computer, the visual, auditory, and tactile interactions between humans and real scenes are simulated to create a simulated space that allows people to integrate into the virtual world scene and experience Various feelings, and even situations that are different from the real scene can be experienced. The study is broad in many educational and public fields [1-4].

Method

The classification of virtual reality varies according to application direction, technology, software and hardware, etc. The system is unified as follows:

- **Desktop VR:** Equipped with a multimedia computer and virtual reality software. In addition, a joystick and 3D glasses may also be attached.
- **Immersion VR:** It is the standard virtual reality system in the general impression. The helmet display is used to simulate human visual perception, and the data glove coordination force feedback system is used to read and react to the sense of touch, creating an environment surrounding the user.
- **Projection VR:** A large projection screen and several projectors are used to form a three-dimensional projection scene around the user, making the user feel as if they are in it.
- **Simulator VR:** A system that allows users to sit in a confined space to simulate operating machines. This simulated operating room will rotate and vibrate according to the screen.
- **Telex VR:** Combining two technologies of communication and virtual reality, it can see, hear, and direct robots to do things. It is most commonly used to remotely perform high-risk tasks such as space appliance repairs and nuclear power plant repairs.
- **Internet VR:** By connecting users in different regions through the Internet, users are integrated into an interactive virtual reality through the network and the host computer, where they can interact with each other people interact with each other. With the improvement of virtual reality technology, web pages can only be presented in 2D, but now they can also incorporate 3D, allowing users to have a more direct visual experience. The virtual reality description model language is: VRML (Virtual Reality Modeling Language) is proposed, so that the scene of the three-dimensional space can also be transmitted on the Internet through the World Wide Web.
- **Distribution VR:** A system developed due to the computer's CPU speed is not fast enough to respond immediately to messages, also known as Distributed Interactive Simulation.
- **Quick Time VR:** The applicability is very high, and many 3D modeling software (such as FormZ, Archicad, etc.) have built-in Quick Time functions. Quick Time VR is a three-dimensional image synthesized from photos taken in many different locations, and then uses the principle of continuous playback to create a dynamic feeling. Quick Time VR is not an effect of instant rendering (Render), but is based on the principle of photo playback.
- **Concave VR**: A simulation system that uses a personal computer as the basic structure, including images and sounds, and allows multiple people to integrate into the virtual environment at the same time through 3D images. This system allows the user to have direct visual and real-time interaction through the 3D environment presented on the surrounding screen. The scene has no response to the user's actions, and the display objects can be presented in actual size.

Results and Discussion

The construction technology of virtual reality can be divided into three types, including: geometric virtual reality technology, image virtual reality technology, and hybrid virtual image technology, which are described as follows:

- **Geometry-based virtual reality:** Also known as graphical virtual reality. In geometric virtual reality, all scene objects are made of 3D the model is composed, and the production process is similar to the production of 3D animation. Both require modeling, mapping, lighting, setting up a camera, etc., but the difference is that the virtual reality has interactive technology, and the user can watch it at any angle and path. The screen of multimedia animation is constructed by the designer. The advantage of this technology is that it has good interactivity, can move around at will, and has a relatively three-dimensional visual effect; the disadvantage is that the production process is more complicated, difficult, and the hardware requirements are also high.
- **Imagination-based virtual reality:** Use real images (such as landscape photos, indoor scene photos, product photos, etc.), and then use computer technology as the basis to create image-based virtual reality on the related software, a virtual world of a real environment can be simulated (that is, a 360° ring field image is made, and the user seems to be in an environment with surrounding scenery). The immersive effect of this technology is visually better than others, but the disad-

vantage is that the higher the image resolution and the larger the file, the worse the execution efficiency.

- **Hybrid virtual reality:** Like image-based virtual reality, multiple images of a 360-degree scene are taken first and then stitched into panoramic photos through image processing technology. After stitching, add objects that do not belong to the original scene in the scene according to requirements. You can also set the characteristics of the objects to give behavior commands through simple programming (such as Java, JavaScript, VRML Script, etc.), that is, virtual reality and a combination of augmented reality.

Development in virtual museum

All non-profit legal entities that are open for the purpose of serving society and promoting social development, collecting, maintaining, researching, disseminating and exhibiting specific exhibits related to human beings and their living environment, and for the purpose of research, education, and promotion of culture are all It. With the trend of museum virtualization, the development trend of future museums includes several elements: (1) Relying on a large number of interactive display and educational activities of technological development; (2) Theater-style technology introduction in museums to make visitors more involved; (3) Multimedia display is bound to be more realistic due to the introduction of high technology (such as virtual reality). The exhibits displayed in the museum all have a museum that integrates virtual reality and interactive art.

In today's digital generation, the concept of virtualizing physical museums has existed for many years. This technology can break the barrier between people and exhibits, and no longer make people think that museums are sacred, mysterious, and inviolable places. You can see the museum directly on the road, and you can see museum exhibitions from various places without long travel. This can also help the museum increase its popularity. Although the experience of viewing a museum on the spot cannot be simulated in a virtual museum, digitization can add more infinite knowledge and imagination, and there will be more different experiences between people and museums. Digitization is not to replace existing museums, but to maximize the significance of existing museums through virtual museums. The digitalization of museums has the following four advantages and trends: (1) bringing the audience closer to the collections that are not easy to display, (2) services that are open throughout the year, (3) globalized and more efficient information transmission, (4) Use the advantages of digital technology to complete the most efficient work.

The user-centered interactive design concept (1) can accurately know what happens at any time. (2) The conceptual model, the designed interactive behavior and the results of the behavior can all be clearly presented. (3) It is easy to know the current status of the system. (4) It can be natural to counteract and take appropriate actions; behaviors and the effects between behaviors; the information generated by the system is clarified and can explain the state of the system. The above four design concepts are also applicable to virtual reality and navigation design. Virtual reality is a technology with multiple interactions and system visibility.

Conclusions and Suggestions

This article makes a preliminary collection and discussion for the virtual museum. For the design of the virtual museum navigation system, the following experimental design is suggested as follows (1) The evaluation results of the virtual museum before and after the operation can be compared. (2) Add qualitative research, and the combination of quantitative and qualitative can increase the completeness of the experiment. (3) More detailed research and discussion can be made on various guide contents.

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