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Retraction

Retracted: 3D Reconstruction and Intelligent Digital Conservation of Ancient Buildings Based on Laser Point Cloud Data

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

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[1] Y. Qiu, "3D Reconstruction and Intelligent Digital Conservation of Ancient Buildings Based on Laser Point Cloud Data," *Journal of Electrical and Computer Engineering*, vol. 2022, Article ID 7182018, 10 pages, 2022.

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Research Article

3D Reconstruction and Intelligent Digital Conservation of Ancient Buildings Based on Laser Point Cloud Data

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With the wide application of computer technology, how to carry out digital modeling and virtual simulation for the protection of ancient buildings has become a new research field. The combination of LiDAR (LiDAR) point cloud data can significantly improve the performance of 3D spatial information extraction of buildings. To improve the level of ancient building conservation, this article uses LiDAR point cloud data to collect ancient building data, extracts 3D spatial location information from multisource remote sensing optical stereo images, restores 3D spatial structure information of buildings from LiDAR point cloud data, conducts optimized topology research work, jointly extracts 3D spatial information of buildings with structural constraints, and compares the collected data with the original data. The research results show that the traditional data collection method has a large error of about 10%, while the data collected by LiDAR (LiDAR) point cloud data in this article is close to the original data. The error is around 3%, which can well complete the 3D reconstruction and protection of ancient buildings.

1. Introduction

China is an ancient civilization with more than 5,000 years of culture. With the change of dynasties, countless cultures and beautiful sceneries have been erased in the long history, and at the same time, many cultural properties have been abandoned, among which ancient buildings are represented. Chinese ancient buildings have incredible achievements and unique styles and occupy an important position in the history of world architecture. Ancient architecture is a combination of science, technology, art, and handicraft, and it is also an important historical tradition. Although China has a long history and has made great efforts and contributions to cultural protection and construction, a large number of ancient buildings are still destroyed. Preserving ancient buildings and cultural relics mean preserving history. In the development of modern technology, various security methods need to be explored, among which digital security is a model of new thinking and new methods.

3D laser scanning technology has many advantages over traditional old building mapping, including noncontact, high speed, high accuracy, and complete information collection. For example, in a task with a large amount of scanning, its efficiency can be improved while ensuring the integrity of the scanning information. 3D laser scanning technology can provide real, accurate, and comprehensive data information for the conservation and restoration of ancient buildings, and has the unique advantage of noncontact. It meets the measurement needs of information acquisition and conservation of ancient buildings in China and meets the needs of digital conservation of ancient buildings. At present, 3D laser scanning technology is a new way of ancient building data collection, which can quickly obtain the real appearance and characteristic information and convert physical information into an electronic format, bringing convenience to the field of ancient building conservation and restoration.

For the protection of ancient buildings and three-dimensional reconstruction, experts from China and around the world have done a lot of research. Khodadzadeh et al. have developed a new and effective strategy for the fusion as well as the classification of hyperspectral and LiDAR data. An important feature of the proposed method is that it does not require any regularization parameters, allowing the efficient use and integration of different types of features in a cooperative and flexible manner [1]. Qin and Yang present a multivariate cumulative damage model and a prediction model for the strength degradation of ancient construction materials in Tibet. Experiments were conducted on old and new wood, and the strength prediction model was modified by introducing correction factors to take into account the effects of different influencing factors on wood properties [2]. Bai et al. have installed a functional health monitoring system to measure structural strain and ambient temperature in a typical wooden building in Tibet. The results show that the method has good repeatability and predictive capability for temperature-induced strains [3]. Taking the Jinan Wu Yue Temple ancient architecture conservation project as an example, Wang et al. analyzed the engineering geological conditions of the tunnel and the surrounding environment, designed the tunnel support structure, and monitored the tunnel structure and the surrounding buildings. By analyzing the horizontal displacement, settlement, and deformation rate of the pit and surrounding buildings, the reliability and effectiveness of the design of the pit support structure were verified [4]. Dickson and Hamby present a simplified method for calculating building protection and shielding factors for common one- and two-story residential unit models associated with source terms. Results are reported for different calculation methods and applications of the source clause to similar structures. The study focuses only on typical one- and two-story residential buildings to provide practical applications to help improve preparedness and response to nuclear or radiological emergencies [5]. These studies have provided a great reference for this article, but the three-dimensional reconstruction and protection of ancient buildings have not been discussed.

In terms of modeling of LiDAR-based point cloud data detection technology, this article takes 3D images of point cloud data as part of the study. The 3D data reconstruction based on point cloud data as the center is completed. It effectively improves the efficiency and performance of remote sensing multisource data utilization for building 3D spatial information extraction, which has obvious economic and social value. The research in this article can provide new ideas for the restoration and protection of ancient buildings, and also provide a new research direction for the in-depth development of laser point cloud data.

2. Three-Dimensional Reconstruction of Ancient Buildings and Intelligent Digital Protection Methods

2.1. Lidar (Lidar) Point Cloud Data. LiDAR stands for laser detection as well as ranging system, which scans and acquires data by LiDAR, i.e., LiDAR point cloud data. As one of the important measurement techniques, LiDAR measurement technology has attracted more and more attention from scholars [6].

The pulse measurement is to see whether the laser field returns within a specified time. If the laser field returns, the current detection time is recorded as the time of laser field reception, the distance between the emission point and the target point is calculated, and then its 3D position is calculated [7, 8]. Phase measurement is used to measure the distance between the laser emission point and the field point by the amount of wave propagation to determine the 3D coordinates of the point field [9].

LiDAR ground detection and airborne search are two different types, where the airborne search is the emission of a laser in the air to determine the surface by analyzing the nature and quantity of the laser emitted by suspended particles in the atmosphere [10]. Ground search is mainly used to measure ground features, landforms, and other information. This method can play many functions in the large-scale detailed geological survey, such as underground cave measurement, geological profile (core) description, and outcrop profile description of important geological structures. Most of the current applications of LiDAR technology are ground sounding. Depending on the laser scanning platform, ground sounding can be classified as space, airborne, vehicle-mounted, and portable [11].

The study in this article uses airborne LiDAR technology, which is a new remote measurement technology that has been rapidly developed in recent years. It integrates three technologies such as laser ranging system, global positioning system (GPS), and inertial navigation system (INS). It achieves its purpose by transmitting a laser through a laser rangefinder and receiving the reflected and scattered echoes of the laser beam from the target. It is further divided into the increasingly mature terrain LiDAR system for obtaining ground digital elevation models and the mature hydrological LiDAR system for obtaining underwater DEM. The common feature of these two systems is the use of laser detection and measurement. The detection of the measurement target can directly obtain irregularly sampled data with high-precision 3D spatial position information [12, 13]. The airborne LiDAR (LiDAR) point cloud data measurement is shown in Figure 1.

Due to the ability of airborne LiDAR to actively acquire large-scale data and the related hardware technology of airborne LiDAR point cloud data system has been very mature and has become one of the important data sources for 3D spatial information extraction of buildings. In the actual scene of extracting 3D spatial information, it is already one of the necessary components. There is even a trend to replace traditional photogrammetry with 3D spatial information extraction methods [14]. We have counted the most common airborne LiDAR (LiDAR) system parameters, and the results are shown in Table 1.

2.2. Three-Dimensional Reconstruction and Digital Protection. Ancient buildings are an important part of human history and culture. As a representative of culture, countries are

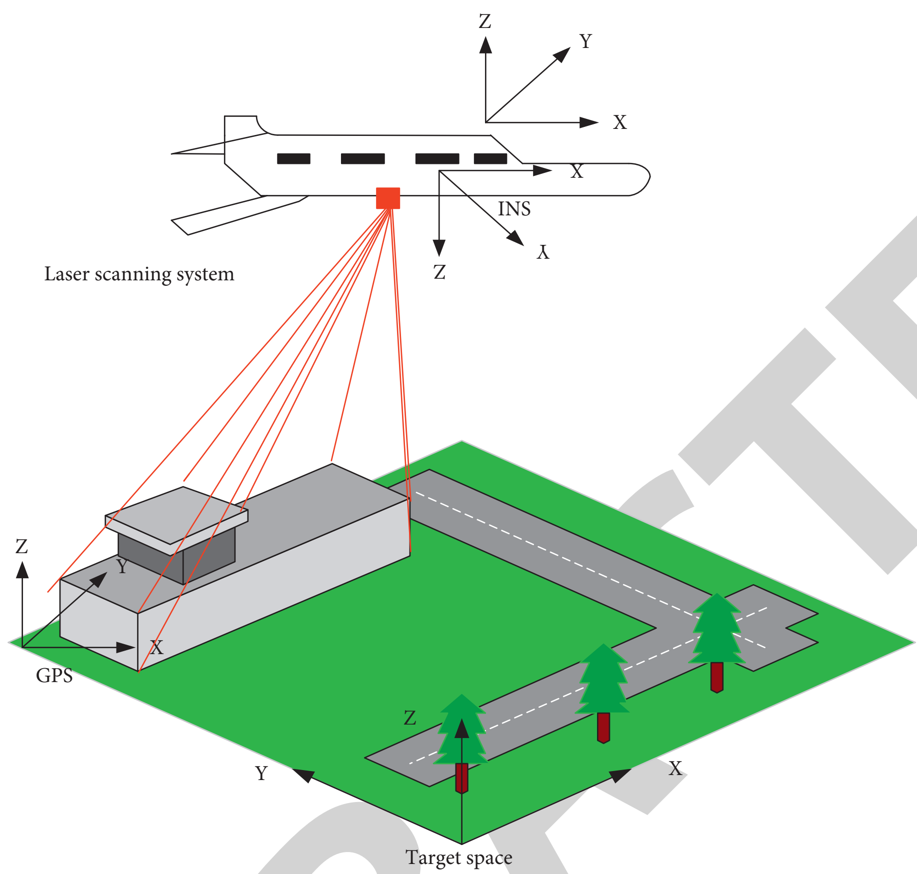


Figure 1: Airborne LiDAR technology measurement.

racing to explore advanced protection technologies. With the development of science and technology, many digital modeling techniques have also emerged [15]. At present, the main foreign technologies include photogrammetry, digital surveying and digital imaging, space imaging, laser detection, infrared imaging, etc. Even foreign countries have adopted virtual reality technology in the restoration of some projects. However, these methods are only applicable to certain specific buildings and are used to obtain building data and multimedia information display [16].

The research in this article is an interdisciplinary study that mainly combines advanced point cloud data modeling methods and the powerful depth modeling capabilities of LiDAR technology. Then, digital 3D modeling of ancient buildings is proposed to solve the biggest problem of ancient buildings: the inability to share and exchange ancient building model data [17]. The implementation process of the system is shown in Figure 2.

3D scanning technology is a new technology developed and applied in recent years, which brings innovation to measurement field. By summarizing the research status of 3D laser scanning technology in the field of ancient architecture at home and abroad, it is found that the development process of 3D laser scanning technology in the field of ancient architecture is shown in Figure 3. Also, the application research on point cloud data is conducted in recent years [18].

In the protection and repair of Chinese ancient buildings, the collection of geometric spatial data information of ancient buildings is a very important link. Most of the ancient Chinese buildings are based on large wooden structures. The wooden frame system is composed of columns, beams, squares, purlins, and other wooden components. On this basis, the wood frame system is divided into two categories such as the beam-lifting wood frame and the bucket-type wood frame. In the process, data collection and retention are even more important [19]. Whether the data collection is accurate or not even determined, whether the protection and repair work can be carried out smoothly, whether it can accurately provide the basis for the protection and repair, can formulate the correct protection and repair plan, and also determines whether the ancient building can still survive enough after the repair is completed. First, the collected information needs to meet the needs of archiving

Table 1: Airborne LiDAR system parameter configuration.

Performance parameter	ALS60	ALTM Orion	LMS-Q560
Wavelength (nm)	1060	1060	1500
Beam divergence (mrad)	0.21	0.24	0.29
Record the first and last echo (Y/N)	Y	Y	Y
Scanning method	Rotating polygon mirror	Rotating polygon mirror	Rotating polygon mirror
Pulse frequency (kHz)	20–198	150	40–230
Maximum scanning angle (deg)	75	50	60
Record intensity signal (Y/N)	Y	Y	Y

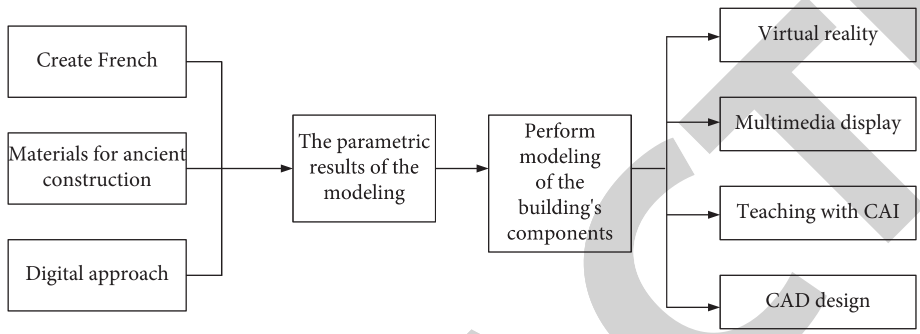


Figure 2: System implementation process.

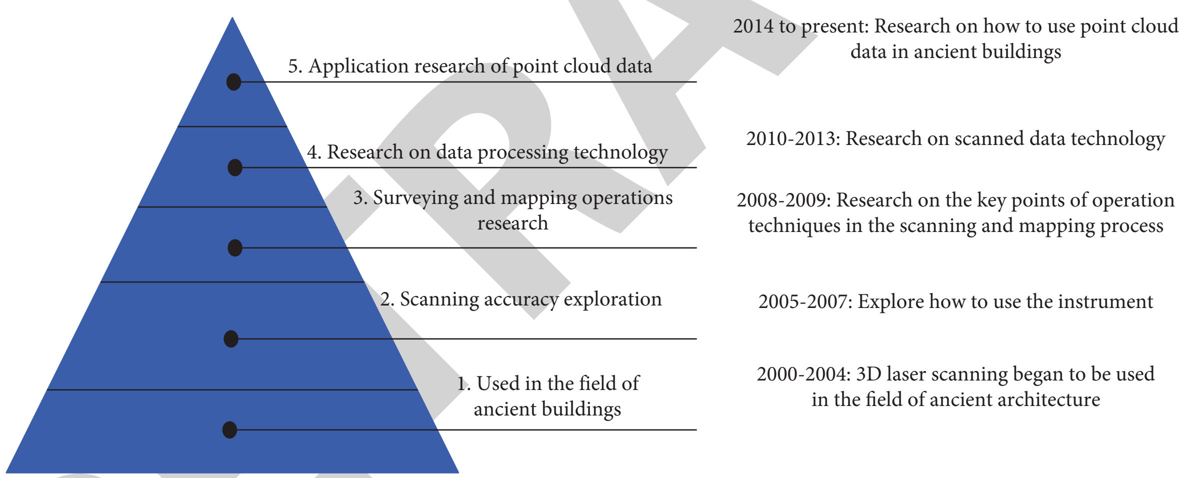


Figure 3: Development history of 3D laser scanning technology.

records. In addition, the geometrical spatial data information of ancient buildings can be obtained through surveying and mapping, which can be used to study the shape and era of the building, as the basic data for construction, maintenance and research, and provide a theoretical basis for conservation as well as restoration of historical structures.

As Figure 4 shows, in the imaging process of the optical sensor, the coordinates of the target point are obtained according to the transformation relationship between the geodetic coordinates, the camera coordinates the physical coordinates of the image, and the image pixel coordinates. They are calculated as follows:

$$G_w = (X_w, Y_w, Z_w). \tag{1}$$

The camera coordinates are

$$G_c = (X_c, Y_c, Z_c). \tag{2}$$

The relationship between them is

$$Gc = [Xc, Yc, Zc]^T = R \cdot Gw - T. \tag{3}$$

Establishing the connection between the image physical coordinate G and the camera coordinate,

$$\begin{cases} x_{\text{img}} = f\dfrac{X_c}{Z_c} \\ y_{\text{img}} = f\dfrac{Y_c}{Z_c} \end{cases}. \tag{4}$$

Combining (3) and (4), we get

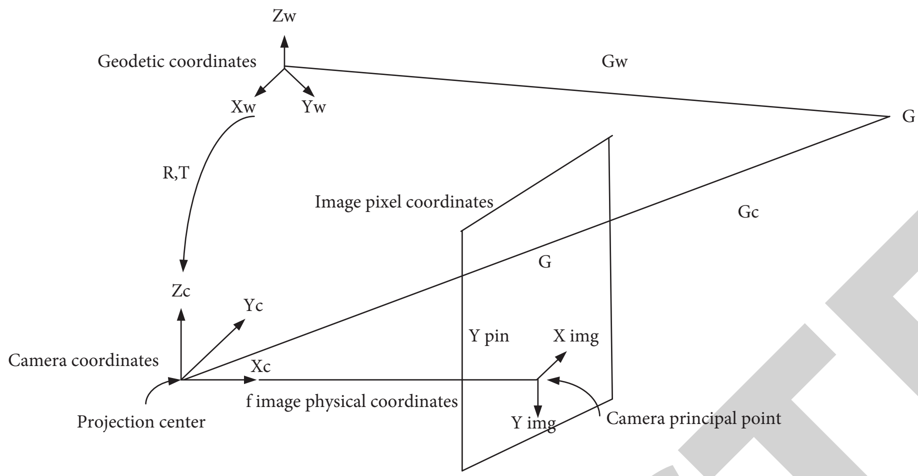


Figure 4: Schematic diagram of the imaging principle of the sensor model.

$$\begin{cases} x_{img} = f\dfrac{r_{11}(Xw - Xs) + r_{12}(Yw - Ys) + r_{13}(Zw - Zs)}{r_{31}(Xw - Xs) + r_{32}(Yw - Ys) + r_{33}(Zw - Zs)} \\ y_{img} = f\dfrac{r_{21}(Xw - Xs) + r_{22}(Yw - Ys) + r_{23}(Zw - Zs)}{r_{31}(Xw - Xs) + r_{32}(Yw - Ys) + r_{33}(Zw - Zs)} \end{cases}. \tag{5}$$

This is not the final rigorous sensor imaging model. After considering the relationship between the image pixel coordinates, the following equation is derived.

$$\begin{cases} x_{pix} = \dfrac{x_{img}}{S_x} + o_x, \\ y_{pix} = \dfrac{y_{img}}{S_y} + o_y. \end{cases} \tag{6}$$

Specifically, the RFM model directly establishes the mapping relationship between the normalized image pixel coordinates and the normalized target space coordinates in the form of a rational polynomial ratio:

$$x_n = \frac{F_1(X_n, Y_n, Z_n)}{F_2(X_n, Y_n, Z_n)}, \tag{7}$$

$$y_n = \frac{F_3(X_n, Y_n, Z_n)}{F_4(X_n, Y_n, Z_n)}. \tag{8}$$

Among them, the normalized coordinates for any coordinate cord are

$$\text{cord}_n = \frac{\text{cord} - \text{cord}_{\text{off}}}{\text{cord}_{\text{scale}}}. \tag{9}$$

The maximum and minimum values of the coordinates are used to construct the normalized parameters. To successfully implement the above algorithm, it is necessary to effectively estimate the initial weight matrix. When using a 0.6-meter resolution satellite image and a 2.5-meter resolution satellite image to form a multisource stereo image pair for three-dimensional spatial location information extraction, the initial weight is set as

$$P_0 = \begin{bmatrix} 0.6 & 0 & 0 & 0 \\ 0 & 0.6 & 0 & 0 \\ 0 & 0 & 25 & 0 \\ 0 & 0 & 0 & 25 \end{bmatrix}. \tag{10}$$

That is, empirically assign a larger weight to an image with a higher resolution, and assign a lower weight to an image with a lower resolution. Set the initial weight matrix to

$$P_0 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & \dfrac{1}{0.6^2} & 0 \\ 0 & 0 & 0 & \dfrac{1}{0.6^2} \end{bmatrix}. \tag{11}$$

The optimal linear unbiased estimate of the generalized linear model is

$$\overline{X} = [\,\Delta X \;\; \Delta Y \;\; \Delta Z\,]^T = \left(A_C^T \sum_{y_c}^{-1} A_c \right)^{-1}. \tag{12}$$

The optimal configuration can be obtained by performing the following optimization training

$$[\eta * \kappa * \lambda *] = \underset{\eta \in R\eta, \kappa \in R_k, \lambda \in R_\lambda}{rag \min} \; \|X - \overline{X}\|_2. \tag{13}$$

According to the resolution relationship between images, the value range can be effectively estimated. According to the acquisition of image information, it is necessary to analyze the actual pixel resolution under two conditions:

(1) Ability to obtain very detailed imaging information, such as pitch angle, instantaneous field of view, the

field of view, and image orthographic resolution. Among these, the acquisition of resolution and contrast is practical. They are also an important part of imaging quality.

(2) Only the imaging pitch angle and the front view resolution of the image can be obtained.

The expression for hard limit function (hardlim) is

$$y = f(x) = \begin{cases} 0, & x < 0, \\ 1, & x \geq 0, \end{cases}. \tag{14}$$

$$\text{or } y = f(x) = \operatorname{sgn}(x) = \begin{cases} -1 & x < 0 \\ 1 & x \geq 0 \end{cases}. \tag{15}$$

Rectified linear units (ReLUs) expression is

$$y = f(x) = \max(0, x). \tag{16}$$

The most commonly used numerical intelligence is the sigmoid function. The derivation of the sigmoid function is very simple, but when the independent variable is far from the origin of the coordinate, the slope of the function decreases rapidly and tends to 0, resulting in "gradient disappearance."

The core design of the network mainly includes three gates, namely input gate, forget gate, and output gate.

Input gate: the main purpose of this gate is to determine how much information in the input remains in C_t, and the realization formula is

$$\begin{cases} i_t = \sigma\left(Wi * {}_{[h_{t-1}, xt]} + b_i\right), \\ C = \tanh\left(W_C * \left[h_{t-1}, xt\right] + b_C\right). \end{cases} \tag{17}$$

The updated calculation of the weight w_{ij} is

$$w_{ij} = w_{ij} + \Delta w_{ij}. \tag{18}$$

Since w_{ij} is proportional to the partial derivative, ∂ is the gradient and λ is the learning rate, Δw_{ij} can be calculated as follows:

$$\Delta w_{ij} = -\lambda \frac{\partial \varepsilon(n)}{\partial w_{ij}}. \tag{19}$$

After that, using the chain derivation rule, the formula can be expanded as

$$\frac{\partial \varepsilon(n)}{\partial w_{ij}} = -e_j(n) \cdot f\left(v_j(n)\right) \cdot y_i(n). \tag{20}$$

After the local gradient δ_j is calculated, the weights in the network can be updated and calculated:

$$\frac{\partial \varepsilon(n)}{\partial y_j(n)} = -\sum_k e_k(n) \cdot f\left(v_k(n)\right) \cdot w_{ij} = -\sum_k \delta_k w_{ij}. \tag{21}$$

To verify the effectiveness of the proposed method, multiple experiments were carried out using simulation data and real multiangle aerial and multitemporal satellite images.

2.3. Digital Virtualization. The cultural pulse of the nation contained in the art of ancient architecture is the great value left to future generations. Nowadays, the government shows great importance to the restoration and protection of the existing entities of ancient buildings. However, China's ancient wooden buildings cannot withstand natural disasters and erosion over the years. The ancient architectural entities will eventually disappear from this Earth. It also contains the culture and history of the Chinese nation. An important historical issue left is how to preserve the existing ancient buildings as long as possible and to inherit and carry forward the culture and history contained in them forever.

From a psychological point of view, experience refers to a special psychological activity of a person, which is a feeling after one's own experience. For the virtual system of ancient buildings, the cultural experience can also be divided into these three levels. At the same time, experience levels and psychological evaluation system factors are used to establish an evaluation system for the digital virtual system of ancient buildings, that is, what do we want from the digital virtual system of ancient buildings, how to evaluate its advantages and disadvantages, and determine an evaluation standard.

The authenticity of the pictures of ancient architectural scenes is mainly determined by the accuracy of the ancient architectural modeling that can be visually felt, the expression of the texture of the ancient building materials, the fidelity of the colors of the ancient buildings, and the realism of the light and shadow of the ancient buildings due to sunlight. From the point of view of the current modeling technology, no matter what the carrying capacity of the hardware is, as long as the ancient building data is complete, virtual reality can fully meet the accuracy requirements of ancient building modeling.

The realization of the interactivity of the digital virtual system includes two contents, one is the virtual scene constructed, and the other is the virtual reality operation platform established. The construction of virtual scenes is the basis for realizing the interactive functions of virtual reality, and the various experiences provided by virtual reality to users mainly rely on the virtual reality platform. When users use the virtual reality platform for interactive browsing, the first thing they see is the platform designed with the virtual reality system. Whether the platform can make users feel comfortable when watching, whether the speed of walking forward is in line with the habit of human eyes, and there will be no feeling of dizziness, and even make users have a pleasing feeling. The first-level evaluation index covers the user experience and design esthetics of the digital virtual system, including the esthetics and rationality of the interface, the completeness of platform functions, and the ease of operation for evaluating the behavior.

In the digital virtual system of ancient buildings, the interaction between users is also very important. In recent years, there has also been a form of three-dimensional virtual communities, where users enter virtual scenes through the network client, browse through the virtual scenes, and can communicate with other users in the community. According to the definition of experience, there are differences in experience, and different users will have different experiences

(a) (b)

Figure 5: Ancient buildings and selected matching point pairs.

and feelings in the same virtual environment. Each user will obtain different levels and different directions of feelings according to their existing cognitive level and experience. Users communicate in a virtual environment through virtual role-playing, which is helpful for the experience and cognition of ancient architectural culture.

3. Three-Dimensional Reconstruction of Ancient Buildings and Intelligent Digital Protection Experiment and Results

3.1. Experimental Data. The data used in the experiment is an aerial multiangle image with a resolution of 0.08 meters. In the experiment, the initial control point selection method is used to select matching point pairs. The results are shown in Figure 5:

The accuracy of the three-dimensional space position information is shown in Tables 2 and 3:

The experimental data were obtained using LiDAR (laser radar) point cloud data technology to form multisource stereo image pairs and extract 3D spatial location information. The experimental results are shown in Table 4.

We used traditional measurement methods and LiDAR (laser radar) point cloud data technology to extract ancient buildings, and the results are shown in Figure 6.

Table 2: Comparison of three-dimensional spatial information extraction accuracy.

	C-RFM	W-RFM	OW-RFM	G-RFM-1	G-RFM-2
X	0.035	0.029	0.026	0.027	0.025
Y	0.065	0.054	0.054	0.051	0.053
Z	0.252	0.259	0.246	0.212	0.142

Table 3: Comparison of the running time of each algorithm.

	C-RFM	W-RFM	OW-RFM	G-RFM-1	G-RFM-2
Time	2.721	2.722	2.722	3.321	3.326

Table 4: LiDAR point cloud data imaging parameters.

	QuickBird	WorldView2
Imaging pitch angle	60.1°	66.8°
Imaging azimuth	9.8°	246.4°
Average field of view	24.8°	18.5°
Average line resolution	0.768 m	0.522 m
Average column resolution	0.686 m	0.486 m

3.2. Error Calculation. For the protection of ancient buildings, the parameters of the data are the most important. We simulate these data to preserve the ancient flavor of these buildings. We compare these data with the original data and the results are shown in Figure 7:

From the comparison in the figure, it can be found that comparing the data collected by traditional data acquisition and LiDAR (LiDAR) point cloud data, it can be seen that the parameter errors in the data acquisition by the traditional method are more obvious, and the error value by this method is generally about 10% higher than the ratio of the original data, while the data collected by LiDAR (LiDAR) point cloud data in this article has a better fitting effect, and the received data is closer to the original data.

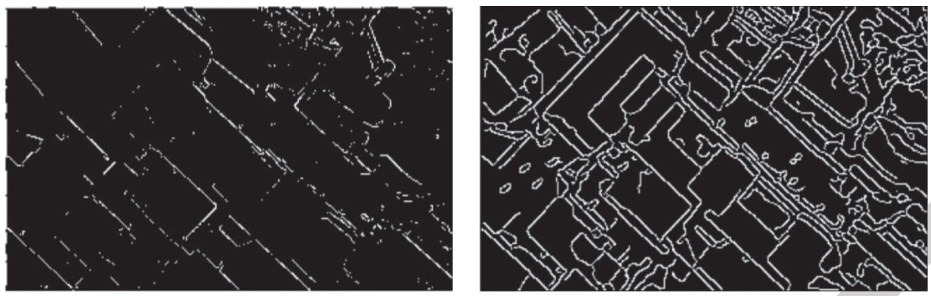
We compared the errors in data collection at different heights, and the results are shown in Figure 8:

From the figure, it can be seen that under the traditional method, the error value increases with the increase of height, and the magnitude of the error value has been kept in a large range, while the error of the data value under the laser lightning (LiDAR) point cloud data technique used in this article has been kept at a relatively stable value with the increase of height, but the increase does not change much.

4. Discussion

The ground object extraction method can effectively extract the ground target. When using it, special attention must be paid to the selection of influencing factors and the regulation of related values, to extract the parameters effectively. In the actual project, you can first select representative data, test the best parameters needed to export the data to the point cloud, save the best parameters, and use the best parameters for all the data.

The purpose of the building model is to prepare a rule file based on the type of building in the area where the model is located. If the building types are the same, you only need to call the same rules and create a model based on the properties of each building itself. Therefore, for simple buildings, grouping them using general rules can be done quickly and



(a) (b)

Figure 6: Features of ancient buildings.

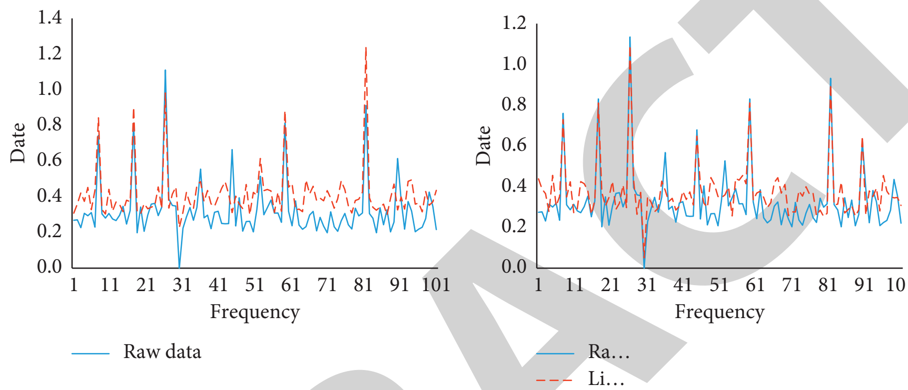


Figure 7: Comparison of parameters of different methods.

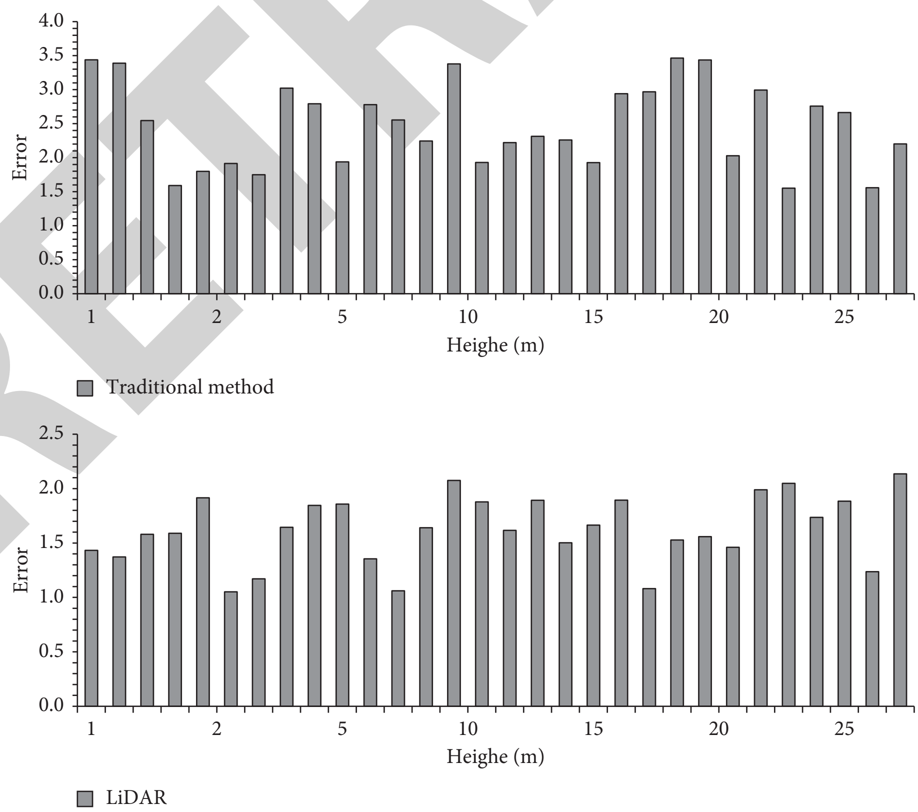


Figure 8: Data error at different heights.

easily. But for complex buildings, you must write a corresponding rule record for each house.

The rule of the building 3D model is to first divide the house according to the geometric system, describe the house according to the function of the 3D model in the rule file, and construct the model purpose of each division. Therefore, when the characteristics of the house are sufficient, the size of the division determines whether the rule file is narrow, thereby affecting the quality of the building model. If the degree of the split is large, the rule file is more detailed and the accuracy of the building model is higher. And from the perspective of practical application, the degree of segmentation becomes larger, which means that the quality of the model is improved.

5. Conclusion

When traditional photogrammetry technology uses strict stereo pairs to extract 3D spatial location information, the existing related technology is already very mature and the extraction accuracy is limited; in the process of airborne LiDAR point cloud data acquisition, the 3D spatial location information obtained will show structural changes, i.e., the acquisition accuracy changes with the local structural characteristics of the target point. This degradation of the structural information of the original data inevitably leads to the degradation of the performance of building 3D spatial information extraction. A global optimal segmentation method based on LiDAR point cloud data top surface is proposed by constructing a hierarchical energy minimization objective function adapted to LiDAR point cloud data, a stable global optimal extraction of building topographic structure information can be achieved. The accuracy of the joint extraction performance of the 3D spatial information of the final building is also guaranteed.

The study still has some shortcomings. The depth and breadth of the study are not sufficient, and several disturbing factors involved in the experimental process were not taken into account. The academic level is also not high, and the research on the restoration and maintenance of ancient buildings is still in its infancy. In the future, the restoration methods of ancient buildings will be optimized from more perspectives based on the current level of technology and expertise.

Data Availability

No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

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