

Current Situation of Digital Application of Museum Cultural Heritage in China

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Abstract. This paper summarizes the current situation of digital application of cultural heritage in domestic museums, and divides them into three categories: digital protection and dissemination of cultural heritage, construction of digital platform or digital museum, and digital restoration and storage of cultural heritage. The research combs the application cases of a variety of digital technologies in different cultural heritage, such as the panoramic virtual tour of the Intangible Cultural Heritage Museum in Huaihai area, the interactive design of the Digital Museum of Chinese traditional villages, and the digital display of Taohuawu woodcut New Year pictures. These technologies include virtual reality, three-dimensional modeling, multimedia, etc., aimed at improving the protection, dissemination and utilization efficiency of cultural heritage. At the same time, the paper also discusses the construction of digital museum and the digital protection methods of cultural heritage, and puts forward the prospects for the future development direction, such as the application of augmented reality technology and the construction of automatic classified storage system.

Keywords: Cultural heritage digitization, virtual reality, digital museum, augmented reality.

1. Introduction

There are various digital applications of Museum Cultural Heritage in China. This paper mainly divides them into three categories. The first category is the application of one or more digital technologies to a cultural heritage. The specific applications are mainly the digital protection of cultural heritage and the dissemination and display of cultural heritage. The second type is to build a mature and perfect digital platform or digital museum to realize the protection of cultural heritage and better use of cultural heritage data processing. The third category is the use of digital technology to protect cultural heritage, mainly including digital restoration and storage.

2. Application of digital technology

Zhang Yanfu [1] and others conducted research on the digital display design of intangible cultural heritage museums in Huaihai area, investigated the structural composition of museum collections, found problems in the display of collections in the museum, and proposed the necessity of digital display of resources in the museum. At the same time, different digital display schemes are proposed for different types of intangible cultural heritage. First, through the digital way of panoramic virtual roaming, the intangible cultural heritage of traditional drama is digitally displayed, and Huaihai opera and other dramas are vividly displayed from the network; Secondly, visitors can use virtual reality technology and wear special equipment to make handmade intangible cultural heritage; Finally, the dynamic of traditional sports intangible cultural heritage is captured, and participants can experience the charm of this kind of cultural heritage through online competition. The following four technologies are used in digital applications: 3D scanning technology, virtual simulation technology, virtual reality technology and all media communication technology.

Caofangju [2] and others took the Digital Museum of traditional Chinese villages as an example to realize interactive design of digital information of cultural heritage. Firstly, the design principles are put forward, including interdisciplinary principle, public participation principle, linkage sharing principle and artistic principle. Secondly, the design concept and information architecture extract and reconstruct the massive data information, and reproduce the existing information using visualization.

Finally, the user centered interaction design is realized. The key point of the design is to make the user easy to operate, clarify the interactive process, reduce the user's repeated operations and prevent the occurrence of error opportunities. At the same time, it realizes interactive experience design, including space-time experience design and emotional experience design. Space-time experience design presents a variety of digital results by means of three-dimensional data model, 360 degree roaming and so on, surpassing the space-time limit of real heritage protection. Emotional experience design can promote the good interaction between digital museum and users, and can be stored in the cultural heritage of traditional villages.

Zhangjingyi [3] studied the digital construction of intangible cultural heritage in Luoyang Folk Museum and the application of digital technology in intangible cultural heritage protection. There are five specific applications in total. The first application is to manage the cultural relics collection through the collection management system, which has the functions of collection, cataloguing, management and preservation to store and protect the cultural relics collection. The second application is to show the success of digital construction in the museum through the establishment of a website, so as to better protect and publicize the cultural relics collection. The third application is to use the two-dimensional code technology to build a portable navigation system, which corresponds the two-dimensional code with the collection information and introduction, so that each user has his own guide. The fourth application is the use of touch multimedia technology to display the cultural relics collection. The use of interactive touch screen in the exhibition in the museum can improve the audience's participation and interaction. The fifth application is the use of an automated office system in the digital management of the protection of cultural relics. Both PC and mobile terminals can be accessed normally, so that the problem of remote office can be solved.

Zhu Lin [4] made a digital display of the "24 solar terms". In terms of the digital presentation of cultural heritage, she focused on the design of digital storage methods, information organization forms and the organic combination of a variety of information. Using digital three-dimensional technology, a three act film of 24 solar terms was produced. The film vividly described how the "24 solar terms" were formed, and introduced how the ancestors used the law to carry out agricultural activities, reflecting the important role and influence of the "24 solar terms". Three act film refers to the integration of ground screen, circular screen and dome screen to build a three-dimensional space, high-definition digital image and surround three-dimensional sound effect to give the audience a profound experience.

3. Construction of Digital Museum

Chang Menglong [5] took the heritage of the Palace Museum as an example to design the function of the digital protection platform. First of all, the digital protection of the world cultural heritage of the Forbidden City is elaborated, the value carrier and protection process of the Forbidden City heritage are described, and the functional architecture of the platform is constructed. The architecture has five business modules, namely, the general appearance of the heritage, risk assessment, monitoring assessment, management assessment and annual report. In the functional design of the heritage landscape, which is most closely related to the heritage ontology, in order to better store and use multi-dimensional data, the functional design needs to be considered from many aspects, from data collection and analysis, interaction and visualization to security.

Wang Xiaogen [6] and others took the cultural heritage of Wuxi Museum of industry and commerce as an example to design the mobile learning activities of Wuxi Museum of industry and commerce. The main objects of education and inheritance are senior primary school students in Wuxi. The purpose is to understand the development process and the role of the times of Wuxi National industry and commerce. The structure of mobile learning system is divided into seven layers, from the bottom to the top are physical layer, data link layer, network layer, transport layer, session layer, presentation layer and application layer. The physical layer is mainly the learning place, which is Wuxi Industrial and commercial Museum and classroom. The data link layer is technology, including

mobile communication technology, mobile multimedia technology, radio frequency technology and QR code technology. The network layer is connected to the communication network, including GPRS, WiFi, 3G, etc. The transmission layer consists of learning devices and terminals, mainly smart phones. The session layer is context aware. After learners enter a specific area, they automatically receive the information pushed by the system; Learners use mobile devices to scan QR codes on certain objects and take the initiative to obtain relevant information, task descriptions, etc. The presentation layer is a learning platform, which is the digital platform of the national industrial and commercial Museum. The application layer includes learning activities and resources, the history and development of Wuxi China National Industrial and commercial Museum and other relevant information: field browsing and research-based learning.

Zhao Ming [7] and others took the protection of five palace tunes in Haizhou as an example to carry out the digital protection of intangible cultural heritage and the construction of ecological museum. The basic elements of digital ecological museum are regional space, inheritors, ecological heritage points and organizers. At the same time, it puts forward six major issues in the protection of project inheritance, which are the restriction and control inside and outside the system, the alienation of a large number of cultural circulation, the protection subject and the protected interest orientation, the difficulty of socialized management, the era gap in the application of science and technology, and the capital bottleneck in the later maintenance. In view of the above six problems, eight ways and methods to solve the problems are put forward, which are to comply with the trend of contemporary cultural development and humanistic needs, the dominant trend of social management, follow the laws of the development of various cultures, the classified inheritance and protection of intangible cultural heritage projects, diversified funding channels, reposition the connotation of ecological museums, adapt to the trend of social digital protection, and the training and training of various talents. With the establishment of the database of the five major palace tunes in Haizhou, the permanent protection of the history and ecology of the project has become a reality, and it provides the possibility for the better development and utilization of the five major palace tunes in Haizhou in the future.

Zhao Xi [8] used digital restoration to restore Ming and Qing architectural murals in Hancheng, Shaanxi, and built a mural virtual museum. Firstly, it studies the murals in Hancheng from the perspective of ontology, describes the history of architectural murals in Hancheng in the Ming and Qing Dynasties, analyzes the current situation of architectural murals in Hancheng in the Ming and Qing Dynasties, and analyzes the artistic characteristics of architectural murals in Hancheng in the Ming and Qing Dynasties: theme, composition and color, and then carries out the digital restoration of architectural murals in Hancheng in the Ming and Qing Dynasties. Finally, the construction of Hancheng Ming and Qing architectural mural virtual museum, first of all, reference to the typical cases of virtual museums at home and abroad, domestic cases are the Palace Museum and Dunhuang Research Institute, while foreign cases are the British Museum and the Louvre in Paris, France. The overall development idea is to design the text and picture material content according to the material collection in the early stage, realize the digitization through CAD plane rendering and 3D scene model building, display the 360 degree panorama through lighting design and rendering, set up interactive design, and constantly get feedback through the test application to modify the content design, and finally realize the construction of the virtual museum.

Zhangyunhan [9] analyzed the Digital Museum of Gaoqian ancient village. Firstly, the UAV sensors were used to collect the geographic information of Gaoqian ancient village from different heights and angles, and the software was imported to generate the three-dimensional model and position coordinates. At the same time, some travel notes and biographies were collected, and the clear and identifiable contents were processed by laser scanning and software recognition. A total of 43g pictures and about 100g video data were sorted out. Secondly, the collected data are sorted out and divided into architectural culture, Zong culture and folk cultural heritage elements. The propaganda film showing the features and historical origins of Gaoqian village was designed, and the unique cultural symbols of Gaoqian village were emphasized in the propaganda film. The ancient style elements were selected as a whole in the soundtrack, which was more in line with the image of

the ancient village. Finally, the web information structure and traditional culture are designed, and the overall grid style and logo are designed. At the same time, the web perception design is paid attention to, and the architectural style, regional geomantic omen and folk culture are displayed.

4. Digital protection

Caolu [10] and others carried out digital protection of Bayu witch culture museum. First of all, it puts forward three problems existing in the museum display, which are the lack of scientificity of the collection display, the single display means of the collection, and the backward mode of communication. Two methods are proposed for the digital protection of witchcraft culture. The first method is to create a virtual environment and use virtual reality interaction technology. When the audience puts on VR glasses, they can feel the witchcraft culture. The witchcraft practices, traditional festivals, sacrifices and other scenes in witchcraft culture are clear at a glance. The second method is to spread the witch culture through new media, and promote and radiate the surrounding culture of the museum, so as to better serve the digital construction needs of the Museum Heritage.

Renyue [11] conducted research and Analysis on the digital protection project of Beidahuang prints in Heilongjiang Provincial Museum. The operation process is mainly divided into three steps. The first step is the image acquisition of Beidahuang prints. The German cruise data acquisition system is used to collect 700 pieces of Beidahuang prints in the early, middle and late periods by using the line scanning acquisition method. The second step is to use Photoshop and other software to calibrate and repair the image of Beidahuang prints. The third step is to cooperate with Epson in the original processing of works of art to achieve accurate colors with more than 95% similarity, restore the original appearance of works, and widely used for display, communication and souvenir. The development and application of Beidahuang printmaking are realized through the establishment of Beidahuang printmaking data management system, the exhibition of digital protection achievements of Beidahuang printmaking and the research and development of cultural and creative products of Beidahuang printmaking.

Xia Yujing [12] explored the application of Daoqing shadow play in Huan County of Gansu Province to digital protection. Through the overview and inheritance Dilemma Analysis of Daoqing shadow play in Huan County of Gansu Province, the significance and value of Daoqing shadow play and digital protection in Huan County of Gansu Province were summarized. The methods and technologies of digital protection of Daoqing shadow play in Huan County of Gansu Province were studied. Based on the three digital methods of digital interactive art, digital animation and digital museum, the construction content of shadow play database was specifically analyzed to provide reference for the digital protection of shadow play in Huan County. At the same time, the purpose of carrying forward the art and culture of shadow play in Huan County of Gansu Province was achieved, which played a role in the protection and inheritance of shadow play culture.

Dai Junbo [13] used multimedia technology to digitally protect Manchu intangible cultural heritage. Firstly, the original materials of Manchu intangible cultural heritage are collected by multimedia, and then digitized and processed. Finally, the data are stored in the database through sorting and classification to establish a sharing platform.

Ma Li [14] and others studied the digital protection and inheritance of Wuhu iron painting. The digital protection of iron painting is divided into six stages. The first step is the digital acquisition of iron painting, mainly involving the acquisition of images, audio and video. The second step is to digitize the collected information, mainly involving the optimization and storage of the original image, the compression of video and audio files, etc., using image processing software and audio and video processing software. The third step is to classify and analyze the iron painting and extract the content, extract and classify the Chinese calligraphy separately, and use the processing software to repair. The fourth step is to build a digital resource database of iron painting, provide a digital museum for iron painting to store and consult, and carry out innovative design of traditional patterns. The fifth step is to make a promotional film of Wuhu iron painting forging technology, which shows the superb skills

of iron painting artists through the recording of digital images, and is convenient for dissemination on the Internet. The last step is to use three-dimensional software to carry out digital modeling and digital simulation of iron painting works, carry out three-dimensional scanning of iron painting representative works, use 3dsmax and other three-dimensional software to carry out modeling and rendering, digital simulation processing, and display the works from all directions and multiple angles.

5. Summary

At present, there are many kinds of digital application technologies, including virtual reality technology, 3D modeling technology, multimedia technology and so on. The specific implementation is also relatively easy. At present, the main direction is to select a specific aspect for application. At present, augmented reality technology has gradually developed. Can augmented reality technology be applied to the protection and dissemination of cultural heritage.

For the construction of digital platform, the process is relatively complex, and a variety of technologies including digital related technologies are adopted. For different cultural heritage contents, the specific digital storage methods may be different. Whether it is possible to build a set of digital storage system with automatic classification, automatically generate database structure for storage according to different types of cultural heritage, and automatically build a digital platform according to the stored data.

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