Application of virtual reality technology in the inheritance of cultural heritage

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Abstract. In order to promote the effective inheritance of cultural heritage, it is necessary to break through the traditional way of inheritance, make full use of new technologies and new media, and provide various new channels, models and methods for the cultural heritage. Therefore, the article first analyses the advantages of virtual reality technology in the heritage of cultural heritage; then, it probes into the new way of inheritance under the support of this new technology. Finally, taking the cultural inheritance of Shanxi Datong Huayan Temple as an example, the concrete application method of virtual reality technology in the inheritance of cultural heritage is deeply explored.

1. Introduction
Cultural heritage is the crystallization of human wisdom, contains profound cultural atmosphere, and has a high historical value, cultural value, artistic value and scientific value, it is the common wealth of mankind. Therefore, it is necessary not only to protect cultural heritage, but also to inherit it effectively and spread it from generation to generation. In January 2017, the general office of the CPC Central Committee and the general office of the State Council issued the opinions on carrying out the inheritance and development project of Chinese excellent traditional culture [1]. This opinion points out the importance, necessity and urgency of inheriting Chinese excellent traditional culture, and has made a detailed deployment to protect and inherit cultural heritage. It takes "increasing publicity and education efforts" as an important task.

The development of science and technology, the emergence of new technology and new media have brought new opportunities for the heritage of cultural heritage, and provided a variety of new channels, models and methods. Virtual reality technology, a new technology developed in recent years, is widely used in various fields, and it plays a more and more important role in the protection and inheritance of cultural heritage. The use of virtual reality technology can provide a new effective way for the heritage of cultural heritage.

2. Advantages of virtual reality technology in the heritage of cultural heritage
In general, virtual reality is a kind of artificially created by modern high-tech with computer technology as its core. It is a virtual environment with realistic sense of vision, hearing and touch [2]. Users can use special input and output devices to interact with the virtual environment in a natural way, perceive and manipulate objects in the virtual world in real time, and gain immersive feelings and experiences [3]. Using virtual reality technology can better protect and inherit cultural heritage.
2.1. Virtual reality is conducive to the overall protection and inheritance of cultural heritage

Many cultural heritages are a whole in itself. According to traditional protection and inheritance methods, they are usually displayed in museums. However, once the cultural heritage is divorced from its original living environment, it will cause the separation of the overall concept, which is a damage to the characteristics of the cultural heritage itself [4][5]. Using virtual reality technology, we can construct "experience Museum" to restore and reproduce a comprehensive and complete virtual simulation legacy space. In this way, cultural relics can be restored to its virtual original environment. Viewers can use virtual reality related devices to roam in the virtual cultural heritage space and experience the overall effects of cultural heritage, thus giving full play to the educational role of cultural heritage. For intangible cultural heritage, traditional methods of protection and inheritance such as character interview, text recording, articles collection, photography and video recording are usually adopted. Although these methods have preserved a large number of precious intangible cultural heritages, the mildew of the books and the aging of the videotape can easily distort the information. And like cultural heritage such as cultural relics, the intangible cultural heritage is often difficult to protect as a whole once it leaves its environment of formation and development. Virtual reality technology can not only make the related information of intangible cultural heritage safe and long through action capture, 3D animation, etc., but also can be displayed and spread in a new digital way, such as 3D virtual games, 3D animation, etc. [6]

2.2. Virtual reality can avoid the damage and corrosion of cultural heritage in the process of research, exhibition and inheritance

Virtual reality technology can establish three-dimensional digital model for material cultural heritage to record real and accurate shape information and texture information. The researchers can use the three-dimensional model to measure and analyze the cultural heritage, analyze the details of the cultural relics without direct contact with the cultural relics, assist the research work; Visitors can observe the details of the cultural relics from various angles in the virtual scene through virtual display and other techniques. The visit process is no longer restricted by the time and space of the exhibition. In this way, people's understanding of cultural relics is increased while reducing physical contact. At the same time, the three-dimensional digital model also provides important data support for restoration and improvement of damaged cultural relics.

2.3. Virtual reality broadens the heritage path of cultural heritage

Through the virtual reality technology, the three-dimensional model of material cultural heritage can be constructed, and it can be displayed in all directions and angles. The multimedia, interactive roaming scene or game scene created by the virtual reality technology can make the audience close to the cultural heritage, feel the historical culture, the customs and the artistic value of the cultural heritage, and make the audience more interested in it. For sites and remains that have not been excavated or annihilated, virtual reality technology can be used for virtual reproduction based on archaeological research data and literature records. Virtual reality technology can be used to create a virtual museum to facilitate the protection and dissemination of cultural heritage. In addition, the use of virtual reality technology to digital protection of cultural heritage, more conducive to a rapid and efficient cultural transmission through the network, to realize the sharing of resources, so that more people understand the culture of the region.

2.4. Virtual reality has expanded the way of industrialization development of cultural heritage

Through virtual reality technology, we can display and deduce the stories contained in the cultural heritage, the current situation or the possible events that may appear in the future, and make use of the interactive technology to let the tourists participate in it, stimulate the interest of the tourists, and combine the virtual situation with the real scenic spots to promote the tourism industry. It will further promote the spread of cultural heritage. For the intangible cultural heritage from the literature and the word of mouth, the virtual reality technology can be used to carry out the lifelike and three-dimensional
development of the intangible cultural heritage, forming the industrial chain of animation games and 3D literature and television, thus promoting the development of the cultural industry and promoting the spread of the intangible cultural heritage.

3. A new way to inherit cultural heritage based on Virtual Reality Technology

With the support of virtual reality technology, a new way of cultural heritage has emerged.

3.1. 3D dynamic display

The three-dimensional model of material cultural heritage can be constructed by virtual reality technology, which provides a simulation, Omni-directional and three-dimensional model for visitors, which is convenient for study and research. In addition, 3D animation technology can be used to dynamically display 3D models and attract tourists' interest in a more vivid way. This method is more suitable for the display and inheritance of material cultural heritage.

3.2. Virtual reality system

The multimedia and interactive roaming scenes created by virtual reality technology can make visitors close to the cultural heritage and feel the historical, cultural and artistic values of the cultural heritage. This method is suitable for the inheritance of material cultural heritage. In addition, people can play the role play through virtual games, participate in it, and understand the way of culture, the construction process of cultural heritage and so on. Whether the material cultural heritage or intangible cultural heritage can be designed according to the content of inheritance into three-dimensional virtual game, so that it can be passed on.

3.3 Digital museum supported by virtual reality

With the development of computer technology and other related technologies, the functions and browsing forms of digital museums have also undergone great changes. From the early introduction of graphics and texts, it gradually evolves into three-dimensional virtual scene roaming and interaction supported by virtual reality technology. Using virtual reality technology, it can not only show the three-dimensional simulation model of cultural relics, but also can "roam" in ancient buildings or sites, and feel the charm and shock of ancient buildings or sites.

3.4. Somatosensory Technology

As a new human-computer interaction, somatosensory technology controls the operation of computer applications by identifying human body posture, arm movements, and movement trends [7]. Compared with the traditional human-computer interaction based on the mouse and keyboard, it is more likely to arouse people's interest, and has a good application space in sports training, rehabilitation training, and simulation operation and so on. It is suitable for the inheritance of all kinds of cultural heritage.

The somatosensory technology can be combined with the modeling technology of virtual reality, digital image and so on to construct the digital model of cultural heritage for users to browse and practice. It is especially suitable for the study and inheritance of practical cultural heritage. For example, for ceramic culture, clay sculpture and other cultural heritage, we can use somatosensory technology to build a somatosensory game or training system for inheritance. Users understand, learn and practice these cultural heritages through body gestures or gestures. In addition, the classic characters and movements of traditional drama are designed and made by using three-dimensional animation. With the help of somatosensory technology, the correspondence and connection of the action of the user's body and the drama role can be realized, and the study and training of the drama can be carried out, and the inheritance of the traditional drama can be realized well.

Somatosensory technology can also be combined with immersive virtual reality technology to construct large-scale immersive virtual reality system, let users play historical roles, integrate into the three-dimensional virtual historical scene, and "personally feel" the social life of the cultural heritage in
the origin of the age, so as to promote users' in-depth learning and understanding of the connotation of cultural heritage.

3.5. 3D printing technology

3D printing is the opposite of the traditional material cutting method. By adding material, 3D model data, and layer by layer manufacturing, the manufacturing method of three-dimensional physical entity model which is exactly the same as the model in the computer is made. It takes the three-dimensional model of the object in the computer as the blueprint, through the software for stratified discrete and numerical control molding, using the laser beam, the hot melt nozzle and so on, the metal powder, ceramic powder, plastic and other materials are stacked and bonded layer by layer to produce solid objects[8].

The emergence of 3D printing technology is of great significance for the protection and inheritance of cultural heritage. In the inheritance of cultural heritage, the 3D model of cultural heritage (such as site sites, handicraft instruments, etc.) can be constructed by using virtual reality modeling technology, and then printed with 3D printing technology to facilitate learning and inheritance. Even if the cultural heritage has disappeared, we can build its 3D model according to historical records.

4. The application of virtual reality in the inheritance of cultural heritage education

The establishment of three-dimensional model is the key to inheriting cultural heritage by using virtual reality technology. After establishing the model, we can use a variety of inheritance ways to carry on the effective inheritance. For example, combined with video technology, the 3D model is integrated with audio, special effect and text introduction to form a comprehensive digital video; the 3D model is applied to the virtual reality roaming system for roaming display; the 3D model is put into the virtual museum; the 3D model is made into 3D animation; the 3D model and the somatosensory technology are combined to construct an immersive virtual reality system, and the 3D printer technology is used to print the entity model, so as to fully understand the concrete structure of the model and so on.

Next, we take the 3D roaming animation of Huayan Temple in Datong, Shanxi as an example to explore the specific application methods of virtual reality technology in education inheritance.

The Huayan Temple is an early and well-preserved temple complex of Liao Dynasty and Jin Dynasty in China. It was announced by the State Council in 1961 as the first batch of national key cultural relic's protection units. In 2014, it was approved as a national AAAA tourist attraction.

In the design of Huayan Temple 3D roaming animation, we first need to collect relevant data from buildings and collate the data, and draw the CAD plan of Huayan Temple based on the data. Then we use 3ds Max software to model the building. After the model is completed, it is necessary to add materials to the model and integrate scenes. Then we need to add cameras for the scenes, make roaming animation, export into AVI format. Finally, complete the works in Premiere video editing software, including titles, ends, background music, text descriptions, and commentary and so on. Let visitors browse along with the camera lens, and through the explanations and texts, they can understand the history, structure, and other knowledge of Huayan Temple, and can produce certain immersive feelings.

In the process of modeling, the main methods are geometric modeling, 2D modeling, polygon modeling, texture modeling, and Boolean operation and so on. The overall effect of the 3D model of Huayan Temple is shown in Figure 1.

![Figure 1. The overall rendering of the 3D model of Huayan Temple.](image-url)
The 3D virtual walkthrough animation of Huayan Temple is mainly produced by the movement of camera in 3ds Max. The production of movie titles in the virtual scenic spot of Huayan Temple mainly uses Premiere software. First import the material picture, music, commentary, and the newly created animation into the library panel; then drag in the animation in the serial number 01, and clip it. Synthesize animations, music, and commentary, add key frames for audio and commentary files, and adjust the volume. Finally, the previously selected pictures are arranged in order and dragged into the video track, and video transition effects are added to the pictures in turn, and the video is exported to the .flv format.

The process of late synthesis is shown as shown in Figure 1.

5. Conclusion
The development and innovation of the heritage of cultural heritage is an important strategic task to improve our cultural soft power, to improve the cultural quality of the people and to build a powerful socialist cultural power. The support of new technology has brought new opportunities for the development of cultural heritage. The article gives an in-depth analysis of the role and advantages of virtual reality as a new technology in the inheritance of cultural heritage, as well as the new methods of inheritance that have emerged under its support, and discusses in depth the application of this new technology in the inheritance of cultural heritage. Virtual reality technology is not only conducive to the overall protection and inheritance of the cultural heritage, it also avoids the damage and corrosion of the cultural heritage inherited from the inheritance, and it also broadens the inheritance path and industrialization development path of the cultural heritage. With the support of virtual reality technology, a variety of new ways of inheritance of cultural heritage have become more suitable for the needs of the age of network and information, which will inevitably promote the inheritance of cultural heritage.

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