

# The Role of VR Technology in Cultural Preservation in Museums

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**Abstract:** In China, there is currently a problem of insufficient cultural preservation in museums. In the context of the digital age, using emerging technologies such as virtual reality (VR) to innovate museum display modes and interactive methods can bring visitors an immersive experience and deepen their understanding of museum culture. From this perspective, the combination of museums and VR technology can better play its social and educational functions.

**Key words:** VR; Cultural preservation; Virtual reality museum

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## 1. Introduction of Virtual Reality and its Development Process

In 1949, the concept of virtual reality was first proposed in *Pygmalion's Glasses* by American science fiction writer Stanley Weinbaum. This book describes that as long as the protagonist wears glasses, he can be immersed in a movie that can simulate vision, hearing, taste, smell and touch. In the 1950s, American photographer Morton Heilig invented the first VR device, Sensorama, which is very large and has a fixed screen. It has three dimensional stereo, 3D display, vibrating seat, fan and odor generator. It can be seen that in the early days, people's understanding of virtual reality was not limited to vision. In 1960, he submitted a patent document with a more ingenious design which brought the fantasy device in Weinbaum's novels to reality. From the appearance, the design of this set of VR equipment is very similar to that of modern VR glasses. However, it does not have a posture tracking function. In other words, when people wear it and look left and right, the scene in the glasses will not change. In 1968, American computer scientist Ivan Sutherland invented a set of VR equipment. This kind of VR glasses achieved the preliminary posture detection function through ultrasonic and mechanical axis. When the user's head posture changes, the computer will calculate and display the new graphics to the user in real time.

## 2. Virtual Reality Museum

The combination of VR and museum can effectively solve the contradiction between exhibition and preservation of cultural relics, expand the cultural connotation and extension of cultural relics, virtual restoration and digital preservation of cultural relics.

### 2.1 Principle of Virtual Reality Museum

With the three dimensional virtual function, a complete virtual museum is made by copying the museum building and collection. The cultural relics in the scene of virtual museum are digital relics with high authenticity corresponding to the real cultural relics in the physical museum. This virtual museum can be "moved out" for touring exhibitions at any time, which can maximize the role of the museum in the dissemination of knowledge. This virtual museum can be displayed without time and place restrictions, and there is no danger of being destroyed or stolen because all the exhibits and scenes exist on the server.

### 2.2 Development of Virtual Reality Museum

Museums have great social and economic value. As an integral part of social education, the museum provides the public with learning opportunities for close contact and learning resources with their own characteristics. That is the reason why museum is known as the second classroom of national education. The emergence of modern museums is closely related to the European Renaissance and the Enlightenment Movement. It is the result of the people's demand for equal rights at that time. It embodies the idea that knowledge and rare cultural relics cannot be exclusive, but should be shared by the public. At the same time, the museum itself creates considerable employment opportunities. It has a natural connection with the cultural and creative industries, and facilitates the development of service industries such as transportation, catering, retail, design, and publishing. Generally speaking, museums are the common wealth of all mankind.

With the rapid development of information technology, the most effective way to meet the multi-level and multi-directional needs of the public is building a virtual museum through the use of virtual reality technology and network technology which breaks the limitations

of physical museums and maximizes the function of the museum. For instance, a large-screen display system is set up in the physical museum as a special means to introduce and publicize cultural relics. Museum can also place a three dimensional display touch screen terminal next to the physical cultural relic, or hang a three dimensional display device at the necessary visitor guide. After logging in to the virtual museum system, visitors can interact with the digital cultural relic, watch the high real digital cultural relics from any angle, and obtain a large amount of information that is usually not available from physical cultural relics. With the continuous development of VR technology, more and more museums have begun to use VR and established various digital museums, allowing visitors to contact and observe the original appearance of cultural relics through electronic devices, and experience the life and culture of ancient human being. This collision of high technology and culture has ushered in an experience upgrade for the museum.

### **2.3. Application of Virtual Reality Museum**

The Capital Museum, China hold a special exhibition for the 40th Anniversary of the archaeological excavation of the tomb of Fuhao in Yin ruins. Just in front of the sand table for the restoration of Fuhao tomb, eleven sets of VR glasses can help nearly a thousand visitors to see through the virtual excavation site in the Fuhao Tomb every day. This is the first time that Capital Museum has used virtual reality technology to extend the exhibition content. In fact, archaeological excavations over 40 years ago found that the tomb of Fuhao was buried in layers. That is, different buried objects are buried at different depths underground. However, with the progress of archaeological excavations, except for the deepest layer, the remaining layers no longer exist. It is difficult for people to restore the scene at that time based on text narration alone, so the Capital Museum thought of restoring it with VR technology.

The Palace Museum has been at the forefront of the cultural museum industry in the exploration of new technologies. As early as 2003, the Palace Museum established the Research Institute of digital application of cultural assets of the Forbidden City. The first work to be shown to the public was the *Forbidden City: the palace of the emperor*. In 2018, to celebrate the 92<sup>nd</sup> anniversary of the Palace Museum in Beijing, the theme digital experience exhibition was set up in the Palace Museum. Visitors can experience the interaction with important officials in the imperial court through a variety of technologies, such as large projection screen, VR helmet, somatosensory capture device and touch screen, so as to understand history in an interesting way.

In recent years, VR 720° panoramic display technology is a new visual technology which is developing rapidly and becoming popular all over the world. Panoramic images are derived from the photographic capture of real scenes, which have a strong sense of reality. It brings a new sense of presence and interaction to people. With the application of VR panoramic display technology, AR intelligent explanation technology, Internet-of-Things and other modern technologies, the combination of VR and Museum breaks through the limitation of traditional museum, such as display time and space, so that the audience can easily visit and understand the museums in different regions at any time, and upgrade the visiting experience. There is no doubt that the online virtual display becomes the most effective supplement and continuation of offline museums.

### **2.4. Influence of Virtual Reality Museum**

VR project products of cultural relics are mainly intended for display, science and education, and cultural promotion. It is undeniable that the combination of VR and museums has a lot of positive effects. First, resolve the contradiction between the exhibition and preservation of cultural relics. In the museum, in order to protect the ancient cultural relics from being damaged, they must be stored in the display cabinets. Due to the distance limitation of the exhibition cabinets, visitors cannot observe closely the details of the exhibition objects, nor can they see their parts hidden by the display cabinets. The virtual museum can use three dimensional modeling technology to truly restore cultural relics in a virtual environment, which not only protects precious cultural relics, but also enables visitors to have close contact with cultural relics. Second, expand the cultural connotation and extension of cultural relics. Cultural relics are historical accumulations, and their cultural value is far greater than the value of the artifacts themselves. In addition to displaying cultural relics, museums play a more important role in conveying cultural connotations. Using VR, visitors can experience the culture, the history and the story which contained in cultural relics by means of scene reappearance, story restoration and situation guidance. Third, the virtual restoration and digital preservation of cultural relics. Cultural relics have high collection and archaeological value. But time is merciless, even if you take care of it, brittle, discoloration, and peeling and other phenomena will often occur. The use of virtual reality technology can display, protect and repair cultural relics. At the same time, cultural relics can also be stored digitally. The application of virtual reality technology in museums has played an important role in the preservation of cultural relics, the restoration of history, and better education and social functions. Through the VR museum, these historical records can be preserved permanently, allowing us and more people in the future to understand the past that has been far away from us. In general, VR can effectively promote the benign interaction between the

user, the environment and the cultural relics.

However, we should also be aware of the difference between VR museums and offline physical museums. First, the difference in perception. The perception methods of virtual museums are mainly “eyes to collection models” and “ears to speakers”. In physical museums, in addition to “eyes to physical objects” and “ears to various sound sources”, physical movement of the body also occurs. Then, the difference in interpersonal relationship. When investigating museum exhibitions, one should not only focus on the “exhibits to audience” relationship. The relationship within physical museum exhibitions is much more complicated. For instance, the relationship between each member of the group audience, and the relationship between the interpreter and the audience. Both of them have a subtle influence on the visit. However, the current virtual exhibition has little to do with the interpersonal relationship. What’s more, difference in the ethical level. Humans perceive external things and generally regard physical artifacts as “real”, in the other words, objects. The model displayed in the virtual museum is a reflection or representation of the physical object, which is not so real when compared with the physical object. This difference in authenticity will have a certain impact on the experience. In addition, the virtual model of the exhibit actually records a time point of it. Assuming that the exhibit has changed thereafter, the authenticity of the virtual model will be decreased.

### 3. Conclusion

Using the new technology and the inherent resources of each museum, we can develop personalized, exquisite and practical souvenirs and gifts of cultural relic elements to meet the diverse needs of different tourists, deepen the understanding of museum culture and facilitate the dissemination of traditional culture. From this point of view, with the addition of VR, museums can better perform their social and educational functions and become more dynamic.

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