Protection and Maintenance of Historical Buildings Based on Virtual Reality Technology

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Abstract: The continuous development of virtual reality technology has improved the production efficiency of various industries. The application of virtual reality technology in the protection and maintenance of historical buildings can provide relevant practitioners with new work directions. Based on previous work experience, this article summarizes the content of historical building protection based on virtual reality technology. Moreover, the author also discusses the protection and maintenance of historical buildings based on virtual reality technology from the following four aspects. It includes the maintenance characteristics, the specific conditions of the project, reasonable maintenance plans formulation, and three-dimensional virtual environment modeling.

1. Introduction
At this stage, China’s social productivity and science and technology are developing faster and faster, and the application range of virtual reality technology is becoming wider and wider. This technology can not only establish and experience a computer simulation system in the virtual world, but also establish a simulation environment with the help of a computer to achieve system simulation of multi-source information fusion and entity behavior. Besides, it also bring a kind of immersive feeling to people. Moreover, historical buildings have certain historical value and belong to precious cultural heritage. In our country, there are many cultural backgrounds hidden in buildings, especially in the application of construction methods and materials. It presents obvious characteristics of the times, which also determines the complexity of its protection and maintenance work. In order to better complete this type of work, people have introduced virtual reality technology to make the protection and maintenance of historical buildings more complete.

2. Virtual Reality Technology and Research
With the continuous development of many modern high-tech, informatization has been closely related to social production and life, and has had a great impact on modern city construction. Since entering the 21st century, the concept of digital city has become more and more obvious, which is also one of the main directions of modern city development. As an important part of urban construction, historical buildings will also undergo great changes in their protection and maintenance methods.

2.1 Research Orientation
In general, historical buildings have undergone some new changes due to the evolution of the urban
spatial characteristics in which they are located. Moreover, historical buildings will undergo significant changes from urban function to image status. At this time, digital networks will provide new protection technologies to meet the needs of social development. In addition, people can also use new virtual interactive technology and network platform integration technology to show the original appearance of historical buildings to the world, and then establish new historical data protection channels. The protection of some historical buildings in China has always been in a state of disorder, which has also increased the difficulty of on-site measurement. Coupled with the restriction of some special factors, even within the established measurement range, precise measurement cannot be achieved. For this reason, people can divide historical buildings into three categories according to existing conditions and different protection needs. That is, precision measurement, short-term contact measurement and intelligent non-contact measurement can be performed. Among them, non-contact measurement mainly refers to shooting from a professional angle on site to ensure the collection of detailed information. Otherwise, we also need to do a good job in the protection of building forms and structures, and make various elevations and video records to create favorable conditions for the development of follow-up work.

2.2 Research Subject Area
The first is architectural science, which involves quantitative Chinese historical architectural theories. It is not only directly related to the architectural environment theory of building optimization orientation, but also belongs to the category of modern space-time theory. The second is landscape science, which can reflect the intersection of landscape science and architectural engineering science. At the same time, it combines ecological protection measures and architectural craftsmanship measures to present the multiple values of the landscape. Besides, it is combined with the humanistic environment to construct patterns in different time and space scales. The process is mainly human-led, and a new central theoretical framework is developed to make the layout of landscape sketches and landscape planning more feasible. The second is computer science. This type of research mainly combines computational science with software science and information processing. The main applications are AutoCad, Photoshop, and so on. In order to show the role of virtual reality technology in the protection of historical buildings, people can use mixed reality and augmented reality technology to design new virtual restoration policies and restoration systems. In addition, we can also simulate restoration technical animations through three-dimensional models to strengthen the safety of historical building protection and reduce the difficulty of restoration.

2.3 Matters Needing Attention in the Application of Virtual Reality Technology
When the statistical work of historical building facades and jewelry collection is completed, we can gradually establish a three-dimensional simulation model and apply three-dimensional virtual model technology to comprehensively process it. First, people can determine the accuracy of the specific virtual reality model and its specific location, and set the corresponding level. In the research process of this paper, two standard execution models are mainly designed. That is, panoramic browsing and bird's-eye view. Due to the large number of models in a specific scene, the staff should choose rough models as much as possible to reduce the number of operations. When part of the building is walking through or entering the interior, we need to show the architectural details. At this time, in order to facilitate the development of related work, we can establish a close-range precision model. Under normal circumstances, both close-up and long-range models need to be made in a 1:1 ratio. Meanwhile, we also need to carry out the creation work with the help of detailed architectural drawings.

3. Protection Content of Historical Buildings Based on Virtual Reality Technology

3.1 Historical Building Restoration
The application of virtual reality technology makes the restoration of the entire historical building more feasible. Moreover, the application advantage of this technology in the restoration of historical
buildings is very obvious. In the continuation of history, these buildings have experienced a lot of baptisms. This has caused some historical buildings to be incomplete, building components are gradually aging, and the actual building appearance has undergone various degrees of reconstruction. In this process, the application of virtual reality technology can help people restore the original appearance of historical buildings on this basis. Especially for those building components that have been dismantled, they can also be rebuilt with the help of virtual reality technology. In addition, it can simulate the perception of historical buildings in the real environment to the greatest extent, providing guidance for subsequent maintenance work.

3.2 Promote Historical Culture by Displaying Virtual Historical Buildings
The virtual historical buildings constructed with the help of virtual reality technology can not only strengthen the display of historical buildings, but also increase the propaganda of historical culture. At the same time, it also allows people to understand the internal information of historical buildings with the help of computers and mobile phones. Moreover, the people can also add some new decorations and furnishings to the virtual historical buildings to assist in the detailed introduction of historical buildings and stimulate the interest of the viewers. With the help of the above operations, the attractiveness of historical buildings will also be greatly enhanced, creating more memory points and increasing their influence. This will not only create more favorable conditions for the subsequent propaganda of historical and cultural functions, but also attract more capital to realize the activation of historical buildings.

3.3 Application of Virtual Reality Technology in Surveying and Mapping of Historic Buildings
The data obtained during the actual surveying and mapping work can be used as the premise and basis for the final establishment of a digital protection mechanism for the protection and maintenance of historical buildings. At the same time, we also can apply 3D scanning technology. Firstly, we can build virtual historical buildings with the help of the collection of specific environmental information. Secondly, we are able to use computer virtualization technology to realize automated measurement operations on virtual historical buildings. Thirdly, we are supposed to analyze the data accurately, and present the advantages of high fidelity and visualization of the data. Finally, we can use the three-dimensional model to reproduce historical buildings, so that its spatial location will become more accurate and reliable, which will help further improve its surveying accuracy. Simultaneously, this is the essence of the improvement of surveying and mapping efficiency. Generally speaking, through the application of virtual reality technology in historical building surveying and mapping, data recording, data analysis and other tasks can be combined to establish a new work system to provide sufficient basis for subsequent building maintenance.

4. Historical Building Maintenance Based on Virtual Reality Technology

4.1 Maintenance Features
Most historical buildings have experienced long-term erosion, coupled with natural decline and man-made damage, some historical buildings have experienced obvious decline. Therefore, the staff need to perform corresponding maintenance operations according to the actual situation, which is also the basic requirement for extending the life of historical buildings. Besides, the maintenance work of historical buildings is mainly a process of "defying illness and prolonging life" of historical buildings. Its complexity is strong, and the actual construction methods and organizational procedures have the characteristics of variability and diversity. Each worker can use virtual reality technology to combine multiple links of historical building maintenance projects to build a three-dimensional model. This is also the basis for presenting the engineering environment, engineering structure and architectural decoration. Moreover, staff in different positions need to complete their own tasks to enhance work efficiency. With the help of the above operations, the accuracy of historical building maintenance and construction efficiency can be improved. In addition, through the feasibility analysis of the specific
protection methods of historical buildings, we are able to determine the effectiveness of various historical building maintenance and construction plans. At the same time, this can also effectively improve the maintenance level of historical buildings.

4.2 Master the Specific Situation of the Project
Historical building maintenance projects have the characteristics of multiple procedures and time-consuming. The actual construction process is also easily affected by factors such as environment and weather. At the same time, historical building maintenance projects involve many construction links, and there are also great connections between various maintenance links. As a consequence, once a problem occurs in one of its links, the overall construction quality and progress will be greatly affected. To this end, the staff can use virtual reality technology to allow maintenance personnel to correctly grasp the surrounding scenes or mechanical equipment. Furthermore, maintenance personnel can also establish a dynamic performance virtual construction environment to reasonably predict possible problems during the work process. More importantly, people have to conduct experimental operations on the whole process of construction and production according to each link in the maintenance and construction. In addition, maintenance personnel should also carry out construction simulation before construction and input engineering data into the computer system. In this way, we can realize the intelligent evaluation of relevant data, formulate a more excellent construction plan, and select the best construction strategy and construction sequence.

4.3 Reasonable Brake Maintenance Plan
The construction plan made by virtual construction technology is more reasonable than the one made manually. It can not only comprehensively consider a number of construction factors, but also combine project cost and construction time. After effective calculation, it can determine the most cost-effective construction plan, so as to provide construction personnel with a reasonable work direction. At the same time, the construction of the system also involves the arrangement of multiple maintenance and construction links. While clarifying the undertaking relationship of each link, the construction undertaking process is simulated to ensure that each maintenance and construction link can be carried out step by step, and there will be no stoppage and quality problems due to the connection of the construction links. In general, virtual reality technology mainly strengthens project management and construction efficiency by simulating historical building maintenance models and construction processes. Furthermore, while saving costs, it reduces the risks of maintenance projects. With the continuous development of this technology, the application prospects of virtual construction technology in the maintenance of historical buildings are becoming wider and wider, and it can make historical and cultural inheritance more effective.

4.4 3D Virtual Environment Modeling
Generally speaking, the main subsystems involved in a virtual reality system are vision, hearing and touch. The digital reconstruction of the entire 3D virtual environment model is also the focus of the realization of virtual reality. The quality of the specific model can have a great impact on the subsequent operation effect and fidelity. Due to the different construction methods of virtual scenes, the actual 3D virtual scene modeling methods mainly involve the following aspects. First, with the help of modeling software to achieve geometric modeling. Second, modeling technology based on graphics and images. First of all, the image-based scene modeling technology mainly uses the specific picture data in the real world to replace the previous traditional modeling technology, and highlights the new rendering effect with the help of picture space transformation. In the actual application process, it is mainly based on computer vision and computer image processing methods to improve rendering speed and realism. This has become a hot topic in graphics, especially the establishment of development space in virtual scenes, which has positive significance for the protection and maintenance of historical buildings. Secondly, in comparison between the two technologies, geometric modeling and image modeling have their own advantages and disadvantages. If the two can be
combined, the conflict between virtual scene images and interactivity can be balanced, and the basic outline of historical buildings can be obtained. After that, image modeling methods are used to introduce corresponding texture maps. In this way, the appearance of the entity will look more realistic.

5. Conclusion
In summary, there is still a lot of room for expansion in the application of virtual reality technology in the protection and maintenance of historic buildings. In the follow-up development, the application of virtual reality technology will also become more in-depth. In order to better present its role, the relevant staff must further enhance their research efforts to solve the problems of fund guarantee and talent training. At this stage, with the continuous development of virtual reality technology, the protection and maintenance of historical buildings has become more innovative.

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