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Virtual Reality-based Approach to Digital Museum Display

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Abstract

Because of the deep historical significance, artistic and archaeological value of cultural relics in museums, they need to be preserved intact and actively displayed and disseminated to the public. Through the display and dissemination of cultural relics, the public can feel the profound cultural heritage of our country and enhance the cultural confidence of the public. At the same time, to enrich the public's cultural knowledge. Therefore, museums need to do a good job of displaying and disseminating cultural relics. In the digital era, museums need to innovate the display and dissemination methods, using digital technology for the display and dissemination of cultural relics, so that the display and dissemination methods can achieve diversity, vividness and freshness, bringing a better sense of experience to the public. Museum culture using digital technology for display and dissemination is to follow the trend of the times and is bound to gain new development. In the display and dissemination of museums, it is important not only to think about how to maximize the dissemination and display of the cultural value of cultural relics, but also to take into account the audience's viewing needs and bring a vivid viewing effect to the audience. To achieve this effect, a multi-layered exhibition perspective is required, using a variety of technologies to achieve new breakthroughs in visual images, spatial environments, sound and color, and to do a good job of designing the exhibition to ensure that it is intelligent, integrated and networked. It enables the audience to realize the autonomy of viewing and to appreciate the deeper meaning behind the cultural relics.

Keywords

Virtual reality, technology, museums, digitisation

1. Introduction

The rapid development of digital technology has also opened up more possibilities for museums to 'show their powers': digital collections, panoramic viewing, AR pop-ups ... have become new ways for many museums to lead visitors across different cultures and eras and talk to cultural relics with ease. In the past, museums tended to focus on static displays, with cloud exhibitions existing only as a supplement to physical arrangements. As the development of physical museum exhibitions has been limited, digital construction has become the necessary path for museums to play a role. The scene in traditional museums is often one of the visitors looking at obscure textual descriptions to learn about cultural relics. With the advent of the digital media age, history is revitalized through new media technology, allowing interaction between the artefacts and the audience, immersing the visitor in it and stepping into history. As time settles in, this experience of interaction between visitors and artefacts will not be easily forgotten, and this is the beauty of digitalization. In order to create a unique experience between visitors and heritage, it is necessary to combine the human senses with the characteristics of the heritage itself and various forms of expression,

such as 3D Mapping projection technology, VR, XR, phantom imaging systems, multi-channel projection splicing and fusion technology. All these technologies often require sound to create a perfect space, thus achieving another aural breakthrough from zero to one. In museums and beyond, technologies such as virtual reality and augmented reality are bringing experiences that are fresher, more immersive and blur the boundaries between the virtual and the real than traditional media technologies, and these are becoming dominant in the technologized experience of digital society, thus constructing a new imaginary of the individual and the world they live in. In the trend towards the symbiosis of the virtual and the real, combine digital explorations on site and online to create a digital experience of the museum in presence, while constructing a digital scene of cultural imagination that extends in a new tactile way [1].

2. Introduction to virtual reality technology

Virtual reality technology generally consists of two main elements: virtual reality (VR) technology and augmented reality (AR) technology. Virtual reality (VR) is an important direction of simulation technology, virtual reality technology (VR) is to immerse people in a completely virtual space through technical equipment, its most important feature is that the space things that users perceive and observe are all virtual, which does not include the real space; augmented reality (AR) is to let users feel in the combination of virtual environment and real environment through technical equipment. The main feature of AR is that it combines virtual images with the real environment, and the combination of virtual images and real space forms the spatial things that users perceive and observe. The application of virtual reality technology is primarily experiential in nature, engaging the viewer with an experience that combines action behaviour and active thinking to enhance memory and improve cognitive abilities [2]. Using new technologies often creates a deep impression and a rich experience for the audience. Theoretically virtual reality technology can fully simulate the full range of human sensory stimuli, making it difficult to distinguish between the real and the fake in virtual reality, and doing so in a way that captures the audience's attention and engages them wholeheartedly. The development and application of virtual reality technology has led to an increasing variety of forms of interaction, with interactive devices that are not even 'visible'. Virtual reality systems recognize the user's actions through motion capture, voice recognition and eye tracking, and provide real-time feedback through sensing devices. The variety of communication tools adds interest and interactivity to museums, expanding the scope for subjective viewing of exhibits and facilitating the transfer of information from fragmented collections to continuous stories.

3. The necessity of digitizing museum resources

Museums are not only a critical material carrier for human beings to pass on the essence of Chinese history and culture and for people to remember that period of history but also an essential social and educational venue for the general public to gain a deeper understanding of and systematically learn about Chinese history and culture, playing an important role in the popularisation of history and education. Digital museums can make full use of modern digital audio-visual technology to provide all visitors with a new experience for the senses China's digital exhibition technology popularisation and information society technology rapid application of the development of the historically inevitable and product.

(1) Museum cultural resources digitization is an essential carrier of historical heritage; one of the current administrative and social functions of museums is to record historical information and discover the heritage of national history and culture and is a critical activity venue for the construction of current mass socialist spiritual civilization activities. Due to the influence of time and space, many important historical and cultural resources and precious material carriers are in danger of disappearing. Museums play an increasingly important role in studying and preserving these precious cultural relics from ancient times. Modern digital museums can effectively make up for some of the functional shortcomings of traditional museums and play a more important role in our overall system of protecting all types of important cultural heritage, especially in national intangible cultural heritage projects. Traditional physical museums allow visitors to experience the development of China's social history and historical and cultural deposits through the physical display of artefacts, which showcase the conventional handmade craftsmanship of China. However, physical museums are subject to multiple constraints, such as historical, social, and spatial conditions, such as opening and closing days and other special time requirements visitors are often unable to. In addition, critical cultural relics cannot be displayed in a centralized museum collection. The widespread use of modern digital multimedia information technology platforms will solve these particular problems effectively, breaking through the limitations of time and space and realizing the museum's "real-time field" digital visit.

(2) The digitization of museum cultural resources to achieve the sharing of cultural resources. Museum resources in the digital multimedia museum digital exhibition hall space construction should also focus on the use of digital multimedia, information networks, three-dimensional digital, three-dimensional, virtual digital three-dimensional animation system and other new digital exhibition hall technology, more three-dimensional complete display and preservation of traditional museums and their valuable and rich collection of ancient cultural relics data and resources. The comprehensive digitalization of the museum website construction is mainly through the museum network to build a resource sharing network platform, to achieve a variety of museums around the world, including all kinds of museum resources platform information disclosure and sharing, visitors can through the Chinese museum network home page to keep abreast of the latest developments in the domestic and international museum network resources, booking all kinds of museums online exhibition visit, for many professional visitor groups and all kinds of people. It provides a more professional and convenient online information search service for professional museum researchers and institutions. The museum can directly use a variety of modern advanced multimedia technology, the museum's various collections of physical content of three-dimensional simulation and three-dimensional effect display, so that each visitor to the information felt closer to the real, more realistic and strong feeling effect. The museum can also use 3D 4D images and holographic 3D scanning and other multi-dimensional technology to simulate and reproduce various historical events and scenes of social and historical evolution, so that the majority of domestic and international visitors can also have an immersive visual intuition, a more vivid and complete three-dimensional understanding of the development of Chinese history and culture, and enhance the cultural connotations to be conveyed by the exhibits' physical images. The effective use of multimedia technology not only greatly expands the scope of traditional museum exhibitions and activities, but also effectively enhances the personal experience of the general public, changing the monotony and dullness of traditional museum exhibitions and attracting more people to come and visit.

(3) The construction of digital museums has furthered the function of popularising traditional culture and science education. As a civil public welfare organization, museums carry a number of important missions such as spreading traditional national museum culture and promoting core socialist values. Traditional museums are limited by many factors such as manpower, funding and environment, and mission and education managers are in very short supply, making it difficult for them to fully and effectively play their role in social services and education. The construction of the digital museum project has broken through the time and space constraints of the exhibition hall, extending the traditional museum's original cultural and social education and research functions beyond the exhibition site. By redesigning and creating a modern, multi-functional digital museum exhibition and information platform that integrates multimedia digital text, sound, image and animation technology applications, the museum creates a diverse open and interactive environment for the wider community to visit and tour, combining the museum's content with richer, clearer and more three-dimensional multimedia digital audio-visual displays. The dynamic museum's content presents a richer, clearer and more three-dimensional multimedia digital audio-visual display and dynamic video effects, bringing visitors a new visual feast and sensory visual experience. By visiting a digital multimedia museum, visitors can more fully experience the novelty of digital exhibitions and overcome the old monotony of the traditional museum exhibition system by using digital multimedia technology to innovate and upgrade the existing museum exhibition system.

4. Problems facing the digital development of museums

Many museums have blindly digitized their collections for the sake of pursuing digitization, with a single dynamic interpretation of the collection, and even a uniformity in technical forms, such as curved curtain, 3D virtual imaging, 3D Mapping projection, VR glasses, interactive screens and other technologies applied without innovation, with serious homogenization of content, gradually departing from the original intention of creating a digital museum. Traditional physical museums allow visitors to experience the development of China's social history and historical and cultural deposits through physical displays, which show the traditional Chinese handmade craftsmanship behind these relics. In addition, important cultural relics cannot be displayed in a centralized museum collection. The widespread use of modern digital multimedia information technology platforms will enable these special problems to be solved effectively, breaking through the limitations of time and space to achieve a 'real-time field' digital museum visit. As a new development concept, museum management in the digital age is not yet fully understood and widely accepted by museum practitioners at the grassroots level across the country. In actual management, the use of various digital, information technology tools to achieve direct control and open display of various types of heritage collec-

tions is not only a need for heritage collection management, but also an innovation in the management of the existing national museum business operations process. In the direction of heritage galleries and exhibitions, due to the museum staff on a variety of digital heritage information display system infrastructure technology awareness is not deep enough, on a variety of modern display equipment is not very familiar with, can not be well all kinds of cultural relics related information through a variety of multimedia display equipment to directly convey the display to the social audience, easy to cause the impact of the public on all kinds of cultural heritage information cognition is not deep enough. Digitization has been labelled as a showstopper since some time ago. In the pursuit of cool, novel digital effects, major museums have ignored the actual needs of their audiences. Many devices are challenging to operate and have cumbersome interfaces, contrary to the original idea of communicating the connotations of cultural heritage in a comprehensive and detailed manner. Visitors are also required to download different museum-specific apps or log on to other digital media platforms before visiting different museums, resulting in a waste of digital resources and boredom of visitors.

5. Strategies to improve the digital display of museums

5.1 Static planimetry

Static plane processing technology is primarily a process of achieving virtual imaging of a museum's culture. First, physical artefacts are first scanned and processed using equipment such as scanners and cameras to obtain image information. Then, the image information is processed, modified and embellished. Finally, the modified images are stored in a computer database. For some cultural relics that need to be sealed and preserved, and cannot be listed for display, but have a certain historical and cultural value. This technology can be used to convert the artefacts into static images to be presented to the audience. For example, paintings, woven clothes, silk and other precious cultural relics need to use this technology in order to avoid air oxidation. In addition, physical exhibitions due to some cultural relics have defects, or display space is too small, there is no way to show the full face of the cultural relics of the situation, the use of digital technology can repair the defects of cultural relics, through the image to show all the contents of the cultural relics, to achieve a comprehensive display of heritage information. In addition to facilitating the display of artefacts, this virtual imaging technology also facilitates the dissemination of artefacts. The use of artefacts as a data store enables the data to be used as a publishing resource, aggregating the data and then disseminating it as a digital publication, thus expanding the scope of dissemination, enhancing the public's understanding of the artefacts and attracting more attention [3].

5.2 Stereo imaging technology

The use of digital technology in the display and dissemination of museum artefacts, in addition to virtual imaging technology based on static planes, there is also three-dimensional imaging technology. Stereoscopic imaging technology is mainly to model the museum's cultural relics, in modelling, you can use a variety of ways, such as three-dimensional software, equipment and instruments, images and video information. When modelling with three-dimensional software, mainly using some professional computer software, including 3DMAX, Maya, etc., to carry out various geometric operations on the image of cultural relics, including rotation, translation, stretching, Boolean operations and a series of other operations, and finally create a three-dimensional scene. When using equipment and instruments for modelling, in order to make a three-dimensional display of cultural relics, it is necessary to first use mapping instruments to obtain specific structural data of the relics, then collect the surface sampling points of the relics, form the three-dimensional spatial coordinates of the relics according to these sampling points, and then use the coordinates to generate a three-dimensional digital signal. An important area of research in the current digital graphics community is the modelling and mapping of images or videos. When modelling by using image or video information, a variety of digital graphics techniques need to be employed to bring about changes in traditional geometric modelling. By manipulating and drawing spatial changes in images, traditional geometric modelling can be made more three-dimensional and presented in a more realistic form, enabling image prototypes to be brought to life. Stereoscopic imaging techniques are therefore also suitable for the display and dissemination of museum artefacts.

5.3 Dynamic imaging techniques

In addition to static flat virtual imaging and three-dimensional imaging technology, there are also dynamic imaging technologies. Digital two-dimensional animation, digital flat interactive technology and digital film and television

media technology are the three technologies often used in dynamic imaging technology. In digital 2D animation, the most typical technology is FLASH animation. Graphic interaction refers to the implementation of multiple media interaction functions, while film and video media refers to ordinary video media. Through this system, as well as various digital devices, it is possible to showcase cultural relics that the museum has not been able to display, thus enabling teaching displays and science education in the museum. In addition, as a result of the current epidemic, online exhibitions have become a direction for thinking about future exhibition methods. By building an online website for the museum, information about the artefacts can be displayed on the website, allowing many people to view the artefacts without leaving their homes through the internet. Not only during major security and health events, but also during normal times, the website can be used to alleviate the overcrowding of museums, which makes it difficult to meet the needs of the public. At present, the film industry in China is developing rapidly, and the digital film and television technology behind it reflects that the country is also relatively well developed. In the museum's work of displaying cultural relics, the stories of cultural relics can be transformed into film and television using film and television technology for the public to watch, in the form of documentaries that allow the audience to understand the stories of cultural relics and artefacts [4].

5.4 Virtual Space Technology

VR technology is the use of VR glasses as a carrier to create a virtual cyberspace for the public by transmitting certain data signals to the human brain. Within this virtual space, a world related to cultural relics can be set up for the audience to explore, find the location of the relics, and dig into the historical stories behind them. Using VR technology, it is as if the era in which the artefacts are located can be brought back to life in front of the audience, creating the illusion of going back in time. The use of this technology in the display of museum relics is mainly to allow the audience to immerse themselves in the feelings brought about by the relics and to create a sense of reverence for them. Thus using the artefacts to inspire people to explore the culture behind them and to actively learn about Chinese culture [5].

6. Conclusion

Digital technology has been applied to the display and dissemination of cultural heritage in museums, with the main features being the unification of exhibit information and navigation systems, and a breakthrough in traditional spatial display methods. The use of digital technology in the display and dissemination of museum artefacts has great significance, including responding to the trend of the times, innovating the concept of display design, promoting the development of virtual museums, and promoting the preservation and dissemination of culture. Museum services within the digital operation management system construction is a long development process, not only need to further improve the relevant management staff within the museum of heritage digital, information technology operation and management service awareness, but also further in-depth study of system optimization, the establishment and improvement of the museum within the various management services, digital operation system management system, and gradually realize the operation and management of the heritage industry to standardize The museum's management staff should be proficient in the management of the museums. Relevant management staff within the museum should be skilled in certain digital operations and management techniques to grasp the opportunities for museum culture construction in the information age.

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