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Retraction

Retracted: The Protection and Restoration of Ancient Buildings in Guanzhong Traditional Villages Based on the Improved Priority Algorithm

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] C. Li and Y. Zhao, "The Protection and Restoration of Ancient Buildings in Guanzhong Traditional Villages Based on the Improved Priority Algorithm," *Mobile Information Systems*, vol. 2022, Article ID 8203590, 8 pages, 2022.

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Research Article

The Protection and Restoration of Ancient Buildings in Guanzhong Traditional Villages Based on the Improved Priority Algorithm

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Architecture is closely related to human development. Different architectural shapes and texture structures reflect the changes of society and the level of social development. They are not only important materials for studying history but also carry the profound significance of human history. However, due to chemical effects, the acid, alkali, salt, and corrosive solvents are applied and produced in the process of industrial production, as well as the corrosive media contained in the atmosphere, groundwater, surface water, and soil will corrode the ancient buildings. The whole picture of many ancient buildings cannot be completely preserved, let alone used as research materials to deeply explore history and humanities. With the development of computer science and technology, we hope to protect and repair traditional ancient buildings through modern technology, which not only respects the long history of the Chinese nation but also helps us better study history through ancient buildings. This paper takes the ancient buildings of traditional villages in Guanzhong, Shanxi Province as an example, optimizes them on the basis of predecessors, and explores the protection and restoration of ancient buildings based on the improved priority algorithm. The results show that the proposed algorithm performs better in the protection and restoration model of ancient buildings than the traditional algorithm.

1. Introduction

China is a country with a long history. In the long history of more than 5000 years, the ancients left us countless Chinese civilization. These civilizations are handed down through cultural relics, showing us the social development at that time, which is the historical proof of the continuous struggle of our Chinese nation for 5000 years, and we also continue to absorb and carry forward the excellent traditional culture of the Chinese nation from cultural relics [1]. Objectively speaking, cultural relics are the material inheritance of the Chinese national spirit; subjectively, cultural relics are also the link of the excellent national spirit of the Chinese nation. Therefore, the protection of cultural relics not only helps us learn relevant experience from history but also plays an important role in enhancing China's cultural self-confidence and national cohesion through the protection and restoration of cultural relics to meet the increasing spiritual needs of the people today when people's material life is gradually met [2]. In the 12th five-year plan, China proposed to strengthen modern information technology, build and improve the basic database of national cultural relics resources through information technology, establish an information platform for the preventive protection of cultural relics, and promote the digital museum project [3]. In China's 13th five-year plan, it continues to propose to build national projects. Through the implementation of the national digital preservation action plan, the cultural relics representative of China's excellent traditional culture, revolutionary culture, and advanced socialist culture will be preserved in batches [4]. With the advent of the follow-up Internet era, we hope to combine the Internet plus model with the protection of cultural relics. Through the active guidance of the government and the active participation of the whole society, jointly promote the protection and restoration of cultural relics reflecting the traditional culture of the Chinese nation and integrate innovative ideas with practical development in combination with the Internet and technology. In the protection and restoration plan of cultural relics, there is a special kind of cultural relics: ancient architectural relics. Ancient architectural relics are different from some small cultural relics such as books, handicrafts, and costumes. These cultural relics are small in volume and common in material and have a large number of reference materials. They are also relatively simple to operate and less difficult to repair. However, the ancient architectural relics are large in size and have experienced natural corrosion factors such as weathering, earthquake, and oxidation for thousands of years. In addition, due to the restrictions of materials under the construction environment at that time, some buildings only use the mixed materials of soil and stone, which have low corrosion resistance and poor ductility. So far, there are few buildings that can be preserved, which makes us have less reference materials in the repair process, it cannot be restored accurately during the restoration process (Shi *R* et al. 2020) [5]. At the same time, the building volume is relatively large. In the process of repair, it often affects the whole body for a structure, making it more difficult to repair. Taking the traditional ancient buildings in the Guanzhong area of Shanxi province as an example, as the territory of the ancient Qin state, Guanzhong, Shanxi province has been the national capital for 13 times in history. Therefore, it has a stronger history in political, economic, and cultural development than other areas. At present, it is an area with more ancient buildings preserved all over the country. Influenced by the development of the times, in the change of traditional dynasties in history, the main buildings changed in urban areas, while the ancient buildings in ancient traditional village areas have been well preserved so far. Through the ancient buildings of these traditional villages, we can have a deeper understanding of the social background, cultural outlook, and social productivity at that time. However, due to historical changes, we cannot study the whole picture of ancient buildings in traditional villages in Guanzhong. Today, the appearance is more or less damaged, which is also the biggest obstacle we encounter when studying cultural relics. Therefore, here we take the Guanzhong area as an example to explore the protection and restoration of ancient buildings in traditional villages in Guanzhong based on the improved priority algorithm [6].

2. Related Work

The protection and restoration of ancient buildings in traditional villages in Guanzhong mainly goes through two stages. The first stage is to convert the three-dimensional image of existing ancient buildings into two-dimensional form through surveying and mapping technology. This stage is to accurately collect the data of ancient buildings so as to better formulate protection and restoration strategies in the future. The surveying and mapping technology for ancient buildings in traditional villages in Guanzhong has been developed for a long time. The early surveying and mapping technology mainly adopts manual surveying and mapping. At this time, the surveying and mapping instruments are only simple tools such as flat panel instrument, rangefinder, theodolite, and calculator [7]. In the process of ranging, the specific fixed-point distance is more by naked eye and manual means, such as shoulder lifting by one person or lifting by multiple people, or dragging by cattle and sheep. The mapped final products are also mostly displayed in the form of physical objects, such as paper maps or globes [8]. The advantages of manual surveying and mapping are low technical content and simple requirements for scientific and technological tools. However, the surveying and mapping method is very vulnerable to the influence of weather and natural environment. Most of the early surveying and mapping technology is carried out in the field, and the cost is high. Especially when the weather is bad, it greatly increases the cost of field work. At the same time, the geographical environment where the ancient buildings are located also has a significant impact on the surveying and mapping. Compared with the ancient buildings located in the plain, for the ancient buildings located in the harsh geographical environment such as mountain pelvis or depression, the manual hand drawing method has large error and inaccurate results [9]. In the 1990s, with the application of China's surveying and mapping industry to all walks of life, the surveying and mapping industry officially entered the digital stage. The main feature of this stage and the traditional surveying and mapping stage is the change of measuring instruments. Digital surveying and mapping technology uses more high-tech measuring instruments for direct measurement and automatically records the land occupation of the measured ancient buildings as points, establishes a plane rectangular coordinate system, and automatically generates the measured information in the plane rectangular coordinate system. At this time, most of the surveying and mapping work is completed by the instrument, and the manual only needs to mark or explain the figure automatically drawn by the measuring instrument [10]. This stage greatly reduces the time spent by manpower in the process of surveying and mapping, reduces the manpower difficulty of surveying and mapping, and significantly improves the efficiency of surveying and mapping. At the same time, the products at this stage are no longer materialized but generate corresponding digital products according to the specific needs of users. Users can independently select the required data for assembly or recording according to their own needs, which has strong flexibility [11]. Compared with the physical surveying and mapping products produced by traditional surveying and mapping technology, they need to be reprinted and published when they are updated. The digital products can be modified in real time on the Internet, which can realize dynamic maintenance. Digital products are easier to maintain and faster to upgrade. In modern society, surveying and mapping technology relies more on information-based operation means combined with modern information technologies, such as remote sensing technology, geographic information system, and global positioning system to collect, process, and analyze the spatial information of ancient buildings, collectively referred to as “3S” technology. The testing methods and means of information-based surveying and mapping technology have completely changed qualitatively. One of the important signs is that the whole process of surveying and mapping under this technology needs the participation and support of computers. At the same time, space instruments such as satellites and aircraft are widely used as measurement systems in the application of measurement instruments. Moreover, in information-based surveying and mapping technology, more time is applied to the link of data analysis and processing, and the process of data acquisition and mapping with the help of modern information measurement tools takes less time [13]. This also promotes the development of the second stage of the research on the protection and restoration of ancient buildings in traditional villages in Guanzhong; that is, the restoration of the images of ancient buildings in traditional villages in Guanzhong drawn by surveying and mapping technology. This is because ancient buildings have been scoured for thousands of years and subjected to various natural oxidation and corrosion. What we see now is often not the original appearance of ancient buildings when they were built [14]. Unlike works of art, costumes, and other cultural relics, ancient buildings can be recorded through books. Therefore, there are few relevant materials for repairing the whole picture of ancient buildings. With the great involvement of computer technology in the information age, more and more computer algorithms are used in the protection and restoration of ancient buildings. For example, foreign scholars Beralmio et al. first introduced the partial differential equation into the research on the protection and restoration of ancient buildings in 2000, and then Chinese scholars Chan et al. proposed the TV model on this basis, making corresponding contributions to the protection and restoration of ancient buildings [15, 16].

3. Method

This paper mainly focuses on the computer algorithm model of traditional village ancient buildings in Guanzhong in the surveying and mapping stage and restoration stage. When collecting surveying and mapping data for traditional ancient village buildings in Guanzhong, the collected data are often affected by surveying and mapping instruments; surveying and mapping angles; and surveying and mapping object materials and surface smoothness. The collected data often have small noise or outliers. Taking this as the data source, the restored images of traditional village ancient buildings in Guanzhong are often highly distorted, and the later restoration stage of ancient buildings in Guanzhong is often repaired through surveying and mapping data. This greatly affected the restoration of ancient buildings in Guanzhong in the later stage. In the stage of protection and restoration of traditional ancient buildings in Guanzhong, researchers have used computer algorithms to improve the efficiency and accuracy of surveying and mapping, but the resolution of traditional algorithms is still low when optimizing the accuracy of surveying and mapping, and in some cases, in order to maximize the accuracy of surveying and mapping, more detailed data of ancient buildings are deleted. The ancients often used some details to show the local customs and traditional customs of the current society. Excessive deletion of details has brought great difficulties to the protection and restoration of ancient buildings in traditional villages in Guanzhong. At the same time, in the subsequent restoration of the ancient buildings of traditional villages in Guanzhong, the edge of the image synthesized by the traditional algorithm is rough, which cannot actually restore the original appearance of the ancient buildings of traditional villages in Guanzhong. In particular, the texture of traditional ancient buildings in the Guanzhong area has rich changes, and the edges are mostly irregular lines, which are affected by nature. Most of the models reconstructed according to the surveying and mapping data have defects. Whether the defective elements can be perfectly filled is the focus of the restoration of traditional ancient buildings in Guanzhong villages. Therefore, this paper improves the main algorithm of traditional village ancient buildings in Guanzhong in the mapping and restoration stage to reduce noise and improve accuracy. The specific research process is shown in Figure 1.

Next, we mainly improve the surveying and mapping method according to the priority improvement algorithm. The traditional surveying and mapping algorithm is mainly the automatic registration algorithm of cloud data. This algorithm is mainly based on the automatic registration process of noise data during reconstruction after scanning the shape of ancient buildings in traditional villages in Guanzhong through 3S system and storing them in the server system. Generally, the noise is caused by the data noise deviation caused by the deviation of the spatial positioning instrument in the acquisition process. The traditional algorithm automatically matches the cloud data. By default, one of the two matched data are noise data, and one is removed randomly, so as to achieve the function of noise cleaning. The specific algorithm is shown in formulas (1) to (3):

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}, \tag{1}$$

$$\delta = L(p_i) = p_i - \frac{1}{d_i}, \tag{2}$$

$$\frac{\partial p_i}{\partial \tau} = \lambda L(p_i). \tag{3}$$

However, in the actual surveying and mapping process, the algorithm is easy to over clean the data, resulting in the final data source. Although there is less interference data, many detailed data are actually lost, which bring great difficulties to the subsequent restoration of ancient buildings in traditional villages in Guanzhong area. The noise fluctuation of surveying and mapping data with traditional methods is shown in Figure 2.

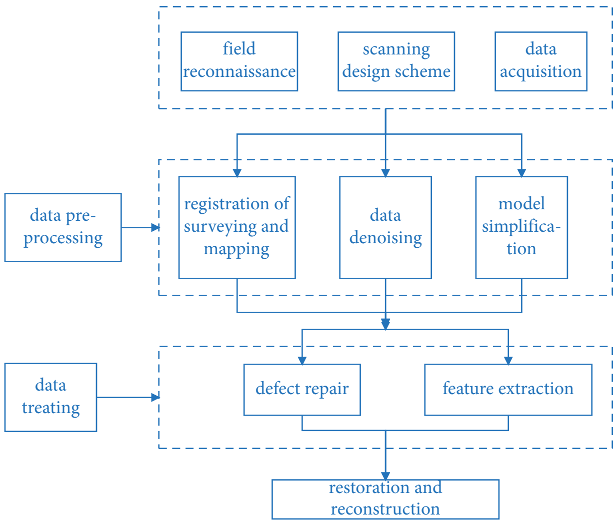

FIGURE 1: Research flow chart based on priority improvement algorithm.

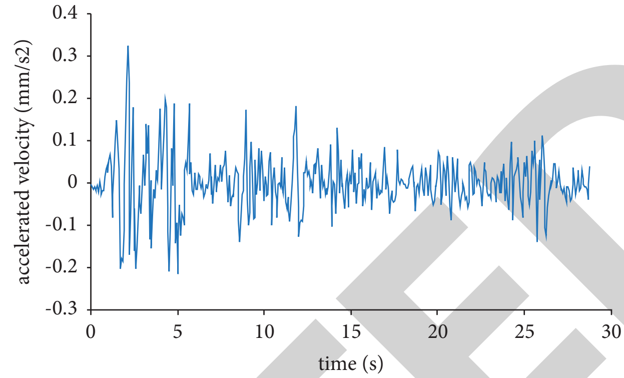

FIGURE 2: Traditional algorithms for mapping data noise fluctuations.

From Figure 2, we can see that in the process of data acquisition, the noise fluctuates very frequently within 30 seconds, and the span is large. If it is removed only through the automatic matching algorithm, it is easy to clean the surrounding normal data points, resulting in the inaccuracy of the data source. Therefore, here we adopt the priority improvement algorithm and propose the bilateral filtering method based on the common noise smoothing algorithm. The algorithm is mainly based on the priority improvement algorithm, which diffuses the easily captured noise from local to overall according to the energy contained, and determines its priority through setting different weight values according to the actual situation through the gray value of its area. Among them, we assume that the overall dataset is C, and the full factor definition is shown in formulas (4) and (5):

$$C = \left\{\left\{p_i \in R^3\right\} \mid i = 1, 2, \cdots, n\right\}, \tag{4}$$

$$\widehat{p}_i = p_i + \lambda n_i. \tag{5}$$

Formulas (4) and (5) define the noise cleaning weight in the data collection of ancient buildings in traditional villages in Guanzhong. Therefore, we iteratively calculate the noise sites according to the defined weight factor, and then we can get the new data point coordinates obtained by the priority improved algorithm. See the following formula for specific iterative expression:

$$\lambda = \frac{\sum_{p_{j \in N(p_i)}} W_C\left(\left\|p_j - p_i\right\|\right)}{\sum_{p_{j \in N(p_i)}} W_s\left(\left|\langle n_j, n_i\rangle - 1\right|\right)}. \tag{6}$$

The basic idea of the improved algorithm is to divide the noise into two types—large-scale noise and small-scale noise—according to the distance between the noise locus and the surveying and mapping subject. The large-scale noise is far away from the surveying and mapping subject, and we default that it is unlikely to be the real data of the subject. Therefore, we adopt the strategy of full deletion of large-scale noise. The small-scale noise is close to the main body, so we think it is more likely to be a part of the main body of surveying and mapping. Therefore, the two-way filtering algorithm is adopted for this part of noise smoothing. The expression of noise locus distance is shown in formula (7), and the bidirectional filtering algorithm for small-scale noise is shown in formula (9).

$$d_{ik}^2 = \left\|x_k - v_i\right\|^2 = \sum_{j=0}^{s}\left(x_{ki} - v_{ij}\right)^2, \tag{7}$$

$$W_{\sigma c}(x) = e^{-x^2/2\sigma_c^2}. \tag{8}$$

According to the improved priority based improved algorithm, we can obtain the noise change of surveying and mapping data for ancient buildings in traditional villages in Guanzhong, as shown in Figure 3.

It can be seen from Figure 3 that after the improvement of the priority algorithm, the noise value in the surveying and mapping of ancient buildings in traditional villages in Guanzhong decreases compared with that before the improvement of the algorithm. In order to ensure the universal applicability of the algorithm, we tested different ancient buildings in Guanzhong traditional villages. The results show that there is little difference in the variation of surveying and mapping noise of different ancient buildings. The style of ancient architecture in Guanzhong area is influenced by the geographical similarity of architectural style. The influence noise value in Figure 3 algorithm can reflect the noise level of ancient building surveying and mapping in this area and has universal applicability.

After determining the algorithm required for surveying and mapping, we begin the second stage of the protection and restoration of the audience's traditional village ancient buildings—the model restoration stage. The ancient buildings will be damaged more or less after experiencing the natural action. If they are not repaired, the overall structure of the ancient buildings will be damaged, which is likely to lead to the accelerated deterioration of the buildings. Therefore, in order to protect the ancient buildings of

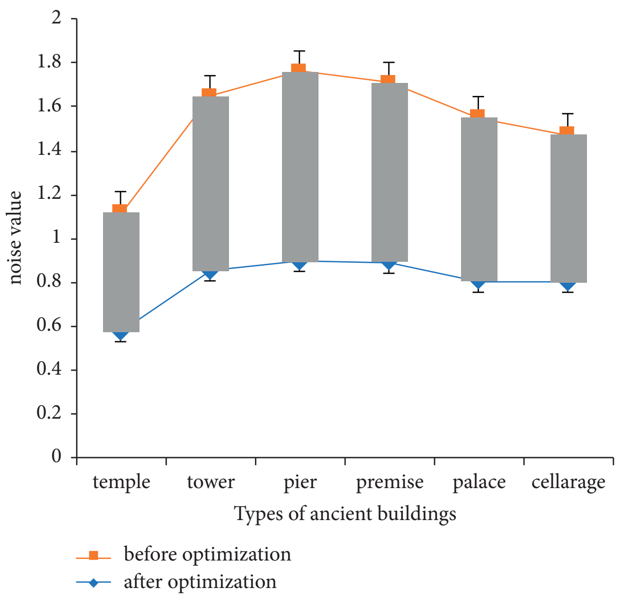

Figure 3: Changes of mapping noise values of different ancient buildings before and after algorithm optimization.

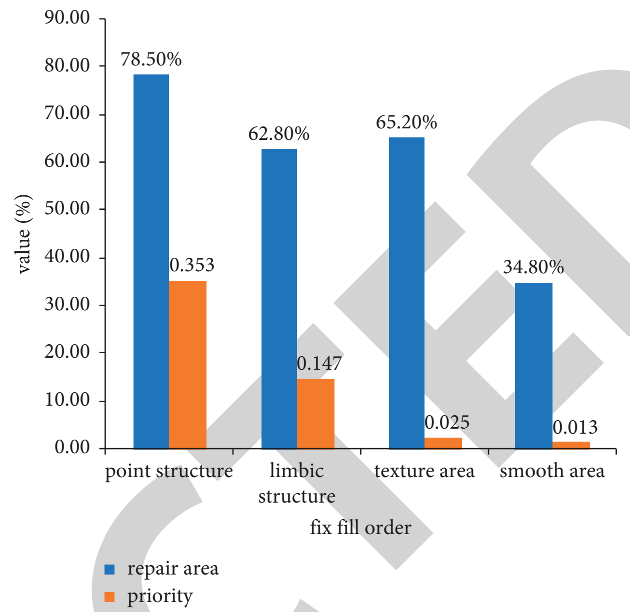

Figure 4: Fill effect and priority value of different repair fill order.

traditional villages in Guanzhong from collapse, we need to repair them without changing the large structure. In order to restore the original appearance of ancient buildings to the greatest extent and avoid secondary damage to ancient buildings, we first need to restore the data reconstructed by surveying and mapping. There are many traditional repair methods, such as the statistical feature algorithm of element brightness, which fills the brightness of image pigment points as the basis for repair. The specific expression is shown in the following formula:

$$\mu_n(x) = \sum_{i=0}^{k} (x_i - m)^2 p(x_i). \tag{9}$$

At the same time, partial differential equation can be used as the second measurement method. Both of them are typical graphic repair algorithms. The expression of partial differential equation is shown in the following formula:

$$e = \frac{1}{MN}\sqrt{\sum_{i=1}^{M}\sum_{j=1}^{N}\left(f(i,j) - f'(i,j)\right)^2}. \tag{10}$$

Among them, we found that the color block filling order of the repaired area greatly affects the final filling effect. Therefore, the filling order of color blocks is the key in the priority improvement algorithm. It is particularly important in the ancient buildings of traditional villages in Guanzhong. Due to the different intensity of natural effects such as weathering and rain corrosion, the time of exposure to the air is also different. Therefore, different hues are produced. When the repair order is different, it will lead to different repair priorities. The specific color block filling sequence and the hue change after repair are shown in Figure 4.

It can be seen from Figure 4 that the final results filled with different color block filling sequences are different and differ greatly. Among them, the filling area obtained by filling the overall defect through the color block sequence of corner structure is the largest, accounting for 78.5% of the total area, while the repair area obtained according to the color block filling sequence of smooth area is only 34.8%. At the same time, we can also find that the priority weights corresponding to different filling sequences are different. The better the repair effect of filling sequence is, the greater the priority weight is, and vice versa. Therefore, on the whole, the color block filling order is directly proportional to the priority weight. Next, we need to explore how to determine the optimal priority to make the repair effect the best.

Here we introduce a TV model, which introduces the P operator into the priority improvement algorithm. The minimization cost function of TV model is shown in the following formula:

$$J_\lambda[u] = \int_{E\cup D} |\nabla u| \mathrm{d}x\mathrm{d}y + \frac{\lambda}{2}\int_{E} \left|u - u^0\right|^2 \mathrm{d}x\mathrm{d}y. \tag{11}$$

Bring formula (11) into Lagrange multiplier to obtain Euler Lagrange equation. See formulas (12) and (13) for details.

$$-\mathrm{div}\left(\frac{\nabla u}{|\nabla u|}\right) + \lambda_e\left(u - u^0\right) = 0, \tag{12}$$

$$\Delta u = \mathrm{div}\left(|\nabla u|^{-1}\nabla u\right). \tag{13}$$

At this time, we establish a general digital image restoration model. In this model, we minimize all Gaussian white noise pollution through variational equations in a closed interval and then iterate continuously, so as to obtain the repair results of the damaged parts in the reconstruction model based on surveying and mapping data. The minimum regularization equation and the expression of the iterative process are shown in formulas (14) and (15):

$$R[u] = \int_{E\cup D} r|\nabla u|\mathrm{d}x\mathrm{d}y, \tag{14}$$

$$\frac{\partial u}{\partial t} = \nabla\cdot\left(\frac{\nabla u}{|\nabla u|}\right) + \lambda_e\left(u^0 - u\right). \tag{15}$$

4. Result Analysis and Discussion

According to the above algorithm, we evaluate the restoration effect of ancient buildings in traditional villages in Guanzhong by improving the algorithm based on priority. The specific results are shown in Figure 5. From Figure 5, we can see that the final repair effect based on different algorithms is also different, and the repair effect is good or bad. Here, we mainly measure the area of repairing and restoring the defective part. Generally, we think that if the algorithm can repair the missing area more perfectly, the better the repair ability and effect of the algorithm. It can be seen that the TV model proposed in this paper based on the improved priority algorithm has the largest overall repair area and the best repair effect. At the same time, as the number of iterations of the algorithm increases, the repair area of the model for ancient buildings also increases. We believe that this is because the algorithm iteration increases the accuracy of the algorithm for parameters, making the repair area larger and larger.

Next, based on the priority improved algorithm model proposed in this paper, we take the ancient tower, the most common ancient building in Guanzhong traditional village, as an example to protect and repair. Ancient pagoda is one of the most common architectural structures in Chinese ancient buildings. In ancient times, it was mainly used for military monitoring or civil water intake. Affected by the geographical environment, the Guanzhong area is one of the areas with the largest number of ancient pagoda sites in China. However, for thousands of years, the appearance of ancient pagodas has been mostly damaged and weathered. Due to the special shape of ancient pagodas compared with ordinary buildings, the traditional methods have not been protected and repaired in time. In this paper, the ancient pagoda buildings in Guanzhong traditional villages are scanned and repaired through the priority improved algorithm model. The specific results are shown in Figure 6. The height of the ancient tower is more than 30m and the structure is complex. The priority improved algorithm model realizes the accurate repair of the tower.

Above, we prove that the algorithm proposed in this paper has good protection and repair for the ancient buildings of traditional villages in Guanzhong area. Compared with the traditional algorithm, this algorithm can repair the damaged part to the greatest extent. Next, in order to further prove the applicability of the algorithm in this paper, we verify the accuracy of the algorithm. The specific results are shown in Figure 7.

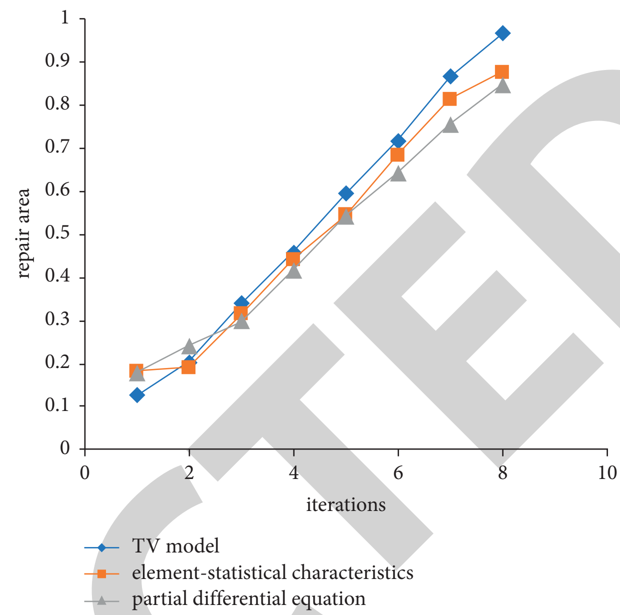

FIGURE 5: Image restoration effects of ancient buildings based on different algorithms.

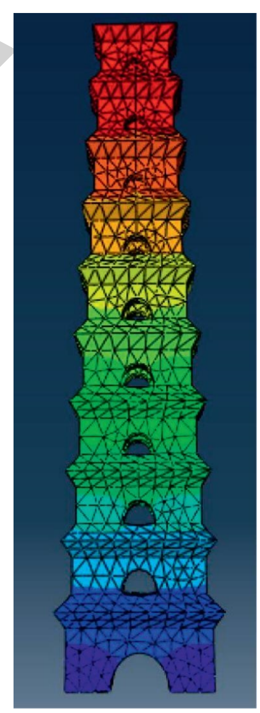

FIGURE 6: Scanning and restoration of ancient pagoda based on improved algorithm.

In Figure 7, the left ordinate represents the height and width of the ancient pagoda, the right ordinate represents the repair accuracy, and the abscissa represents different types of ancient pagodas. In order to ensure the accuracy of measurement, we randomly selected five ancient pagodas with different heights and widths to verify the accuracy of algorithm repair for ancient pagodas with different heights and widths. The results show that the restoration accuracy of

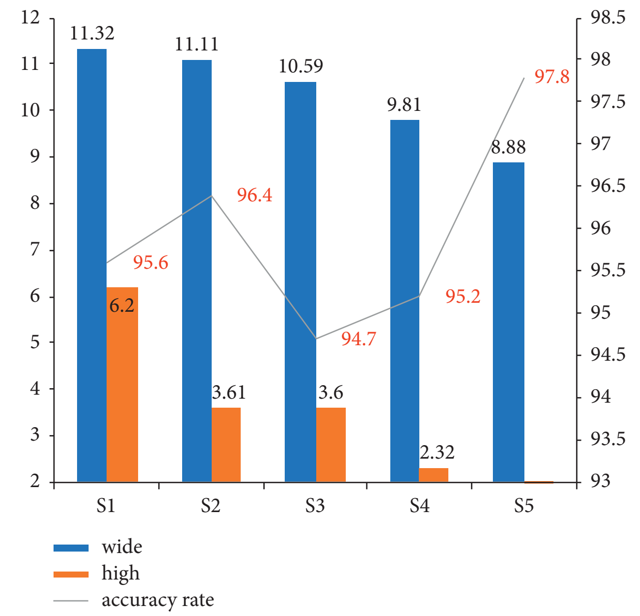

Figure 7: The accuracy of restoration of ancient towers under different appearances.

the five ancient pagodas is about 95% and the highest value can reach 97.8%. This further shows that the improved algorithm based on priority proposed in this paper has wide applicability. It can not only repair the integrity of ancient buildings with damaged external surface but also ensure the accuracy of repair.

5. Conclusions

(1) Through the relevant research on the protection and restoration of traditional villages and towns in Guanzhong, the priority improvement algorithm is applied to the protection and restoration of traditional villages and towns in Guanzhong. By setting the weight of different parameters, different protection and restoration strategies can be obtained, and the restoration effect of different ancient buildings is better than the traditional mapping algorithm.

(2) The improved priority algorithm can effectively reduce the noise value. Taking ancient pagodas as an example, for ancient pagodas with different heights and widths, the average restoration accuracy is 95%, the maximum accuracy is 97.8%, and the restoration accuracy is high, indicating that the improved algorithm based on priority has wide applicability.

(3) Based on the improved priority algorithm, this paper recalculates the priority of parameters, combined with the two different stages of ancient building protection and restoration, which significantly improves the accuracy during the surveying and mapping of ancient buildings in traditional villages in Guanzhong, improves the image restoration effect of ancient buildings in traditional villages in Guanzhong, and provides a new method for the protection and restoration of ancient buildings in traditional villages in Guanzhong.

Data Availability

The figures used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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