Construction Strategies of Rural Residential Management Data Platform—— A Case Study of Crystal Town Residence in Pingwu County, Mianyang

Wu Mei¹, He Dan¹

¹Academy of Architecture, Chengdu College of Arts and Sciences, Chengdu, Si Chuan, 610401, China

*Corresponding author’s e-mail: joeymm19841102@hotmail.com, 5421038604@qq.com

Abstract: There are large numbers and areas of rural dwellings in China. Because of remote locations of many villages or improper protections of local residents, countless historical villages and traditional dwellings are slowly dying out. Digital information platforms will preserve data of residential buildings through professional surveys and mappings, which timely and effectively integrate all kinds of residential information, share data to the maximum extent and protect valuable residential buildings.

1. Introduction

Both the number and areas of rural dwellings in China are large. Due to remoteness of many villages or improper protections of local residents, countless historical villages and traditional dwellings are dying out.

Nowadays, digital landscape information has been constantly developed. It is an inevitable trend that data platforms are built for modern managements of rural residential buildings. A digital information platform can save the data of residential buildings through professional mappings, integrate various types of residential information in a timely and effective manner, as well as maximize sharing of data and protections of residential buildings.

Crystal Town is located in the northwestern edge of Pingwu County, Mianyang City, Sichuan Province, which is at upstream of the Minjiang River and is 88 kilometers from Huanglong Scenic Area. Crystal Town used to be a settlement of Baimafan people in history. The place was called "Nisig Shao" in Baima because its underground entrance was often flooded in history. It has later been evolved into crystal due to productions of crystal mines in the country, which is known as Crystal Fort.

Residential houses in Crystal Town not only have characteristics of typical houses located at mountainous areas of Sichuan Province, but also have unique historical cultures. However, in recent years, traditional houses have gradually declined due to reasons such as not meeting modern lifestyles. According to this trend, after a few years, relatively complete houses owned by people in Crystal Town will disappear. In order to retain the original research data, and for researches on digital landscape information platforms aimed at rural residential houses, the author carried out rescue mappings of typical mountainous residential houses in Crystal Town, and used a platform to analyze thematic data of various categories in the hope that future technologies could be provided for protective restoration supports.
2. Construction Purpose of Rural Residential Management Database Platform

Establishment of rural residential management database platforms is a necessary trend for smart and digital managements. It can promote modernization processes of rural planning and managements as well as protect and utilize excellent resources with historical protection values in the vast rural areas of China.

2.1. Improving Management Efficiencies of Rural Planning

The purpose of building rural residential management database platforms is to promote sustainable developments of rural planning, properly protect rural features and minimize maintenance costs.

In China, on the one hand, managements of information collections and preservations of rural dwellings have remained in traditional preservation methods on paper documents, whose contents are mostly picture information and explanatory text materials. In long-term data storage processes, information contents are complex and scattered, and their sources are unclear. Many precious data is in danger of being damaged and lost.

On the other hand, those management methods are mostly manual operations, whose management effectiveness is affected by professional levels and protection consciousness of managers, which has high uncertainties. A rural residential management data platform can make up for the above shortcomings of traditional manual methods, enable professionals to quickly obtain a large amount of spatial information, improve information accuracies and maximize values of landscape information. Acquisition of rural residential resource information can be realized through fully automatic and semi-automatic operations instead of manual operations, which can provide efficient guarantees for protections, planning and managements of rural landscapes [1].

2.2. Expanding Sharing of Rural Residential Information

Sharing is an important feature and attribute of databases [2]. Compared with other information, such as rural streets and village squares, etc., there is no uniform standard for rural residential information, which is more complicated. In the face of rural developments, existing management departments and different development agencies need to do a lot of works to improve information of rural dwellings. Information collections are highly repetitive, which are of a low resource allocation and utilization rate. A rural residential management database platform can integrate various types of residential information in a timely and effective manner as well as maximize sharing of data and materials, so that governmental personnel, planning and scientific researchers, indigenous people and development agencies can grasp basic information of rural residential houses and observe their dynamic changes in a timely manner.

3. Functions of Rural House Management Database Platforms

Main functions of rural residential management database platforms are storage, management, retrieving, browsing as well as publishing data and information related to rural residential buildings. They can communicate with relative planning and design software platforms as well as provide bases for analyses, researches and planning evaluations [2]. Rural residential management database platforms should implement the following three functions.

3.1. Quantitative Collection and Entry of Information

Through professionally surveying and mapping dwellings, collecting and encoding dwelling data and establishing a database to digitize and visualize information of various types of rural dwellings, quantitative collections and editing of dwelling data are realized.

3.2. Regular and Real-time Updates of Information

Compared with traditional management modes, computer technologies have functions of efficiently collecting and editing data, and a database can implement its functions of regular and real-time data updates to ensure timeliness and authenticity of data.
3.3. Classified Query and Management of Information

According to different usage methods of users, query methods are established for different users, such as governmental departments of various villages and towns, relative planning departments, scientific research staff and indigenous villagers. A database system should classify them and set different rights for managements and queries [1].

4. Construction of Rural Residential Management Database Platform

According to constituent elements of those rural dwellings, data is divided into two parts. One is basic information of those dwellings and the other is detailed data of them.

4.1. Basic Information of Dwellings

Basic information of those dwellings is presented in the form of a table, which are numbered in establishing process of the database, and data such as building areas, preservation statuses and responsible persons are established through links, associations and hypermedia. (Table 1)

| Field name | Field type | Field meaning       | Remarks          |
|------------|------------|---------------------|------------------|
| Number     | Digital    | Numbering           | NO.1             |
| Type       | Text       | Type                | Residential building |
| Date       | Text       | Time                | 1930             |
| Protection | Text       | Protection level    | Unprotected      |
| Owner      | Text       | Responsible         | Building owner Xu XinLiang |
| Square     | Digital    | Area                | 178.92 m²        |

4.2. Residential House Details

A rural residential management database can include a variety of data such as planar positions, section elevation analyses and detailed analyses of rural residential buildings.

4.2.1. Layout

The total area of Residential Area No. 1 is about 178.92 square meters. Its overall layout is typical of Sanheyuan, which is basically symmetrical along the center axis. The main house has a total width of 16.88m and a depth of 10.6m (see Figure 1).

Fig.1 General Layout

Those dwelling houses are of two floors, of which the second floor is an attic. The main and side rooms are close in depth, and the column network layout is the same and they are symmetrical along the central axis. The main and side rooms are directly connected indoors. Plan of the functional layout is to facilitate production and life. The front yard dam is a closed space, which can be used to store debris as well as feed chickens, ducks, geese and other small domestic animals. Although the layout follows the rules, it is also flexible and shows the freedom of residential constructions (see Figure 2，3).
4.2.2. Section Elevation Analysis

The main and side rooms have the same cross-sectional structures and are symmetrical along the central axis. Ridge of the main house is 6.8m high and the eaves are 3.3m high, which is 1.2m higher than the side eaves. The pitch is 1m. Slope of the main roof is 15%, which is relatively low, that of the auxiliary roof is 26%, which is relatively steep as it is conducive to frequent and abundant rainfalls in mountainous areas.

The whole building is double-eave, whose eaves reach as far as 1.4 m, providing a certain space for activities. There is a row of small beams at the height of the profile house in the middle, which realizes flexible divisions of upper and lower floors. Residents can erect floor slabs according to their needs and can also remove those floor slabs to achieve flexible uses of spaces [3]. The clear height of bedroom interior is 2.8m, and that of most rooms such as the hall and the side hall are the same, which is 2.8m. This height is convenient for erection of the beams and columns of the house as a whole, and improves performances of the house. Proportion of façade of a dwelling house is harmonious. The roof is covered by small green tiles in a large proportion. Most of the walls are made of wood. Due to the small depth of eaves, the facade can have sufficient sunlight.

4.2.3. Detailed Analyses

Shape of the shingle in the middle of the roof is a typical flower decoration of roofs in residential houses of Sichuan Province [4] (see Figure 4). The ridge and corners are sharp tips, which are simple but vivid (see Figure 5). The eaves have an unsupported arch structure, which is a directly challenge. It is a single-challenge system without a sitting melon. The board wall is maintained, which can be seen on the edge of the frame and is directly stuck on the second floor.

5. Conclusion

Today, with rapid transformations of society, a large number of rural houses scattered in mountainous
areas have gradually disappeared over time. Construction of rural residential management data platforms can better protect and sustainably use rural resources, realize systematic managements and reasonable connections among resources, which is of great significances for protections of deceasing rural residential houses and also provides scientific bases for rational developments and utilizations in later periods.

References
[1] Xiong Xing, Tang Xiaolan. Construction Strategy of Rural Cultural Landscape Management Database Platform in Scenic Spots [J]. Journal of Nanjing Forestry University (Natural Science Edition), 2017 (9).
[2] Gong Jianya. Concept and development trend of spatial database management system [J]. Surveying and Mapping Science, 2001 (3): 4-9. DOI: 10.3771/j.issn.1009-2307.2001.03.002.
[3] Li Menggang. On the characteristics of Sichuan residential houses [J]. Heritage Building, 2009 (00): 194-196.
[4] Sichuan Survey and Design Association. Sichuan folk house [M]. Chengdu: Sichuan People's Publishing House, 1996.
[5] Wang Zhaoxia. Regional characteristics and formation of traditional houses in Sichuan Basin [J]. Chongqing Architecture, 2004 (1): 106-109.