



Digital Preservation and Development of Historic Buildings

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Abstract. This paper analyzes the advantages of the current stage of digital technology in the protection and updating of ancient buildings, to complete a systematic perspective, the current stage of digital building protection technology to sort out, and put forward the application path of digital protection of historical buildings. In order to realize the goal of digital protection of historical and cultural buildings, and then enhance the scientific and sustainability of the protection of historical and cultural buildings.

Keywords: historical buildings, digitalization, visualization, virtual simulation

1 Introduction

With the rapid development of digital technology, the application of digital technology in the conservation of historical buildings is becoming more and more common. This paper will explore the application of digital technology in the conservation of historical buildings: collecting textual information, digital images and spatial data, transforming them into documentary information, geographic database as well as image information and 3D visualization information through digital processing, etc., and establishing a set of digitized archival platforms for digitally related traditional historical buildings¹. This paper will evaluate the feasibility and prospect of digitization technology in the conservation of historical buildings, and put forward relevant suggestions and measures, in the hope of realizing the inheritance of traditional historical buildings as well as sustainable development.

2 Review of domestic and foreign literature

Since the introduction of virtual reality by American Lanier in the 1980s, virtual reality technology has been widely used in various fields such as architecture, entertainment, military and aerospace after decades of development. Scholars at home and abroad in the theoretical discussion, technology use have emerged a lot of results: in March 2001, Switzerland, Zurich United Institute of Technology to use 3D image technology, for

Afghanistan's Bamiyan Buddha restoration to provide information support. The ancient city of Rome in Italy was also virtually recreated through experts from various countries; in 2019 Cheng Chunyan introduced the application of AR technology in architectural conservation; in 2020 Yao Luji discussed the necessity and feasibility of MR technology in architectural conservation. In the Guiding Opinions on Promoting the Deep Integration of Culture and Science and Technology issued by the state, it is also mentioned to accelerate the construction of the national cultural big data standard system, reflecting the state's emphasis on heritage digitization.

3 Analysis of trends and methods of historic building preservation in the context of digitization

3.1 Characteristics and Advantages of Digitization of Historical Buildings

Characteristics: First, ancient architecture reflects its economic and cultural practical value through tourism, exhibition and commemoration. The digital technology digitally expresses this utility, and at the same time integrates the historical events to restore the historical time and space of the ancient buildings through the interaction and participation of the users. In addition, in the virtual world, people participate in the process of cultural production through the interaction with other users of the system or the virtual tour guide of the system, which transforms the original static research process into a dynamic spatio-temporal participation process².

Advantage: digital technology can improve the efficiency of information processing. After the use of digital technology, ancient building protection can be more deeply combined with the computer, using the computer's high-speed computing speed to improve the efficiency of the protection work. Through the use of digital technology, you can get all the information of the ancient buildings, so that the follow-up work will also show significant fine features, thus making the building protection more detailed.

3.2 Importance and inevitability of digitization of historical buildings

Importance: on the one hand, digital technology has become the main development direction of ancient architecture protection. The application of digital technology in the field of ancient architecture protection is more extensive, and the protection system will be more perfect. On the other hand, the use of digital technology reduces the required labor cost. At the same time, the use of the technology can effectively improve the effectiveness of the protection work.

Necessity: in the context of the society moving towards a digital economy, the government attaches great importance to the restoration and protection of the existing entities of historical buildings, but the ancient wooden buildings in China are difficult to withstand natural disasters and erosion over the years, and will eventually fade away. Therefore, our current focus is on how to preserve the existing historical buildings for as long as possible and pass on the culture and history they contain.

3.3 Visualization protection construction of historical buildings

Visualization platform is mainly based on tilt photography technology and 360 panorama technology as the platform basis, through the computer generated GIS three-dimensional model, can make the user have a sense of immersion. In the tilt photography three-dimensional model display using Cesium, can easily and quickly show a wide range of tilt photography model data and three-dimensional geographic data, in through the modeling software according to the tilt data into 3dtiles data format, in the Cesium system scene for loading display interactive processing³. At the same time using the krpano panorama engine for panoramic roaming, so that the user can well with the panoramic three-dimensional data for interactive browsing.

3.4 Construction of virtual simulation system for historical buildings

The application of virtual reality technology in historical buildings is to organize and analyze the data related to historical buildings, and then carry out artificial restoration of valuable historical buildings through a large amount of textual information, image information, etc. Through the virtual simulation technology to establish the site of three-dimensional models and 3D technology, the real world will be displayed in the virtual practice⁴. In the user browsing at the same time, you can also from all angles to observe the relevant historical buildings landscape and the surrounding environment, can realize the all-round display of historical buildings, but also for the protection of the later to give support.

4 Modern application of historical buildings based on digital technology

The digital protection and development of historical buildings is very conducive to the enhancement of cultural soft power and the development of cultural industries, while cultural industries are the materialization of cultural soft power, and can further enhance the national and regional cultural soft power. The digital protection and development of historical and cultural resources can promote the development of cultural industry.

4.1 Digital development and dissemination of historical buildings

Digital tourism is an emerging tourism industry based on the digital era. The use of digital technology to launch digital tourism products can vigorously promote the integration and development of the information industry, tourism industry and cultural and creative industries. The construction of the visualization technology platform can preserve the information completely, accurately and truthfully, form digital archives, and then form the industry of historical and cultural resources protection and development⁵. The use of digital protection and development has a high degree of accuracy and virtual reality, and is the absolute development trend of the protection and development of the

historical and cultural resources of Wenbo.

In the evaluation and appraisal of historical buildings, 5G and drone photography have been used for wall inspection of the famous Peace Hotel in Shanghai. The high-definition and infrared cameras equipped with drones take comprehensive photos and scans of buildings, obtain texture images of building surfaces, identify and locate damaged parts of historical buildings, determine the degree of damage to historical buildings, effectively evaluate the damage situation of historical buildings, and lay the foundation for subsequent repair work. In the repair and operation and maintenance of historical buildings, two warehouses in the North Bund area of Shanghai with a century old history use digital technologies such as 3D laser scanning and deep modeling to accurately restore the original historical appearance from appearance to details, and nearly 80% of historical elements can be reused. Since 2012, the total number of national first, second, and third level museums has increased from 764 to 1222, with a growth rate of 59.9%. The proportion of first, second, and third level museums in the total number of museums in the country has increased from 14.26% to 21.1%, with rapid growth⁶.

4.2 Combination of digitalization of historical buildings and cultural tourism

Since the 18th National Congress of the Party, "let cultural relics come alive" has become the orientation of cultural and exposition business. Differing from the previous protection of static affairs, digital cultural heritage mainly uses VR / AR, big data, holograms, Internet of Things, 3D / 4D printing and other technologies to build an interactive platform for display⁷, and at the same time in the collection, restoration, research, management and application of various aspects of the architectural heritage of the whole chain of life, digitalization system is implemented to the basic level. For the protection of architectural cultural heritage, the cultural tourism industry has entered the stage of deep digitization.

China has a large amount of ancient architectural resources. In October 2019, the State Council approved and announced the national level protection units. The total number of domestic insurance units in China has reached 5058 (excluding Hong Kong, Macao, and Taiwan regions). But digitization of resources still has a long way to go, and we must work together. Accelerate the digitization process of historical and cultural resources, to promote the creation of historical buildings such as "real" palaces, imperial tombs, and ancient battlefields, and to promote the development of China's cultural, museum, and tourism industry⁸.

4.3 Combination of digitalization of historical buildings and animation games

Animation and games belong to the content industry, and creative connotation is very important. At present, historical building sites can be creatively developed into anime short films and mini games, displayed in the cultural and museum department in the form of anime games. Animation and game based teaching in school history and culture. Rich tourism products and other aspects in historical and cultural scenic spots. There is a certain market⁹. Regarding the current hot topics of anime games such as

palaces, ancient battlefields, and imperial tombs. Animation game developers can closely rely on the rich historical building resources in this province to creatively develop related animation game products.

China has a solid foundation of monuments and sites and other resources, palaces, imperial tombs, ancient battlefields, etc. have a strong attraction to fans of animation and games, and designers can easily create them into application scenarios. For example, in the Assassin's Creed game (Fig. 1) released by Ubisoft Montreal Studio in Canada, digital modeling of buildings was used to present historical buildings such as Notre Dame de Paris, Big Ben (Fig. 2), and the Pyramid of Khufu in front of customers. The Chinese movie "Big Fish Begonia" was modeled with the actual location of Yongding Tulou in Fujian Province, which was widely loved by the audience. The continuous advancement of digitization and database construction has led to a continuous improvement in the quantity and quality of animation and game products of China's historical architectural heritage¹⁰. The digitization of resources with animation and games as carriers is of great significance to the heritage of historical buildings.



Fig. 1. Assassin's Creed Game Scene



Fig. 2. England Big Ben

5 Conclusion

This research report is based on the combination of 3D laser scanning technology, virtual reality technology, BIM technology and other architectural digital protection technology, which provides theoretical technical support for the design and development of the subsequent architectural digital protection system:

By adopting virtual reality technology for virtual reconstruction of the surviving buildings, it is possible to have close contact with the buildings and view the buildings in the virtual environment of the buildings, which can make the buildings that have been destroyed restore their original appearance, Favorable to retain the original data of the building, for the protection and development of historical buildings to provide a more scientific basis;

Through the three-dimensional laser scanning technology in the collection accuracy, collection speed and collection range has more advantages, can greatly improve the efficiency of surveying and mapping, so that the collected building digital information is more accurate and complete. And it can be adapted with other supporting software and support a variety of data format output, which can be widely used in building mapping, intelligent transportation, disaster assessment and many other fields.

BIM technology can make the data obtained from building mapping more intuitive and concise, which has a positive significance for the digital protection of buildings.

Chinese culture has a long history, the use of digital technology to enhance the protection of ancient buildings, for the inheritance of ancient architecture into the new vitality, and promote the sustainable development of ancient architecture protection.

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