

Research on Digital Protection of Cultural Heritage Dujiangyan

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Abstract. Dujiangyan which belongs to the world cultural heritage and natural heritage represents an important scientific and technological invention in ancient China. It displays the wisdom of the ancient working people and enjoys great value. With the development of tourism in Dujiangyan, the combination of culture and tourism has become a focus of local work. This paper analyzes the dilemma of Dujiangyan in cultural protection, combines the characteristics of Dujiangyan, proposes a reliable digital protection scheme which uses digital technology to increase the promotion channels of Dujiangyan and attracts the audience to know about the water conservancy knowledge and the historical story of Dujiangyan, so that they further understand Dujiangyan. The paper also puts forward new requirements for the Dujiangyan scenic spot, which is to improve the existing shortages in the scenic spot by adapting to the digitalization pace of Dujiangyan, thus promoting the development of cultural tourism in Dujiangyan. The initiatives presented in this paper also provide new ideas for the digital protection of other scenic spots or cultural heritage.

1. The development status of Dujiangyan

Dujiangyan was listed on the World Heritage List in 2000. It is by far the oldest water conservancy project in the world. Characterized by dam-free water diversion, it has played a huge role to this day. Dujiangyan includes three major projects, namely Yuzui, Feisha Dam and Baopingkou, which respectively play an important role in water separation, flood control and water regulation. Dujiangyan's water management culture and technology formed and developed in the long-term practice are in line with objective scientific and technological principles, and at the same time have unique personality characteristics [1]. Dujiangyan also realizes the ideal of harmonious coexistence and common development between man and nature, which embodies the concept of "unity between man and nature" in Chinese traditional culture [2].

In recent years, the combination of culture and tourism to create collision and infusion between the two has become a major trend in the development of tourism economy. In order to further promote Dujiangyan, Dujiangyan government constantly explores Dujiangyan's achievements in science and technology and culture, vigorously adjusts the internal structure of the industry and promotes the integration of local cultural industries

and tourism to realize sustainable development of the economy and natural resources. Dujiangyan, which was established based on the ancient people's profound cognition and grasp of the laws of nature, contains the wisdom and rich historical experience of the ancient Chinese working people. With Dujiangyan water conservancy culture as the basis, it is an important measure to develop Dujiangyan cultural tourism industry by increasing Dujiangyan's display form and promotion channels via the use of digital technology, thereby letting visitors understand Dujiangyan more deeply.

In 2005, the concept of "Digital Dujiangyan" was proposed. However, Dujiangyan's current informatization and digitization are mainly applied to Dujiangyan ecological protection and water quality monitoring. Only a small program featuring "one-click tour of Dujiangyan" is applied in Dujiangyan tourism digital products, and the functions carried by the small program are very simple. Although there is a fun feature of AI flower knowledge, it can be reproduced in any scenic spot, the characteristics of Dujiangyan is not demonstrated. It doesn't help much for Dujiangyan's cultural propaganda. Instead, it is easy to make tourists put Dujiangyan tourism's focus on the natural scenery along the way, ignoring the historical value and cultural value of Dujiangyan. Therefore, it is necessary to design a new digital product around the cultural characteristics of Dujiangyan. Digital technologies of augmented reality and virtual reality can play an important role in Dujiangyan cultural tourism.

2. Advantages in digital protection of cultural heritage

In the information age, the emergence of digital technology has broken the time-space gap between the past and the present, breaking the time and space restrictions of words, sounds, images, etc., omnidirectionally and multi-facetedly intervening with the daily life of contemporary society, and forming global shared cultural resource [3]. Digital technology has fully exploited the advantages of technology in combining with humanities. From the aspects of digital information collection, digital restoration and product system construction, it not only maximally guarantees the presentation of original appearance of cultural heritage, but also greatly expands spiritual connotation of cultural heritage in terms of display mode, aesthetics experience and education communication.

The advantages of digital technology in the protection of cultural heritage include:

- 1) More diverse means of presentation: The application of digital technology enables cultural content to have more levels of interpretation. Digital works create a sense of relevance, immersion, experience and participation from various aspects such as content planning, user experience and space design, "talking" to the audience from the perspectives of emotion, knowledge, and interaction.
- 2) Breaking through time-space limitation: The application of digital technology can make related works no longer confined to a specific space and time. As long as there are smart devices such as mobile phone, users can

ignore space and time and experience different scenery and culture. The characteristics of no time and space limitation enables digital works have a broad promotion channel, and more users can understand cultural heritage.

3) Reproducing historical scenes and promoting cultural heritage: Digital technology can reproduce things that have disappeared in the long history, and can also reproduce the stories that have occurred, and deliver them to the audience in real or artistic expressions so that the audience can understand the history, learn about culture and understand the essence and soul of Dujiangyan.

3. Promoting Dujiangyan culture with digital technology

Digital technology is diversified in form, convenient to promote, and free from the limitations of time and space, so that the digital works related to cultural heritage can be better protected and popularized. In the following, we will take Dujiangyan as a representative to explore the ways in which different digital technologies protect and spread cultural heritage, and give specific Dujiangyan cultural communication and tourism promotion schemes.

3.1 Virtual roaming in Dujiangyan

Virtual reality technology represents a computer simulation system that combines computer graphics and other related science and technology to generate a digital environment that is highly acquainted with a specific real environment. Users can interact with objects in the simulation environment with equipment such as virtual reality helmets to generate feelings and experiences of presenting personally in the real environment. Currently, VR virtual tourism has become a popular application of virtual reality technology.

In order to realize virtual roaming in Dujiangyan, it is first necessary to build a model of Dujiangyan scenic spot. If one wants to restore the natural scenery of Dujiangyan in virtual roaming, one can record Dujiangyan scenic area in the image by panoramic photography or aerial photography, then synthesize the image into a panorama using image mosaic technology and display the panorama on device to achieve full-range user browsing. The architectural model in Dujiangyan can be obtained by using technical means such as 3D laser scanning. If one wants to enjoy more artistic scenes in virtual roaming, one can use modeling software such as Maya and 3D Max to build the Dujiangyan model. After the model is built, it can be imported into the virtual reality system development software. Through scene node control, observers can explore the environment from different angles and different orientations.

In order to let users better understand Dujiangyan's past and today, two scenes can be designed in Dujiangyan virtual roaming system, namely today's Dujiangyan and Dujiangyan in the past. Through the comparison of the two, audience can understand the changes of Dujiangyan. In the virtual scene, it is also possible to load historical related animation models, display the history of Dujiangyan in an animated form, and illustrate Dujiangyan's water conservancy principles through voice commentary.

3. 2 "Digital Dujiangyan" APP

Designing a mobile phone app with Dujiangyan characteristics for users who travel to Dujiangyan can also improve the travel experience of Dujiangyan. For a mobile app used in tourist attractions, the most basic functions include map navigation, voice commentary, route recommendation, food recommendation, etc. However, if the software only provides the above basic functions, most visitors will not choose to install Dujiangyan APP. Therefore, provision of Dujiangyan characteristics plays an important role. The use of augmented reality technology to design the function around Dujiangyan has reference value.

Augmented reality technology which represents an emerging research field developed on the basis of virtual reality technology can superimpose computer-generated virtual information in the real world in real time, and augment or expand the real world. In order to improve the visitors' usage experience and let them learn more about Dujiangyan, multiple AR functions can be launched. For example, by imitating "Pokémon Go" game and placing historical characters in a specific area, visitors can search for specific characters using mobile phone camera, and obtain the corresponding historical knowledge through the interaction with virtual characters. Through augmented reality technology, Dujiangyan's historical scenes can also be superimposed on specific scenes to reproduce the historical scenes of Dujiangyan. For instance, bamboo cage pebbles can be superimposed in the rivers of Feisha Dam, and the role of bamboo cage pebble in the past can be illustrated through voice commentary. Designing an AR card with Dujiangyan as the theme as the souvenir of the scenic spot is also an important means to popularize Dujiangyan. Users can use the mobile phone to scan the AR card, and the corresponding scene and stories will show up, which can also deepen the visitors' memory of Dujiangyan culture.

3.3 Application of digital museum

Digital museum is built on the digital space through three-dimensional graphic images, interactive entertainment technologies, etc. It not only has the collection, research and education functions of traditional museums, but also can store data such as text, voice and influence in digital form [4]. A more typical digital museum is Baidu Baike Digital Museum, which displays its own characteristics and exclusive collection knowledge in various forms, such as pictures, texts, voice commendatory, animations, virtual roaming, high-altitude overlooks, etc., thus enriching users' sensory experience [5]. Entry of Dujiangyan Qingshan City Scenic Area in the Baidu Baike Digital Museum, or establishment of a digital museum on its own, is a great tool to promote Dujiangyan culture.

To design a digital museum, the first thing to do is to determine the orientation and goals of the digital museum. Secondly, determine the system purpose of building a digital museum, follow the "people-oriented" design concept, give up redundant functions, and clarify the main functions of the digital museum and its artistic form of presentation [6]. The Dujiangyan Digital Museum is designed to allow visitors to enjoy the natural scenery,

historical relics and stories behind Dujiangyan Scenic Area without leaving home. In the specific design of Dujiangyan digital museum, the virtual roaming function can be used as an integral part of the digital museum to satisfy people's desire of viewing Dujiangyan without leaving home. Secondly, it is necessary to build a digital cultural relics exhibition, collect cultural relics data of Dujiangyan Museum through three-dimensional scanning, and display it in the digital museum, so that users can better see the details of the cultural relics and understand the background story of the cultural relics. For some cultural relics that are somewhat damaged due to time, reconstruction of the model can also restore its original appearance, allowing users to view their best. In addition to the above two functions, the digital museum can achieve better interaction through simple interactive games, and allow users to personally participate in the reconstruction of Dujiangyan, which not only enhances entertainment, but also enables users to have deeper impression of the knowledge.

4. Suggestions for Dujiangyan cultural tourism development

In order to better promote Dujiangyan and let users know about this "land of abundance", Dujiangyan Scenic Area also needs to take corresponding measures to coordinate with the digital propaganda of Dujiangyan and enhance the charm of Dujiangyan Scenic Spot.

4.1 Enhance the cultural connotation of Dujiangyan tourism

Dujiangyan not only has beautiful natural scenery, but also has spatial value in harmonious use of water bodies by heaven and earth, time value in continuous evolution of historical functions, and spiritual value in integration of multicultural contexts [7]. It is possible to start from Dujiangyan's water conservancy culture, review Dujiangyan's past and today, combine political, social, economic and cultural changes in different periods to explore the reasons for formation of different historical landscapes such as villages, cities, gardens, streets and courtyards, and explore the overall value of historical landscape of Dujiangyan water system, so that visitors have a deeper understanding of the overall style of Dujiangyan.

4.2 Enrich cultural resources and build a cultural industry chain

In order to maintain the vitality of the scenic area for a long time, it is not enough to display and protect the resources that have been developed. Instead, it requires the local government to explore and publicize the historical and cultural resources of Dujiangyan and optimize the infrastructure of Dujiangyan to attract more foreign tourists. First, according to the results of field visits, efforts should be made to optimize the tourism route, reduce the cost of tourism transportation, optimize the pricing of entertainment facilities, and improve the accommodation conditions around the tourist area, so as to create a more localized and humanized tourism environment for tourists. Second, it is necessary to further explore the folklore and mythology of Dujiangyan. In addition to well-known folk stories such as Li Bing's water control, it is also necessary to develop folklore legends gradually forgotten by the people such as Sichuan Taoist Zhao Yu's bare-handed killing of flood

dragon. Next, it is necessary to further explore local geeks and cultural scholars in Dujiangyan City, promote Dujiangyan's spirit with man as the cultural carrier to create a unique label for Dujiangyan. Finally, it is necessary to rebuild Dujiangyan infrastructure, unify the style and foster characteristics of Dujiangyan.

4.3 Cultivate high quality professionals

As an intermediate link between the tourist and tourism culture industries, professional managers constitute a very important part of tourism industry construction. Therefore, the primary task of promoting the development of cultural tourism industry is to cultivate high-quality professionals. First of all, Tourism Human Resources Department of Dujiangyan City should implement more instructive and targeted talent introduction policies and guidelines, and grasp the number and requirements of talents required in Dujiangyan from a general perspective. Secondly, it is necessary to strengthen the training of relevant personnel, including management personnel for overall planning and layout of Dujiangyan tourism culture industry, tour guides and other front-line personnel directly facing tourists as well as reserve talents guaranteeing subsequent development of the scenic spot. The existence of the above three types of professionals is a guarantee for the development of the industry and tourist experience of tourists, which demands focused attention.

5 .Conclusion

At present, digital technology has become more and more mature, increasingly appearing in people's daily life, study, work and entertainment. It is a practical and feasible way to protect Dujiangyan by digital technology, publicize Dujiangyan's water conservancy knowledge and display Dujiangyan's historical value and spiritual value. The use of digital technology to protect the culture of Dujiangyan, the rational development of Dujiangyan by Dujiangyan local government, as well as market promotion strengthening can arouse more people's interest in Dujiangyan, attract tourists to Dujiangyan, and promote the dual growth of local economy and culture.

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