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Retraction

Retracted: On the Digital Path of the Protection of Folk Houses in Qiang Nationality Villages from the Perspective of Digital Media Technology

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] D. Hu, L. Zhang, X. Shi, X. Ma, and Z. Pang, "On the Digital Path of the Protection of Folk Houses in Qiang Nationality Villages from the Perspective of Digital Media Technology," *Advances in Multimedia*, vol. 2022, Article ID 3462644, 11 pages, 2022.

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Research Article

On the Digital Path of the Protection of Folk Houses in Qiang Nationality Villages from the Perspective of Digital Media Technology

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In order to better adapt to the development nationalities of the digital media era and promote the inheritance path innovation of traditional nationality cultural resources, this study takes Qiang nationality village houses as the research object and takes the digital media era as the research background to deeply analyze the inheritance and protection path of Qiang nationality village house culture in the digital era. Therefore, this paper proposes a method of digital protection path of minority residential buildings based on point cloud technology and BIM Technology. This method constructs the digital resource database of village residential buildings by constructing the BIM model and the three-dimensional model of point cloud technology and then constructs the building information model based on traditional residential buildings from the data of building model, graphic influence, and cultural attributes, so as to provide technical support for the protection, repair, and reconstruction of ethnic minority buildings and the inheritance of ethnic culture.

1. Introduction

China is a country with 56 ethnic groups, and 55 ethnic minorities have gathered rich and colorful cultural contents. As an ancient ethnic group in China, Qiang began to migrate and spread culture from the ancient Shang and Zhou dynasties. However, Qiang has always been on the edge of the Chinese nation [1]. As a special cultural phenomenon, the cultural diversity of Qiang culture is also the focus of our study of Qiang related culture. The unique regional cultural nationalities of Qiang nationality are reflected incisively and vividly in the architectural style of their village folk houses. The infiltration and dissemination of diversified cultural elements have been extended to all details of Qiang folk houses. At the same time, the multiethnic integration and cultural integration of Qiang architectural culture are also fully reflected [2]. In the digital media era, the protection of traditional nationality folk houses is not only the protection of traditional culture but also the inheritance of traditional cultural elements [3].

With the continuous recognition of globalization in the world, information technology has slowly extended to many fields in the world. Over the years, with the continuous development and innovation of global science and technology, information technology has also developed and became more and more mature. Many high-tech computers have been developed in some special fields for professional scientific and technological knowledge research. Due to the advent of computers with high-tech technology, this can bring a lot of convenience to the development of science and technology in the future. In the continuous development and research, human beings have found computers to adapt to the development of modern science and technology [4]. These new technologies are closely related to many aspects of

our life. In the 21st century, almost everyone knows the word Internet, and the network is synonymous with the computer, and modern human interest in the network is great. In other words, the Internet is the hub of computer growth. It and computers restrain each other and make common progress. Because the Internet makes human life colorful and diverse, today's network technology has become an indispensable information technology in people's life [3].

Driven by science and technology, human beings are not only limited to the research and development of two-dimensional science and technology but also more and more mature for the research and development of three-dimensional information technology. Now the more mature three-dimensional laser scanning technology has also made great research achievements in some fields, so this technology is gradually applied to the field of three-dimensional landscape reconstruction [5]. These technologies use omnidirectional camera system and other high-resolution digital cameras to scan and collect the data of the target according to the different nationalities of different types of scanners.

In China, BIM Technology is not widely used, but a few construction enterprises apply BIM Technology to all stages and progress of the project. For example, the famous Shanghai center project is a typical case combined with BIM Technology. This technology makes an all-round plan for the whole process of early planning, construction, and management of the project. It is the first project led by the project owner in China [6]. Another example is the terminal 3 project of capital airport. In BIM Technology, the collision problems of all pipelines in the design are understood, the overall model is analyzed, and the problems are solved one by one, so as to speed up the progress of the project. Therefore, the development trend of BIM Technology in the construction industry cannot be underestimated, and, with the continuous development of BIM Technology, it is very likely to change the construction mode of the construction industry [7].

2. Construction of Three-Dimensional Point Cloud Model of Ethnic Architecture in Qiang Nationality Villages

2.1. Data Acquisition. The essence of three-dimensional laser scanning technology is full-automatic high-precision three-dimensional scanning technology, namely, "real scene replication technology." By obtaining the three-dimensional coordinate data of the scanned object and digital photos, we can quickly obtain the three-dimensional information of the entity, reconstruct the three-dimensional model by computer, and reproduce the real morphological nationalities of objective things [8]. The noncontact measurement method can accurately and efficiently collect the three-dimensional coordinate data of entities or real scenes with irregular shape and complex structure and build the three-dimensional model of the measured object through the postprocessing software, so that the measured object can be drawn more quickly.

FARO X330 3D laser scanner is used in this study, and its parameters are shown in Table 1.

The working principle of three-dimensional laser scanner is to estimate and record the distance of the target object by calculating the phase difference of the laser wave reflected from the object. For different instruments [9], the direction of the coordinate axis will be different, but most instruments define the coordinate origin as the laser emission of the scanner, as shown in Figure 1. The z-axis is the vertical direction of the scanner, and upward is positive; the x-axis is perpendicular to the z-axis, which is in the transverse scanning plane of the scanner; the y-axis points to the target object and forms a complete right-hand coordinate system with the x-axis and z-axis [10].

We have

$$\begin{cases} X = S\cos\theta\cos\alpha, \\ Y = S\cos\theta\sin\alpha, \\ Z = S\sin\theta. \end{cases} \tag{1}$$

The FARO X330 3D laser scanner is used to realize a series of technical application research such as 3D data acquisition, processing, and 3D model establishment by formulating a detailed and complete scanning operation process [11], so as to provide a good reference for 3D surveying and mapping of buildings. Figure 2 is an operation flow chart using a scanner.

The scanner used in this paper works with itself as the rotation center in the scanning process, and the spacing of folk houses in Qiang villages is relatively dense, and the scanning range is relatively increased. Therefore, the scanning of each part is required to be accurate and comprehensive [12]. Therefore, when setting the scanning site, it is necessary to make the scanning object as omnidirectional as possible. Figure 3 shows the scanning layout scheme.

Through the above steps, we can complete the survey, scheme design, and scanning of the village terrain and then carry out a series of indoor operations such as denoising, height adjustment, and parameter setting on the scanned data, so as to obtain a complete point cloud data model [13].

2.2. Building 3D Point Cloud Model Construction

2.2.1. Select the Research Object. In order to obtain the complete and effective cloud mapping data of Qiang buildings, we need to carry out comprehensive and effective mapping. Due to the complex shapes and various types of ethnic minority buildings in Qiang area, it is difficult to meet the high standards and requirements of current surveying and mapping by using traditional surveying and mapping methods [14]. With the advantages of nontouch, high precision, high efficiency, and being free from human intervention, 3D laser scanning technology can solve many defects in the traditional surveying and mapping mode and quickly and intensively obtain the point cloud of buildings, so as to realize efficient and accurate modeling. Topcon GLS-1500, a ground-based three-dimensional laser scanner used in this section, is used as experimental equipment to comprehensively scan Qiang buildings. Topcon GLS-1500 is a laser rangefinder that uses the built-in scanning prism to

Table 1: Technical parameters.

Technical parameter	FARO X330
Scanning principle	Phase type
Scanning accuracy	Distance measurement error ≤ ±2 mm
Scanning distance	The maximum measuring range shall not be less than 300 m; the minimum measuring range shall not be more than 0.6 m
Light emitting diameter	The diameter of the emitted light at the laser emission point is less than 2.3 mm
Instrument positioning	Integrated GPS positioning
Texture acquisition	The 3D scanning system has a built-in camera with a pixel of no less than 70 million pixels. The laser and the built-in camera are designed coaxially without error
Scanning field angle	Horizontal viewing angle 360°; the vertical viewing angle shall not be less than 300°
Resolving power	The vertical and horizontal resolution shall not be less than 0.009°
Tilt sensor	Built-in high-precision inclination sensor (accuracy ≥ 0.015°)

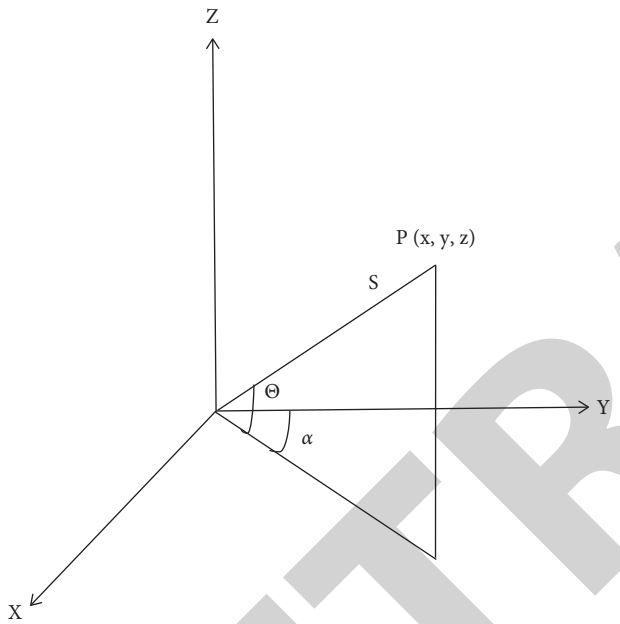

Figure 1: Coordinate calculation principle.

obtain the three-dimensional model of the target point with high speed and accuracy. Its scanning speed can reach 30000/s. Its advantages are as follows: it can obtain the three-dimensional point cloud of the target range with no contact, high precision, and fast speed [15] and form the point cloud through the supporting point cloud processing software. Another feature is that laser ranging can be carried out whether there is a visible light source or not. When there is a visible light source, the color value (RGB) of the target point can be obtained at the same time to form a real point cloud image. The technical parameters of Topcon GLS-1500 instrument are shown in Table 2.

2.2.2. Point Cloud Data Acquisition. Obtaining complete and accurate point cloud data is an important foundation and key to establish a fine 3D point cloud model. Therefore, before scanning, it is necessary to determine the scanning scheme and formulate a reasonable scanning route and detailed workflow. According to the spatial layout and morphological nationalities of Qiang buildings, determine the location of the corresponding survey station, draw the on-site sketch, scan the inside and outside of the building, and import the scanned point cloud data into Leica cyclone software for processing. The point cloud processing process mainly includes three steps: point cloud registration, point cloud denoising, and point cloud thinning. The instruments and equipment required for this scanning work include Topcon GLS-1500 ground 3D laser scanner, Shanneng ZHS2470 digital camera, and a tripod. The data acquisition process of 3D laser scanning is shown in Figure 4.

In order to better scan the buildings and make the scanning work reasonable and smooth, it is necessary to conduct on-site survey, fully understand the surrounding environment of the Qiang building site, and determine the scanning scope. Then determine the general location of the scanning station according to the external environment, spatial location, and structural nationalities of the building. The selection of the measuring station needs to avoid the shelter as much as possible. Combined with the scanning range of the scanner and the actual situation of the site, reasonably plan the scanning route, draw the site sketch, optimize the scanning route, and formulate the specific work arrangement. Include personnel arrangement, scanning process, and progress and complete the scanning task with quality and quantity until the collection of point cloud data of the whole Qiang building is completed. In order to ensure that the data obtained at each scanning position can cover the complete scanning area, multistation and multiangle scanning mode should be selected during scanning. Among them, the selection of scanning stations should avoid obstructions and visual blind areas as far as possible according to the actual situation of the site and set reasonable stations [16]. The stations should not be too far apart, and a certain degree of overlap should be reserved. Because the Qiang buildings are relatively regular and rectangular, four survey stations are arranged in this survey, so as to ensure a certain degree of overlap between adjacent survey stations. The approximate location relationship between the survey station and Qiang buildings is shown in Figure 5.

Turn on the scanner to collect point cloud data. In the process of scanning, pay attention to keep the scanner stable, prevent inclination, and ensure the safety of the instrument. After the end of the first survey station, remove the 3D laser scanner from the tripod and transport it to the next survey

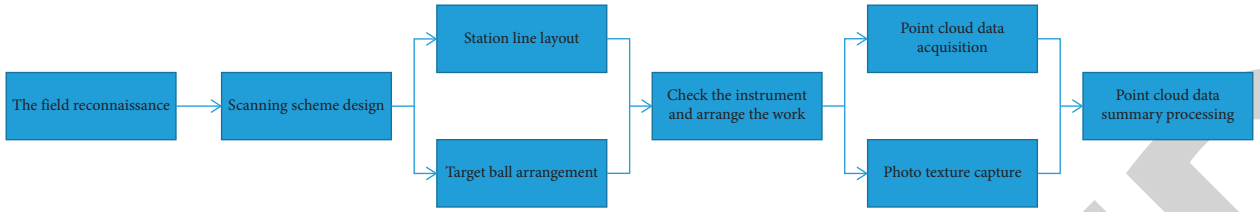

Figure 2: Operation flow chart.

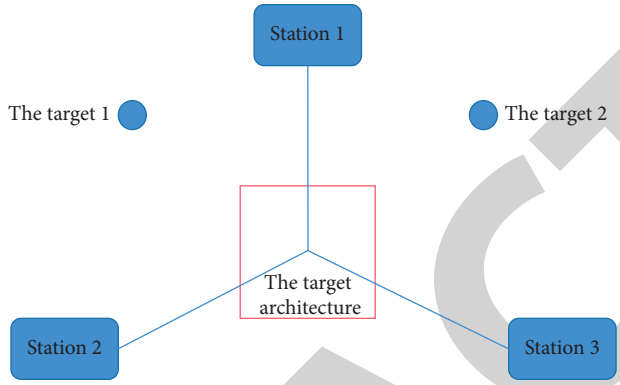

Figure 3: Scanning station scheme.

Table 2: Technical parameters of Topcon GLS-1500 instrument.

Instrument parameters	Value
Maximum scanning distance (M)	150–300
Minimum scanning distance (M)	1
Ranging accuracy (mm)	150 m处4 mm
Maximum sampling density (mm)	100 m处1 mm
Maximum scanning speed (points/s)	30000
Horizontal scanning angle range (°)	0~360
Scanning angle range in vertical direction (°)	−35~35

station. Repeat the above steps and scan station by station until the 3D point cloud data of Qiang buildings are completely collected. In order to avoid the generation of noise point cloud during scanning, the flow of personnel within the scanning visual range should be reduced as much as possible. The scanning time of each station is related to the setting of scanning distance and point cloud density. The scanning time of this single station is about 25 minutes. The point cloud data is collected from four stations, and the cumulative time is about 2 hours [17].

2.3. Point Cloud Data Processing Process. This paper uses Leica cyclone software to complete the processing of Qiang architectural point cloud data. Leica Cyclone is powerful professional 3D laser scanning processing software independently developed by Leica company and matched with the scanner. Cyclone software can output scribing diagram, point cloud diagram, and two-dimensional and three-dimensional drawings, systematically process and manage massive point cloud data, and support the output of TPS, RCP, RCS, and other data formats. At present, it is widely used in engineering survey, cultural relics archaeology, reconstruction engineering, and other fields [18]. The work flow chart of point cloud data processing is shown in Figure 6.

2.3.1. Point Cloud Registration. The result of point cloud registration will affect the efficiency of subsequent data processing and the accuracy of 3D modeling. In the scanning process, due to the limitation of the field of view angle, the shielding of the target building itself, or the complex surrounding environmental conditions, it is impossible to obtain the complete point cloud model of the target building through a single station, so it is necessary to adopt the working mode of multiple angles and multiple stations. The schematic diagram of multiangle scanning building surface is shown in Figure 7.

Point cloud registration is to transform the source point cloud into the coordinate system of the target point cloud. The purpose is to find the rotation and translation matrix between the two coordinate systems, use the matrix to realize the registration of point cloud data from different scanning perspectives, and obtain a complete point cloud model. In order to realize the transformation between two spatial coordinate systems, one coordinate system needs to be translated, rotated, and scaled, which is mainly determined by three kinds of parameters of spatial coordinate transformation [19]. There is no scale change before and after point cloud registration. Only three rotation parameters and three translation parameters are required. Solving these six parameters requires no less than three feature points. Finally, these six parameters can be solved according to the least square method. The transformation diagram of space rectangular coordinate system is shown in Figure 8.

Figure 4: Flow chart of 3D scanning data acquisition.

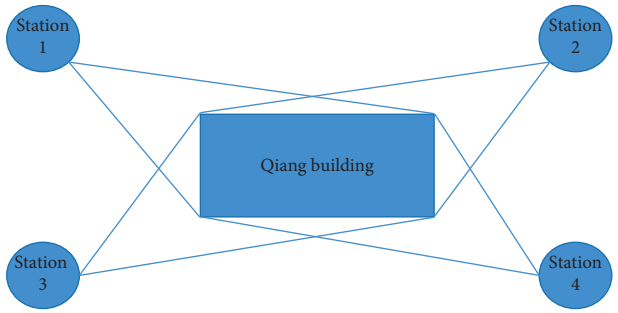

Figure 5: Schematic diagram of the general location relationship between the survey station and Qiang buildings.

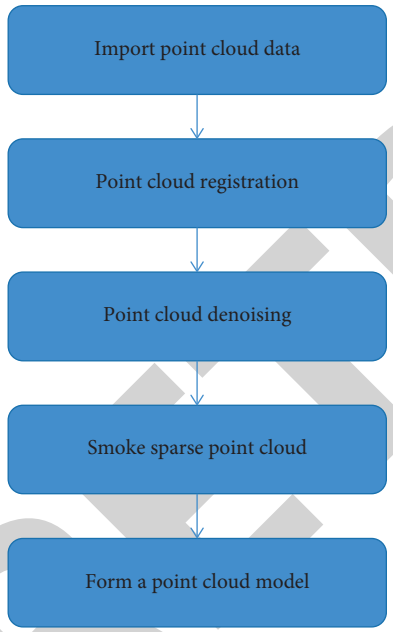

Figure 6: Work flow chart of point cloud data processing.

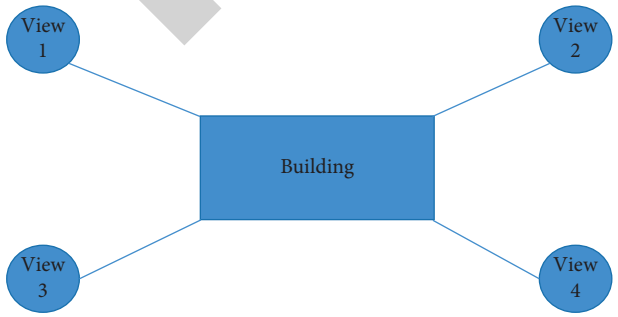

Figure 7: Schematic diagram of multiangle scanning building surface.

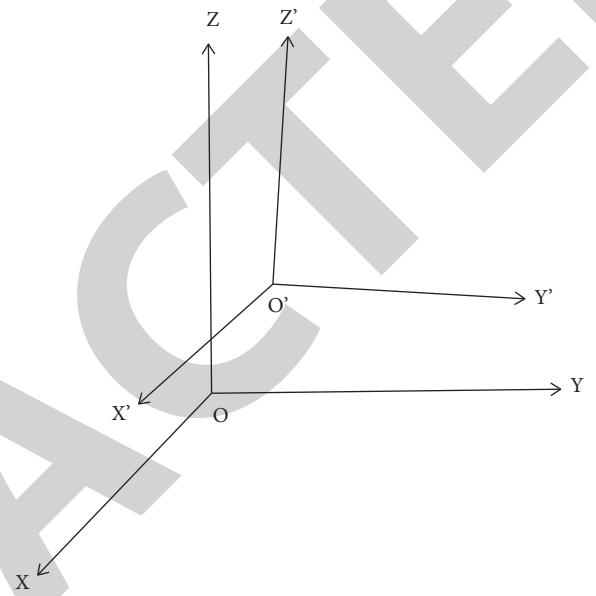

Figure 8: Transformation diagram of space rectangular coordinate system.

2.3.2. Point Cloud Denoising. In the process of scanning, it is inevitable to be affected by external factors, such as the shielding of vehicles, pedestrians, buildings, and trees, as well as the reasons of the 3D laser scanner itself and the reflection nationalities of the scanned object surface. Some nontarget points and error points, that is, noise points, will inevitably appear. The existence of these noise points will not only affect the efficiency of subsequent point cloud data processing but also have a negative impact on the accuracy of 3D point cloud model. Therefore, before constructing the 3D point cloud model, it is necessary to denoise the point cloud data, eliminate the noise points, and realize the denoising of the point cloud data [20].

2.3.3. Point Cloud Thinning. Thinning of point cloud refers to the reduction of the massive point cloud data obtained by eliminating redundant points and noise points without affecting the accuracy of the point cloud model. Generally, not only is the point cloud data obtained by 3D laser scanner huge in quantity and occupies the storage space of the computer, which brings great challenges to the operation and processing of the computer, but also these point cloud data are not all available point clouds. There will be a certain overlap area in the point cloud between different stations, which will increase the workload of inner page data

processing and have a negative impact on the accuracy of later 3D model construction. Therefore, in order to improve the processing accuracy and efficiency of subsequent point cloud data, it is necessary to dilute the collected point cloud data [21].

3. Construction of Building Information Model (BIM) of Qiang Nationality Folk Houses

3.1. BIM Model Construction Based on Point Cloud

3.1.1. Import of Point Cloud Data. The processed point cloud data needs format conversion before it can be imported into Autodesk Revit software for 3D model establishment. Through Leica Cyclone software, the point cloud data is exported to the point cloud format of RCS and directly imported into Autodesk Revit 2017, providing a scientific reference for the establishment of "nation" Library and the final complete BIM model.

3.1.2. Parametric Design Establishes "Nation" Components. The point cloud model collected by three-dimensional laser scanner is imported into Autodesk CAD, and the two-dimensional plane of the component is drawn by extracting the structural features of the component. In Revit software, the 3D model of geometric components is established through combined operations such as stretching, fusion, and lofting.

The modeling of ethnic architectural components is complex and diverse. In the process of modeling, it is necessary to summarize the key parameters and variation interval according to the internal structural nationalities of the components, realize the parametric driving of the size, material, and shape laws of the components, and form a standardized information model of architectural components.

In addition to providing the geometric information of components, the "nation" component model can also give the attribute information of components. Add attribute information in the form of text in Revit architecture including the material, color, age, and material strength of building components. Save as a newly defined family. To ensure the validity of the driving parameters in the 3D model, you need to load the newly defined "nation" directly into any open project to test its operation. The parametric design flow chart of "nation" components is shown in Figure 9.

3.1.3. Addition of Nongeometric Attributes. Nongeometric attribute information is unique to BIM, and it is also one of the key steps of BIM Technology applied to building digital protection. To establish a geometric model, you need to add corresponding text information or parameters as required, such as dimension, name, material, age, repair records, and other multidimensional records. The addition of nongeometric information breaks the tradition of focusing only on the establishment of "shape" model, endows the building with cultural connotation, realistically restores the original

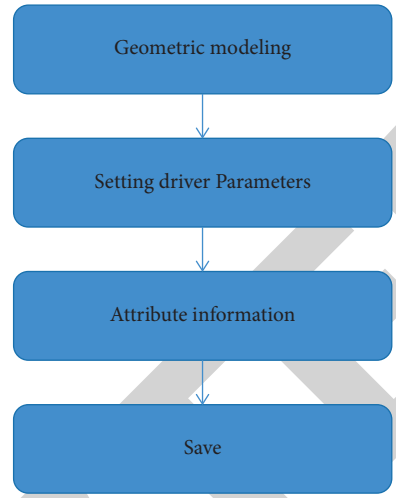

Figure 9: Parametric design flow chart of "nation" components.

appearance of the building, ensures the subsequent repair and permanent retention of digital information, and realizes the management of three-dimensional geometric model and attribute information [22]. The attribute information of building life cycle is shown in Figure 10.

3.2. Development and Establishment of Building Digital Resource Database

3.2.1. System Environment and Development Tools. Based on the 64-bit Windows 10 operating system, the building digital resource database system realizes the front-end function through Python programming language, the background database realizes data connection and data exchange through SQL Server 2012, and the front-end application realizes data exchange with the background database server through network transportation. The digital resource database of Qiang Minority Architecture includes a series of functions, such as the storage, management, and application of architectural model data [23], graphic images, and cultural attribute data of Qiang Minority Architecture. The software and hardware development environment of the system is shown in Table 3.

3.2.2. Database Platform and B/S Architecture

First is database platform.

This paper selects SQL Server 2012 database as the digital resource database of Qiang ethnic minority buildings as the underlying background database. SQL Server 2012 is a relational database management system developed and designed by Microsoft with comprehensive functions and mature technology, which can be applied to all kinds of Windows systems. Compared with other databases, it has the advantages of simplicity and practicality, strong adaptability, security and stability, strong scalability, and high integration with relevant software. The database has a very strong ability of data operation and sharing. It can quickly and

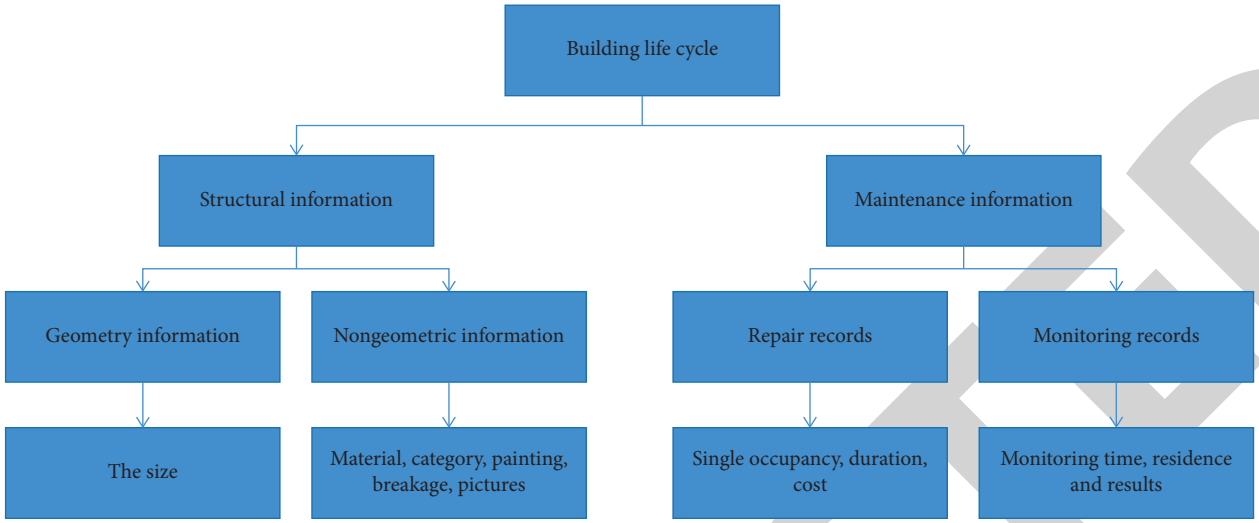

Figure 10: Attribute information of building life cycle.

Table 3: Software and hardware development environment.

Software and hardware environment	Parameter configuration
Operating system	64-bit Windows 10 Ultimate, 4.0 G memory
System type	64-bit Windows 10 Ultimate, 4.0 g memory
Processor	Intel CPU i5 2.67 Hz
Graphics card	NVIDIA Quadro 600
Database platform	Microsoft SQL Server 2012
Development platform	PyCharm
Programming language	Python

efficiently complete a series of operations such as data reading, storage, and analysis and work together with other database systems to realize data processing and sharing. Microsoft SQL Server database engine provides a very powerful storage function for relational data and structured data and can build and manage data applications for business. SQL Server 2012 database has the functions required by most systems, can work in a variety of modes, and provides powerful database management functions according to user needs. At the same time, SQL Server 2012 database also has security and reliability, which can ensure the security of data storage. At the same time, it is also more widely used.

Second is B/S architecture.

The working interface of B/S architecture is mainly on the browser side. The front end implements part of the transaction logic, while the server side implements the main transaction logic. The three layers and architecture of B/S, namely, user interface layer, business logic layer, and data access layer, are shown in Figure 11.

3.2.3. Demand Analysis of Database. The data of building digital resource database mainly includes the following categories: point cloud 3D data information, 2D drawing plane information, 3D building model information, image audio-visual data information, building attribute data information, and national component data information [24]. The data classification in Qiang Minority Architecture digital resource database is shown in Figure 12.

The design of database conceptual model does not depend on the specific computer system. It is designed based on the demand analysis and system analysis of database. Conceptual model design is mainly to analyze, sort, summarize, and extend the data requirements and define the data elements and the relationship between elements. *E-R* model (entity relationship) is the most widely used relational conceptual model in the conceptual design stage of database. *E-R* diagram is an expression tool to describe the relationship between data entities. It is commonly used and typical. It is mainly composed of entities, attributes, connections, and association cardinality. The entity is represented by a rectangle and the entity name is indicated in it. The entity attribute is represented by ellipse, the connection between entities is represented by diamond, the association cardinality is marked next to diamond and connected by straight line, and the connection type is marked next to straight line, so as to form a complete *E-R* diagram. The *E-R* diagram of Qiang Minority Architecture digital resource database is shown in Figure 13.

The digital resource database of ethnic minority buildings is a digital protection system with B/S as the architecture mode. It uses the structured development method and adopts the three-layer structure system of presentation layer, intermediate service layer, and data layer of industry standards. The three-tier architecture of B/S mode is shown in Figure 14.

(1) Presentation layer

The system presentation layer mainly completes the interaction between users and computer system, so as to realize the core function operations such as data update, query and retrieval, and improvement. Users

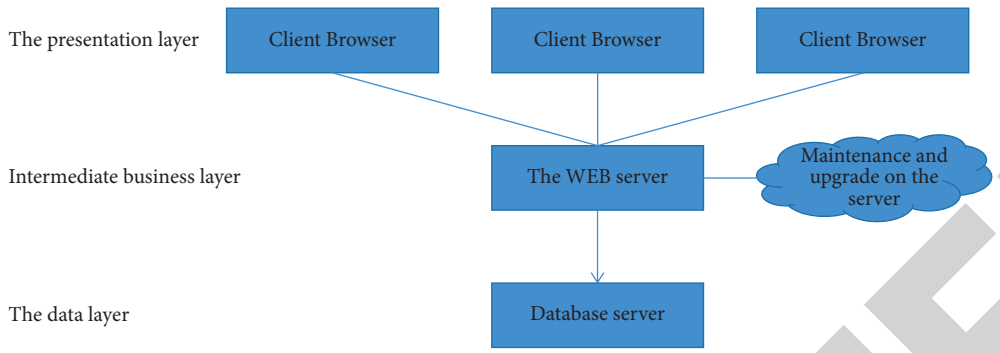

Figure 11: B/S architecture.

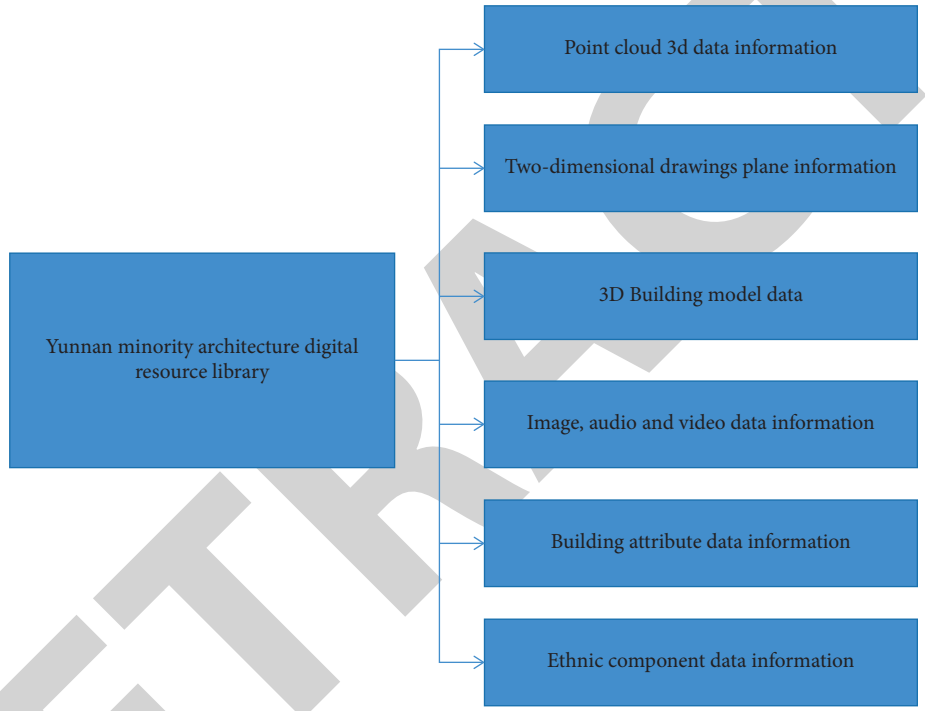

Figure 12: Data classification of digital resource database of national architecture.

of Qiang Minority Architecture digital resource database can access the point cloud data, two-dimensional plane, three-dimensional model, picture text, video audio, family components, and other architectural related data information generated by the web server on the Internet through the browser.

(2) Intermediate business layer

The intermediate business is mainly responsible for defining business logic, receiving data requests from the interface layer, submitting requests to the data access layer after logical judgment, and transmitting data access results.

(3) Data layer

The transaction done by the data layer is the operation of storing data files such as database or file text. It provides data services for the interface layer and business logic layer for the functions of data addition, deletion, modification, query, retrieval, and application.

4. Protection and Utilization of Qiang Residential Buildings

4.1. Establish an Expert Protection Committee for Qiang Residential Buildings. Today, some villagers in Qiang areas have renovated their houses, such as changing the original appearance of the houses, decorating the outer walls with cement and tiles, and even replacing local materials with bricks and stones near roads and convenient transportation. This is very eye-catching in ancient Qiang village, which is incompatible with the surrounding architectural style. For example, in Taoping Qiang village, a toilet and public building have been built in the past few years, and the outer wall has been coated with cement. In recent years, with the prosperity of tourism and the

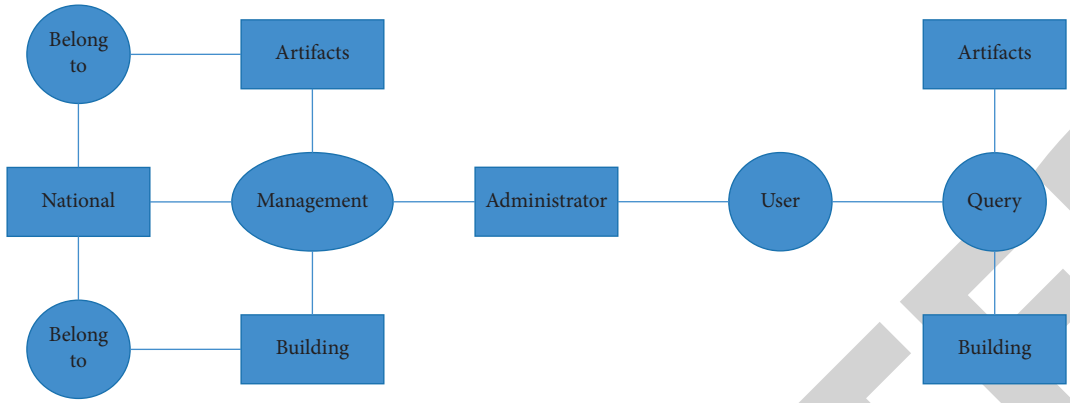

Figure 13: *E-R* diagram of building digital resource library.

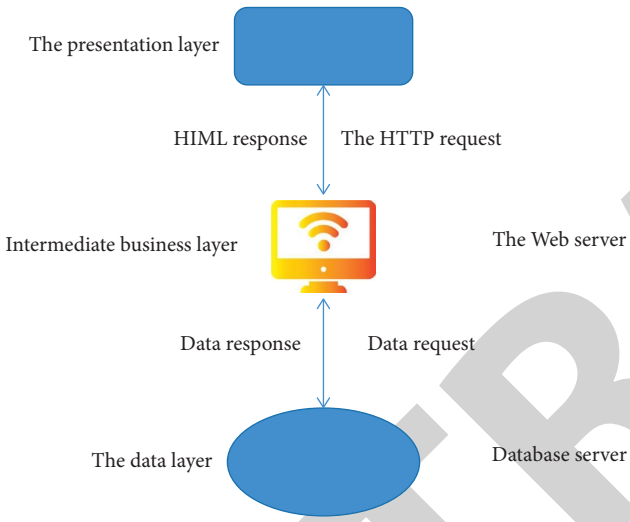

Figure 14: Three-tier structure system of B/S mode.

awakening of protection consciousness, the original appearance has been restored. We think that, to solve these problems, we must establish a relatively independent expert protection committee.

The expert protection committee of Qiang folk houses is organized by the government, and the administrative meetings of counties, towns, and villages are established under the leadership of local governments. The ethnic and religious affairs committee can provide assistance. Members should include experts in natural sciences, social sciences, and Qiang research. At the same time, architects, historians, and artists are also indispensable candidates for the organization. In addition, the Planning and Construction Commission, the Bureau of Cultural Relics, the Bureau of Culture, the Tourism Development Bureau, and other relevant departments should also send people to participate. Only in this way can we organize experts and scholars from various disciplines, fields, and departments to jointly explore the connotation of Qiang people's housing, formulate specific protection measures for each village, provide decision-making basis for government functional departments, and deal with them properly. The protection of Qiang people's houses and the expansion and reconstruction of houses by villagers must be approved by the expert protection committee and carried out under the guidance of the expert protection committee.

4.2. Find Out the Family Background, Survey All Qiang Villages, and Make Specific Measurements. At present, Qiang people live together and form villages of different sizes. However, this number is still limited. The relevant functional departments of the government shall organize surveyors and photographers to log in, record, draw, and take photos and publish the series of surveying and mapping of Qiang residential buildings. No Qiang villages should be left, so that the government and the ethnic and religious affairs committee can grasp the overall situation of Qiang and provide effective protection and development details. This work can learn from the collection of photographic works of Taoping Qiang village published by Li County Tourism Bureau.

4.3. Attract Multiparty Investment and Establish a Multilevel and Diversified Protection and Development System. In the 50 years since the founding of the People's Republic of China, the protection of cultural relics and historic sites and ethnic architectural complexes mainly depends on government funding. The economy of Qiang areas is relatively backward. It is unrealistic to rely solely on the government. It is necessary for us to absorb funds from various channels, emancipate our minds, and protect some Qiang villages with convenient transportation, large construction scale, and long history. Taoping Qiang village in Li county is jointly operated by the Tourism Bureau and private capital to protect and reasonably develop and transfer the operation and development rights of some or all scenic spots and greatly improve the development and utilization level of tourist resorts. At present, the Qiang people have embarked on the road of prosperity, which deserves the attention and research of experts and scholars and provides rare experience for the rational protection, development, and utilization of government departments.

4.4. Develop and Utilize in a Planned and Step-by-Step Manner. China is a multiethnic country. National unity and common prosperity are the road to strengthening the country. As an important part of national folk art, housing is the basis of improving the competitiveness of commodity economy through in-depth, systematic, and comprehensive research, development, and utilization. At present, the people in most parts of China have basically solved the problem of food and clothing. Some areas have even embarked on the road of prosperity. With the increase of economic income, the consumption level of cultural industry also increases accordingly. The unique architectural style and thrifty virtue of Qiang nationality can be developed as a reasonable tourism resource. For example, the development of Shuimo town and Luobo village began a few years ago. The economic and living standards have improved significantly, so that generations of Qiang people who rely on land, work at sunrise, and live at sunset can enjoy the benefits of rational development.

5. Conclusion

With the continuous development of 3D laser scanning technology and BIM Technology, the digital protection of national architectural cultural heritage will continue to play an important role. In general, this paper explores and studies the digital protection of ethnic minority buildings combined with three-dimensional laser scanning technology and BIM Technology and provides methods and paths for the digital protection of ethnic buildings. However, due to the limitation of the authors' own professional ability and time, the research level needs to be improved. At present, there are still many aspects that need to be improved and further studied. On the one hand, although the digital resource database of ethnic minority buildings has realized the basic functions of the preliminary assumption on the whole, there are still many places that can be improved. We believe that, with the deepening of research, the specific functions of the digital resource database system of ethnic minority buildings will be further improved. On the other hand, the combination of digital protection of ethnic minority buildings based on point cloud and BIM Technology and digital construction technologies such as AR/VR technology, artificial intelligence, and big data will provide more possibilities for digital protection of ethnic minority buildings, which will be the next research direction.

Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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