Digital Dissemination of Jiageng Architecture and Culture

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Abstract. Jiageng architecture has had a profound influence on Xiamen's architectural style, but the ways for the public to understand Jiageng architecture are very limited. This study aims to improve the efficiency of the dissemination of Jiageng architecture culture through digital means, So that more people can quickly and deeply understand its history and cultural connotation. The research literature related to the digitization of Jagan architecture was searched in literature databases and online, and articles related to the study were screened out. Through reading and comparative analysis, the favorable ways of digitizing the dissemination of Jagan architecture were totaled to provide new ideas for the digital transmission of non-heritage.

Keywords: Jiageng architecture; digital dissemination; cultural heritage preservation

1   Introduction

"Architectural culture" is a limited concept of the genus "culture", which is narrower in scope than "culture" but richer in connotation. Architectural culture is an important part of human culture, and is a comprehensive reflection of material culture, institutional culture, spiritual culture and symbolic culture. It arises with the emergence of human beings and develops with the development of human society, and it also has the characteristics of history, nationality and locality [1].

Modern Chinese thought and academia in the early 20th century, with Hu Shih and Liang Qichao, set off a fierce debate on Chinese social thought and ideology and culture, and their progressive ideas then influenced modern Chinese architecture. Their progressive ideas then influenced Chinese modern architecture. The Jia Geng architecture was designed and built by the Chinese leader Chen Jiageng during this period of high architectural thinking, which was a blend of Southern and traditional architectural styles, absorbing advanced experience in the construction and then innovating.

Jiageng architecture has had a profound influence on Xiamen's architectural style, but the ways for the public to understand Jiageng architecture are very limited. Existing displays revolve around graphic materials and historical artifacts and models, without systematically introducing the characteristics of Jia Geng architecture, which is not

conducive to the audience's complete learning and experience of Jia Geng architectural culture. In addition to the Chen Jiageng Memorial Hall, visitors need to go to Jimei School Village and Xiamen University to observe Jiageng architecture, which greatly increases the cost of learning about Jiageng architecture and culture. This study aims to improve the efficiency of the dissemination of Jia Geng architecture and culture through digital means, so that more people can quickly and deeply understand the history and cultural connotations of Jia Geng architecture.

2   Literature review

2.1   Research on Jiageng architecture

The direct attention to the study of Jia Geng style architecture began in 1984 when Chen Congzhou published in Xiamen Daily an article entitled "The Excellent Architect - Mr. Chen Jia Geng", in which he affirmed the historical and cultural value of Jia Geng architecture and proposed for the first time the concept of "Jia Geng style architecture" [2]. The concept of "Jia Geng style architecture" was first proposed [3]. Since then, research on Jagan architecture has sprung up, with the following comprehensive monographs: the book "Jagan Architecture" by Chang Yuezhong and Zhou Hong in 2009, which conducted a systematic study on the architecture of the Jagan style of Chen Jagan, exploring the social and cultural value of Jagan architecture, conservation research and how to inherit and develop it in the construction of modern urban areas [4].By analyzing the historical, scientific, and artistic values of Jia Geng architecture, the historical and cultural connotations of the city were explored, and ideas were proposed for the conservation, utilization, and development of Jia Geng architecture. 2011, Zhuang Jinghui chronicled the nearly 100 years of construction of Jia Geng architecture, interpreted the profound cultural connotations of Jia Geng architecture, and revealed the rich historical heritage of Jia Geng architecture in Jia Geng Architecture at Xiamen University. It illustrates six characteristics of Jia Geng architecture: site-specific layout, rational and innovative structure, economical and practical construction, use of real estate materials, Minnan craftsmanship, and East-meets-West style [5]. Chuang Jing Hui and He Chunni published "Jiamei School Jagong Architecture" in 2017, which divides the development of Jiamei School into two periods: "East-meets-West-Founding Period (1913-1931)" and "Inclusion-Development Period (1950-1963)", which systematically lists the history and architectural details of the founding of Jimei School in chronological order, and is of great reference value [6].

   In terms of the inheritance and protection of Jiamei's architecture, there are also more and more explorations on renovation design, coordinated architectural design of the wind and landscape within the protection area, campus planning and architectural design of the new campus, and cultural tourism industry. Chang Yuezhong's master's thesis, "Research on the Protection and Development of Jia Geng Architecture" [7], explores the influence of regional culture and Chen Jia Geng's expatriate life on the formation of architectural styles, analyzes the historical, scientific, and artistic values of Jia Geng architecture, explores the protection, inheritance, and development of Jia Geng architecture and the excavation of urban history and cultural connotations, and

proposes ideas for the continuation of the historical cultural lineage and the expression of the individual characteristics of the city in the construction of modern urban areas. and the possibility and development strategy of combining the conservation of Ja-gong-style architecture with the city's regional brand.ZhuangLiE "" Jiageng building "one hundred innovation high" [8] of "Jiageng building" in the 1990-2010s a new development of systematic analysis and comb, study how to learn the modern "Jiageng building" in response to the local natural conditions, the continuation of local architectural culture, development of local construction skills, the creation of contemporary campus architecture, eventually form both Jiageng style, and era of new buildings. Lin Dongxia's "protection and heritage development of Jia Geng architecture" [9] pointed out that the heritage development of Jia Geng style architecture, the excavation of the connotation of Jia Geng architecture, the development of Jia Geng cultural industry, to create Jia Geng cultural brand, to promote the spirit of Jia Geng in the new era to create a higher value.

2.2   Digital research of traditional architecture

In terms of digital research on traditional architecture, a total of 6674 documents were searched in the knowledge network, and the number of literature studies has gradually increased in recent years, reaching 1044 in 2022, see Figure 1. among them, there are 151 documents related to art design and culture, which can be divided into four main types:
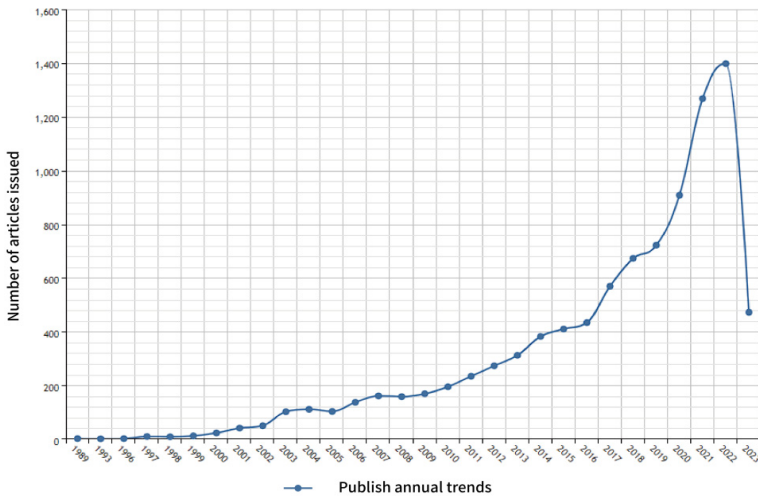

Fig. 1. Digital research literature of traditional architecture
Source: China Knowledge Network

1. Using VR, AR and other technologies to digitally reproduce traditional architecture. For example, "Virtual Pompeii" presented at the Second Virtual World Heritage Conference in the UK[10], "Virtual Ancient Rome Project" produced by the University of Virginia, USA, "Research on Virtual Experience of Traditional Architectural

Settlement in Southern Fujian Based on VR Technology - Taking Puxi Castle as an Example" by Haohan Chen [11], etc.

2. Using digital scanning for data collection and storage of traditional architecture. Chen Luming's "Research on digital conservation of minority buildings in Yunnan based on point cloud data and BIM technology" [12], Niu Pengtao and Tian Jiang's "Exploration of 3D laser scanning and HBIM technology in digital archiving of historical buildings" [13], Li Haigang's paper "Application of HDS technology in the measurement of ancient architectural relics" [14] use laser scanning technology, optical method, and construction method algorithm Laser scanning, data acquisition and storage, 3D modeling, data collation and mapping of ancient buildings, and analysis and comparison through case studies. Zekin's paper "A Preliminary Study on Digital Conservation and Construction of World Cultural Heritage - Taking the Ancient Architecture of Lop Noringa in Tibet as an Example" [15] and others proposed to use digital technologies, such as 3D modeling technology and 3D automatic imaging system, on the basis of not changing the original appearance of the building, to carry out virtual restoration work on the building and to completely record, organize, virtually storage of the painted heritage of the building, there are advantages such as high precision, high fidelity, high efficiency and convenience, high security, and rich success.

3. building digital museums, Gu Jianxin's "Study on the construction of digital museum of Nanjing Republican architecture and culture" [16] proposes ideas and methods for the construction of digital museums, carrying out urban memory projects, and realizing online panoramic roaming of digital museums to meet the audience's free arrangement for time and place. The "Digital Cave of the Hidden Scriptures",   makes comprehensive use of game technologies such as high-definition digital photosweeping, physical rendering of game engines to vividly recreate in the digital world the historical scenes of the Cave of the Hidden Scriptures and the more than 60,000 volumes of precious cultural relics in the chamber collection a century ago.

4. interactive popular science display method, Zhang Baoxin and Wang Tao explored the game-based popular science display method based on the digitization of the royal garden entity in "Digitalization of Classical Royal Gardens and its Game-based Popular Science Display", and proposed the idea of conservation and game-based display of historical and cultural heritage of classical garden category [17]. Tan Jianqing's "Research on the design of interactive display of traditional architecture - taking traditional architecture of Guangfu as an example" [18] combines digital interactive technology and synthesizes several parts from its digital reproduction of architectural space, multi-dimensional interactive expression of culture, and digital display and dissemination.David Fonseca introduced the current status of gamification technology applied in education, architecture and urban design, as well as the main goals of the project[19].

In terms of the digitization of Jageng architecture, "Parametric design research of Minnan Jageng style architecture based on CityEngine" [20] by Li Yuan et al. in 2018 carried out architectural style analysis and parametric modeling of the main building complex of Xiamen University Xiang'an campus based on CityEngine modeling tool, taking the famous Jageng architectural style as an example. By splitting and analyzing

the gatehouse, building body and roof, the cultural genes of JiaGeng style architecture are interpreted in programmed language and expressed parametrically, and the rule template of JiaGeng style modeling is created. It is mainly used in the professional field to improve the efficiency of modeling, but not much for the digital communication of Jagan architecture.

3   Discussion and result

In "Research on the Application of Interaction Design in Museums in the Age of Multi-Screen" [21], Tang Yi proposed that future multi-screen interactive interaction design will shorten the distance between the audience and the museum, provoke the audience to think, and then resonate with them. Based on this evaluation criterion, corresponding to the four types of digitization research of architecture mentioned above, Table 1 is summarized and obtained.

Table 1. Main types and functional characteristics of architectural digitization
Source: Self-drawn by the author

Type of Research	Function	Shorten the distance to the audience	Deepen the audience's thinking	Resonate with the audience
AR/VR	Digital Reproduction	√	×	×
Digital Scanning	Data Acquisition and Storage	×	×	×
Digital Museum	Online panoramic roaming	√	√	×
Interactive display	Interaction and demonstration	√	√	√

AR and VR technologies and the construction of digital museums, interactive displays, etc., all enable the audience to interact with the displayed content to different degrees through different digital media, transforming passive "seeing" into active "experiencing" and shortening the distance between the museum and the audience. This shortens the distance between the audience and the museum, and eliminates the disparity between public displays and research collections. For example, through the digital museum, we can search for objects that have not been exhibited offline, and viewers can observe and evaluate various exhibits according to their own preferences, thus deepening their thinking, which is difficult to achieve through AR and VR technologies. The last stage of resonating with the audience is very difficult to do, which requires us to use the space characteristics according to the content and atmosphere of the whole museum, adding space display design and interactive experience to meet the basic display needs of the museum based on the cultural connotation, to achieve the real evocative. This is difficult to do at the online stage, but it is also possible to add an interactive narrative display that allows visitors to truly immerse themselves in this history and experience the cultural values that resonate with it. The role of digital

scanning is generally data collection and storage, which is far away from the audience, so it does not have the advantage of shortening the distance with the audience, provoking the audience to think, and then causing the audience to resonate with these aspects.

In summary, the interactive display method has the most advantages for the digital dissemination of Jia Geng architecture and culture. In the current period of prosperous development of both cultural heritage and technological development, the cultural core of Jia Geng architecture is combined with new technical means, and the interactive methods of combining reality and imagination, tradition and modernity, contact and non-contact are used to better realize the dissemination of Jia Geng architecture and culture to the public. With the development and progress of the times, the cultural literacy of the audience continues to improve, and this interactive presentation will certainly attract more people to deeply contact, feel and understand more traditional culture.

The limitation of this study is that the literature database referenced in the study is from China Knowledge Network, and articles from other literature bases are excluded, yet articles written in other databases or languages should also be important. Still, the results of this study can be used as a preliminary reference to gain insight into the implementation of digital technology in Jagan's architectural culture.

4　Conclusion

This study takes the Jia Gung architectural culture as the entry point, and provides a new way of thinking and method for the digital presentation of traditional culture. Through in-depth excavation and analysis of the connotation of Jagan architectural culture and comprehensive comparison and analysis of existing digital display technologies, it is found that interactive display is more conducive to the digital dissemination of Jagan architectural culture, shortening the distance with the audience, deepening their thinking, and arousing their resonance. It allows the audience to experience Jia Geng architecture and culture in museums and other places through a variety of sensory methods, and improves audience participation and interactivity.

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