Research on the application of digital technology in Conghua Traditional Village architecture and landscape protection

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Abstract—The continuous promotion of the rural revitalization strategy has brought new opportunities and challenges for the protection of traditional villages in Conghua District, as well as new goals and requirements. The research on the protection and application of digital technology in traditional villages is an important direction for the protection and development of traditional village architecture and landscape, as well as an excellent path for sustainable development. From the perspective of building and landscape protection of traditional villages in Conghua District, Guangzhou, the author carried out research on traditional villages in Conghua, obtained real-time graphic data by means of 5G, 3S, ETM and other technical means, combined with field research and surveying data, analyzed their value characteristics, analyzed existing problems and causes, and highlighted the characteristics of traditional villages in Conghua. Strive to use new technological means to explore and creatively put forward the effective path of traditional village architecture and landscape protection and inheritance under the background of Conghua rural revitalization.

Keywords: Digital technology; Protection; Architecture and Landscape

1 INTRODUCTION

As an important node-space of the national rural revitalization strategy, traditional villages have high research and protection value. From the historical process of the protection and inheritance of traditional villages at home and abroad, it can be seen that although the protection of traditional villages in China started later than that in western developed countries, the establishment and promotion of the protection system is fast from written records to the promulgation of protection laws and regulations, from the active declaration of villages and towns to the establishment of supervision mechanism, and the covered directions and protection measures are gradually being fully developed and improved. However, in recent years, the progress of urbanization has spawned a large number of "hollow villages". In addition, the lack of restoration and protection of traditional villages and good commercial operation environment have resulted in the destruction of buildings and landscape environment of many traditional villages and the loss of traditional culture.

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Digital technology can break through the limitation of time and space and transform the information of traditional village architecture and landscape into editable digital data form, so as to realize the reconstruction and restoration of traditional village architecture landscape more conveniently. Digital inheritance and protection technology realizes the innovative integration of physical and virtual protection, communication and display of three-dimensional traditional villages, plays a certain publicity role in traditional village cultural inheritance and architectural landscape, activates the vitality of traditional village cultural heritage protection, and has positive significance for the heritage and protection of traditional village architecture and landscape in Conghua under the background of rural revitalization.

2 PROBLEMS EXISTING IN CONGHUA TRADITIONAL VILLAGE ARCHITECTURE AND LANDSCAPE PROTECTION

2.1 To fall into disuse by idleness

Due to the flow of young and strong population to cities, some traditional villages have been idle for many years, the decay of ancient village buildings, the disordered growth of vegetation, the disappearance of village culture, no successor of traditional intangible heritage, and the scene of traditional villages.

2.2 Loss of authenticity due to improper protection

In the process of inheritance, the integrity and authenticity of traditional villages are not firmly upheld, and the transformation and repair of traditional dwellings are blind. The pattern and historical context of traditional villages are damaged, and the unique cultural connotation is lost. As a result, the cultural charm of traditional dwellings is difficult to protect and excellent cultural genes cannot be carried forward.

2.3 It was forgotten because of a weak sense of protection

Due to the lack of funds, imperfect protection consciousness and responsibility mechanism, as well as limitations of their own conditions, some small traditional villages with no characteristics and lack of benign commercial operations are not enough to become local supporting industries and attract attention from the outside world, and it is difficult for villagers to maintain continuously. Many traditional villages have fallen into disrepair, gradually deserted and lifeless .(Figure 1)

Figure 1 Current situation of traditional village architecture and landscape in Conghua

3 THE ADVANTAGES OF DIGITAL TECHNOLOGY IN TRADITIONAL VILLAGE ARCHITECTURE AND LANDSCAPE PROTECTION

With the promotion of the rural revitalization strategy, the development and utilization of traditional village resources are more and more reasonable, and they are better at making use of their own advantages and exploring their own characteristics. While developing, the landscape pattern of traditional villages is not lost. The construction of infrastructure in traditional villages is becoming more and more perfect, the living conditions of local villagers are getting better and better, and the government is giving more and more support. Under the 5G environment, the excavation and inheritance of traditional village culture will become more and more modern and convenient. Information organization technology will link and integrate various elements of village culture, and the communication advantages of digital media will be constantly brought into play. It is gradually developing towards a virtuous circle of promoting inheritance through protection and helping protection through inheritance.

3.1 Data acquisition is more objective and scientific

Integrate 5G, 3S, ETM and other technologies into the protection mode of traditional village architecture and landscape, combine professional skills and public opinions with participants as the main body, establish a public participation platform with digital technology, expand the channels of public participation, and protect more humanity through questionnaires, interviews, publicity and digital platforms. The method of relying only on a small number of experts and professional and technical personnel should be changed, and the traditional thinking of relying on subjective experience and emotional creation should be removed, so as to make traditional villages live, promote better protection and inheritance of traditional villages, and sustainable inheritance under the environment of rural revitalization. The introduction of digital technology provides objective and scientific basis for the protection of traditional villages.

3.2 Protection is more efficient and complete

By means of digital technology, the collection of massive data related to traditional villages can be stored in the responsive interval, so as to make the village pattern and texture relatively clear and complete, with relatively complete buildings and village appearance. In addition, real-time updates are carried out according to the development dynamics of traditional villages, which avoids a large amount of manpower and time spent on repeated measurement, collection and collation of data. It not only excavates the history remembered by villages and the intangible cultural heritage carried by them, but also timely and effectively responds to changes in the protection process to ensure the integrity of the protection and inheritance of traditional villages.

3.3 The protection is more permanent

Through the digitization of information, the protection experience of traditional villages can be acquired timely, and the changes of traditional villages can be perceived timely. The protection of traditional village buildings and landscape can be more dynamic and real-time, providing a good way to protect traditional village resources, culture and industries under the background of rural revitalization, and evaluating and dynamically monitoring the achievements of protection and inheritance of traditional villages. We will use new technologies to help sustain and sustain rural revitalization.

4 DIGITAL PROTECTION PATH DESIGN OF TRADITIONAL VILLAGE ARCHITECTURE AND LANDSCAPE IN CONGHUA

4.1 The conservation and inheritance cognition of Conghua traditional villages and the collection and analysis of the features of architecture and landscape

Firstly, through literature and excellent case study, the material and intangible cultural characteristics of traditional villages are analyzed to obtain abundant theoretical support. Then, from August 2022.08 to November 2022.11, the field survey and mapping of the traditional villages of Conghua, such as Xuanxing Village, Fengyuan Village, Dajiangpu Village, Mumian Village, Yinjiazhuang Village, Shuixi Village, Dadun Village, Songbai Tang Village, Xitou Village, Datian Ancient Village, Zhongou Village, Qiangang Village and Qiufenggu Village, will be carried out through multiple channels for 4 months. Fully understand their traditional architecture and landscape protection status, spatial layout, production and life, traditional folk customs, environmental factors, village history, religious culture, existing industry and development status. The technologies adopted include communication technology, paid, camera, GPS, unmanned aerial vehicle, etc., which combines macro and micro aspects, including village layout characteristics, industrial mode, protection status analysis, government planning outline of Conghua District, regional satellite map analysis, site exploration, surveying and mapping, visit, etc., and satellite image of Conghua District is obtained by ETM remote sensing technology. Combined with satellite image, 3S technology and site survey, the author analyzes and studies the inheritance dimensions of traditional villages, finds out their multi-dimensional

inheritance values and characteristics in architecture and landscape environment, and defines the direction of its digital protection. (Figure 2-Figure 4)

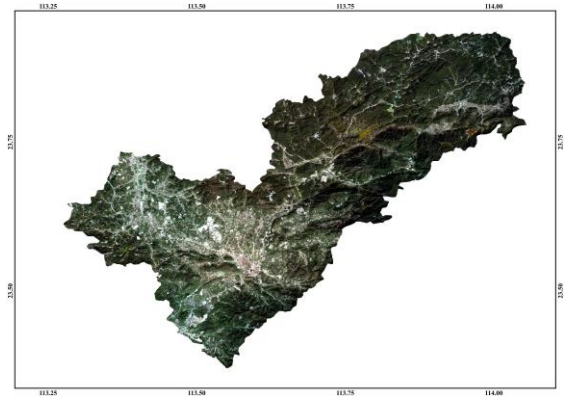

Figure 2 ETM remote sensing image of Conghua District

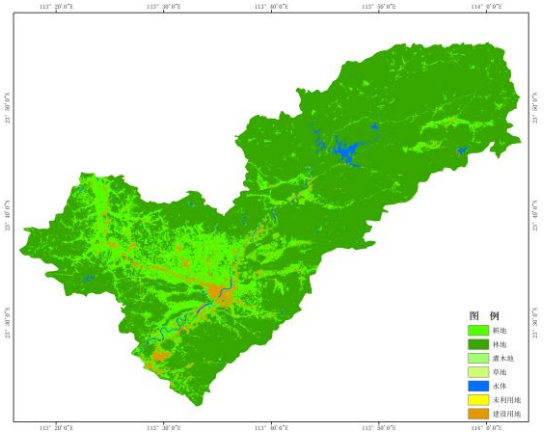

Figure3 Interpretive map of land use characteristics in Conghua District

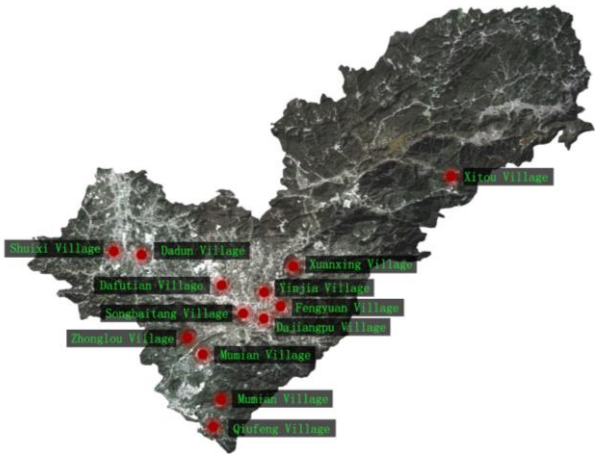

Figure 4: Distribution map of traditional villages in Conghua District

4.2 Construction of digital protection path of Conghua traditional village architecture and landscape with the support of information technology

Based on inheritance degree evaluation and influence factor analysis, multiple systematic and operable digital public participation sharing platforms for traditional village architecture and landscape under 5G environment will be established in Conghua, allowing the public to participate in the whole protection process on a daily basis. The establishment of digital sharing platform mainly includes mobile communication, positioning and navigation, social networking, environmental perception, numerical simulation, traditional village photos and other means. Data analysis is carried out according to the actual situation reflected by them, combined with the previous literature research, DEM digital elevation model and field survey. A digital sharing platform suitable for the specific measures of digital protection of traditional villages should be built to make the protection of unified villages popular, scientific and sustainable. In addition, with the different characteristics of Conghua villages as the carrier, the management is improved, and the communication advantages of different types of digital media are given full play, so that the traditional village culture is more humanized and amiable, and the diversified participation is proposed to put forward its differentiated personalized protection path. (Figure 5)

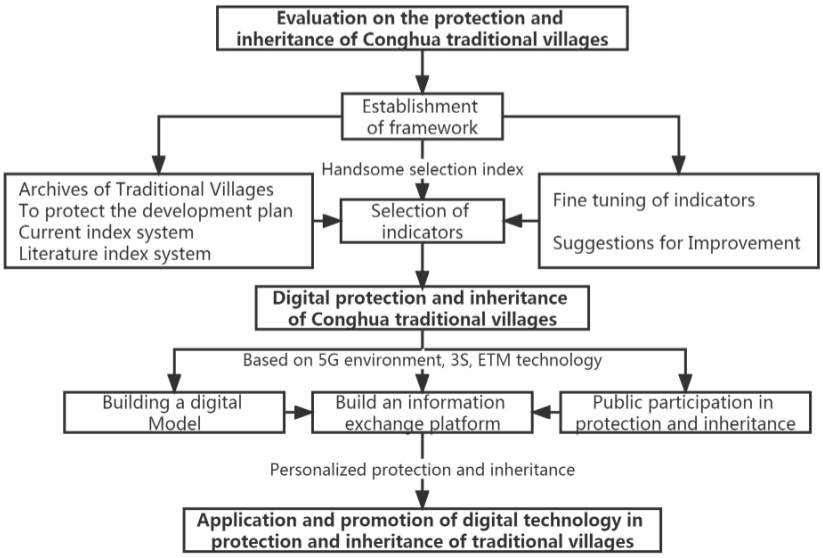

Figure 5 Technological route of digital technology in architecture and landscape protection of traditional villages in Conghua

4.3 Digital protection workflow

After the digital protection path design of traditional villages is completed, the digital collection of standards and specifications is carried out through field investigation to obtain the relevant contents of various ontologies of traditional village protection. Based on this, the 3D model is reproduced and the knowledge map is constructed, and the documents, images, audio and video, point cloud data, 3D model and other methods are input into the digital resource database of traditional villages. After data integration and collation, realize the preliminary resource database construction; Further, based on the basic database, the type identification of the cooperation between manual intervention and machine learning is carried out to analyze, summarize and explore the attribute types from the perspective of the dual semantic model of culture and construction in traditional villages, so as to guide the protection of traditional villages and the contemporary construction work (Figure 6) .Through the design of front-end retrieval and the design of different knowledge density levels, the final achievement can be obtained on demand.

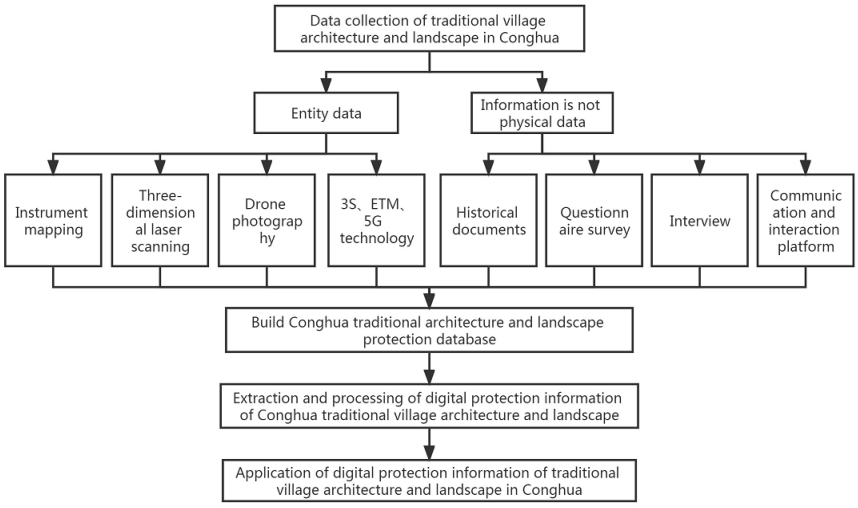

Figure 6 : Detailed workflow of digital protection path construction of traditional villages.

4.4 Conservation evaluation and influencing factors analysis of traditional villages in Conghua

By integrating and analyzing the satellite image data of land application in Conghua District obtained and interpreted by 3S, ETM, VR and other technologies, and combining with the resources collected and sorted out as well as the field research, the current pattern, distribution characteristics and spatial layout of traditional villages in Conghua can be explored, and the environmental composition and current situation of the villages can be analyzed. Investigate and study the production and life of traditional villages, existing industries and their development status, establish a comprehensive and dynamic digital monitoring and evaluation system, evaluate and analyze the history, culture, religion, and folk customs of traditional villages in Conghua, construct an evaluation index system of the protection degree of traditional village architecture and landscape, monitor the inheritance situation, and judge the inheritance level of traditional villages. According to the evaluation results, the current characteristics and protection of traditional villages in Conghua are summarized, and the differentiation factors affecting their inheritance characteristics are found, so as to better protect and inherit traditional villages, create conditions for the construction of livable and productive new villages, and help rural revitalization.

4.5 The effect achieved

1) Digital technology has been applied and promoted in Conghua traditional village architecture and landscape protection

With the development of social and economic environment, the factors affecting traditional village architecture and landscape protection are constantly increasing and changing. The traditional way of protection can not meet the actual demand. The application of information technology will find the correlation hidden in the massive data, comprehensively analyze

different factors, and put forward targeted countermeasures, which will greatly enhance the confidence of practitioners to use new technology to solve problems.

2) Expand the platform for the public to participate in the protection of traditional village architecture and landscape

The development of information technology such as Internet, social media, APP and mobile terminal provides technical means and platforms for communication and interaction for the public to participate in protection and application, rather than limited to questionnaires and interviews. This will allow the common people and social investment subjects to actively participate in the protection at any time and anywhere, and have a real-time understanding of the status quo, composition, implementation and construction process, management and application of traditional villages. The protection of traditional villages can better meet the wishes of the public, make them more humanized and reasonable, and promote their sustainable and eternal development.

3) To obtain certain economic benefits

Through the application research of digital technology in Conghua traditional village architecture and landscape protection, under the premise of protection, with the focus on improving people's livelihood, the inherent historical, cultural and unique resources of traditional villages are explored, according to the principles of "make farming better, tourism better, appropriate development and differentiated development". It is beneficial to retain the cultural bloodline containing the traditional production and life style of the original residents, establish a long-term mechanism with equal protection through multiple measures, reasonably explore the economic and social value of traditional villages, and benefit the local people.

5 CONCLUSION

The use of digital technology makes the inheritance of traditional villages more and more modern, convenient and persistent. This paper analyzes the reasons why digital technology is better at making use of its own advantages and exploring its own rural characteristics in the modern environment of traditional villages, so as to make the development and utilization of resources more and more reasonable, and gradually develop towards the virtuous circle of promoting inheritance through protection and promoting protection through inheritance. It also discusses the realization path and method of digital technology in Conghua traditional village architecture and landscape. It is believed that digital technology is an effective way to protect and inherit traditional village architecture and landscape under the background of rural revitalization in Conghua.

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REFERENCES

[1] Tian Jing. Research on the digital inheritance and protection of traditional village architecture landscape in Guangxi under the background of rural revitalization: A case study of Guilin, Guangxi [J]. Guangxi Urban Construction,2022(08):49-56.

[2] Luo Jin, Li Penghao, Ji Tie. From Typification to digitalization: A study on the protection Path Construction of traditional villages [J]. Packaging Engineering, 201,42(14).

[3] Liang Jing, Tang Mingzhe. Research on digital protection method of Traditional Village architectural features [J]. Cryogenic Building Technology,2022.05.

[4] Sun Yijing, Lin Mingshui, Fairy Tale, Zhang Yuhan. Study on digital Protection Mode of Traditional Villages in Southern Fujian -- A case study of Wulin Ancient Village [J]. City,2022.07.

[5] Rong Yuefang. Research on the protection and development Strategy of traditional Villages under the background of rural revitalization: A case study of Jielingkou Village [J]. Journal of Beijing University of Civil Engineering and Architecture, 2020.03.

[6] He Shilan. Digital Exploration of traditional village architectural heritage protection in Central Hunan Region [J]. Ju She,2022.03.

[7] The Application of Information Technology in the Care of overseas Chinese in Ancient villages [D]. Degree Thesis of Xi 'an University of Architecture and Technology, 2007.06.

[8] Zhu Xuemei. Study on the status quo and protection and utilization mode of ancient villages in Guangdong Province [J]. Journal of South China University of Technology (Social Science Edition),2016.02.

[9] Zhu Xuemei, Livable Highlights Characteristics, Reappearance of Lingnan Nostalgia -- Conservation strategies of ancient villages in Guangdong [J] Southern Journal,2016,6 (234): 66.

[10] Wang Kai. Research and application of digital innovation technology in traditional village protection and inheritance [J]. Construction Science and Technology,2022.07.

[11] Liu Mengting. Research on Ecological and sustainable Development of traditional villages based on Cases [J]. Value Engineering,2012.03.

[12] Zhu Jiali, Yu Yifang, Xiong Jian. Application analysis of GIS in the protection and development of traditional villages [J]. China Water Transport,2021,21.

[13] Jiao Yanzhu. Research on Digital Protection of Traditional Villages in Hainan [J]. Tomorrow's Style,2022.10.

[14] Gu Yanyan, Sun Pan. Digital protection and development paths of traditional villages in the context of Digital villages: A case study of Jinhua Region [J]. Green Technology,2022.05.