



# Research on New Repair Techniques for Huizhou Ancient Buildings

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**Abstract.** With the rapid development of science and technology, we can no longer see the bustling streets and high-rise buildings everywhere. It makes termite and rot appear on the surface of the structure. This paper combines 3D scanning modeling technology Bim digital modeling technology aims at repairing the structural decay of Anhui style ancient buildings, and puts forward targeted suggestions on the repair methods and design. History and culture are irreplaceable precious resources. Through this technology, Chinese history and culture will be protected, so that more people can also see the beauty of ancient Huizhou style ancient buildings.

**Keywords:** Reinforcement technology; 3D scanning modeling technology; Bim digital modeling technology

## 1 Introduction

In recent years, the state of ancient architecture is also more and more attention [1], in the party's twentieth report put forward: "increase the protection of cultural relics and cultural heritage, strengthen the urban and rural construction in the protection of historical and cultural heritage [2-4]." By visiting a series of Huizhou ancient architectural heritage sites, such as Huizhou government office in Shexian County, Xitou Sanhuaitang, Hongcun in Xi Di of Huangshan Mountain, and Chaji Ancient Architectural Complex in Jingxian County, we found that some of the buildings have been damaged to varying degrees due to natural weathering, disrepair, environmental impacts, and man-made damages, and so on, so it also increases the resistance to restoration work in all aspects of the suffering.

At present, the traditional concepts of "repair" and "make up for the new" are the main means of repairing Huizhou-style buildings, which are not the same as the modern concept of heritage protection, and the concept of repairing and reinforcing modern wooden structures is not mature enough. In the future, the concept should firstly be based on the angle of satisfying the protection of heritage value and information retention, and at the same time, it should take into account the characteristics of Chinese

architectural culture, layout, structure, environment, climate, etc., so as to develop a heritage concept that meets the requirements of heritage protection and adapts to the protection of the local historical atmosphere and culture.

Based on this, this paper combines the modernized technical means [5-10] to provide a new argument for the repair and construction of Huizhou ancient buildings, which provides a new meaning for the restoration and construction of ancient buildings.

## **2 Defects in the Repair of Traditional Huizhou Ancient Buildings**

(1) Without technical support, it is difficult to achieve restoration results

Ancient building restoration industry still does not have a standardized technical system, restoration work relies on the teacher's experience, can not get the correct conclusions and the corresponding construction technology and construction specifications, such as: why repair this place, why repair, how long to repair and so on, we have no way to know, there is no way to start. And because of a local damage to the damaged and thus lead to the whole was replaced, can not judge where the problem, the problem can not be solved, resulting in most of the ancient buildings have become "new", lost its due sense of age and ancient historical and cultural flavor characteristics.

(2) The loss of material is significant and security cannot be guaranteed

Hui style ancient buildings generally use wood structural materials as supporting structures, and wood structures are vulnerable to termites, decay and other hazards, which can cause structural damage. However, traditional repair methods require a lot of time and material costs to make replacement parts of wood structures or iron reinforcements to repair, which is also easy to cause further structural damage in the repair process. As a result, some tourist attractions cannot operate normally, and have been repaired repeatedly, GDP industry is greatly discounted.

## **3 New Digital Technology Empowers Huizhou Ancient Architecture**

### **3.1 Three-Dimensional Scanning Modeling Techniques**

Also known as real-life reproduction technology, the use of high-speed laser measurement, to obtain the terrain or complex objects of the geometry of the data and images, in the use of software to analyze and process the collected point cloud data and images. The establishment of three-dimensional spatial location coordinates or three-dimensional visualization model, at the same time, the point cloud can also output a variety of different data formats, as a spatial database data source and to meet the needs of different applications. Three-dimensional laser scanning technology can be a real scene 1:1 in the form of point cloud presented in the computer.

For some terrain or complex objects, scan the scanner at the measured part, convert it into various 3D data, and output it to a visual 3D model in the computer through 3D modeling technology, so as to study a series of related problems and find solutions to these problems.

Three-dimensional scanning technology plays an important role in the protection of ancient architecture, he gave the protection of ancient architecture provides a new measurement method. Through on-site investigation, the production of ancient architecture data acquisition program, in order to be able to obtain all the data of the ancient architecture through the most effective way. Generally for the higher ancient buildings, want to measure the data on the top of the ancient buildings, need to be equipped with a drone, in the ancient buildings on top of the tiles, roof ridges, horns and other data, the drone data and scanner data for the collocation, to get the complete three-dimensional data of the ancient buildings. The use of drones do not use scaffolding, can reduce the risk of labor and time costs.

### **Advantages of 3D Scanning Modeling Techniques.**

Fast speed: The 3D scanner can scan at speeds of up to a million dots per second

High precision: high data acquisition precision, the precision can reach  $\pm 1\text{mm}$ ;  
Strong intuition: the collected point cloud data not only has spatial information (X, Y, Z), It also has color information (R, G, B) and reflectivity value (I), giving a sense of scene reproduction;

Highly applicable: less affected by external influences and can be measured in the absence of light;

Variety of results: a single measurement outputs multiple results, eliminating the need for repeated measurements

Non-Contact Measurement: Keep away from hazardous areas to ensure the safety of equipment and operators.

### **Technical Solutions for 3D Scanning Modeling.**

The scanning technology scheme in this paper can be divided into three stages, field measurement scanning, point cloud data processing, and advanced 3D detection. The processed data can be directly imported into CAD BIM and other software aided modeling.

### **Advantages of BIM Digital Modeling.**

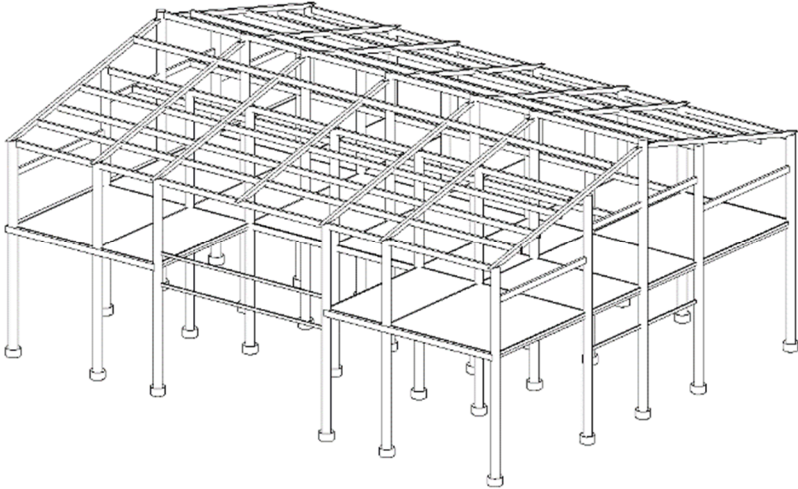
(i) Virtual simulation of building models

Traditional building design can only be drawn in the drawings, this flat design, not only more drawings and cumbersome more can not be stored for a long time as well as the difficulty of finding the force analysis of the construction project, the amount of material calculation, seismic analysis can not be known.

(ii) Calculate the amount of materials used in the project

The calculation of the amount of engineering materials is an important part of architectural design, while the design of plane drawings can only calculate the amount of building materials from the area, However, BIM technology can be calculated from a

three-dimensional perspective. During the construction process, the amount of each building can be calculated from the construction position. Further, the amount of each building link can be calculated, and the amount, time, amount and percentage of materials consumed for the overall structure can be finally obtained, See Figure 1.



**Fig. 1.** The physical drawing of the ancient houses of Huipai simulated by BIM technology

### **3.2 The Use of Reinforcement Techniques**

The framework of ancient buildings is obtained through 3D scanning modeling technology. With the help of nondestructive testing technology, BIM digital modeling technology is used to create three-dimensional architectural drawings, so that craftsmen can observe the interior of buildings directly, so as to obtain targeted solutions, suit the remedy to the case, and greatly reduce the pressure of survey and employment. Through the application of new technology, the cost is reduced, the speed of building repair and reinforcement is accelerated, and the safety of the building is guaranteed.

## **4 The Research Significance of New Digital Technology Integrated into Huizhou Ancient Architecture**

- (1) Promote the Huizhou ancient architecture wood structure is more people's acceptance, more realize the diversification of the building structure, but also improve the efficiency of resource utilization, to achieve energy conservation and emission reduction and green development is of great significance.
- (2) Promote the transformation and development of local industry and economy, increase jobs, guide and drive the masses to increase income and become rich, drive consumption upgrading, and support the development of regional tourism. At the same time, it will also play a key role in promoting the excellent local culture and enhancing

the reputation of the place. It can reflect the culture and characteristics of a region as well as the regional style so as to attract talents, introduce talents, and contribute to the development of rural revitalization.

(3) Promote the diversified development of wooden structure of Huizhou ancient architecture, and it is a good interpretation of the significance of wooden beam restoration for rural revitalization. Let the wooden structure building and the ecological environment to achieve peace and unity.

(4) To create a landscape idyllic style of wooden buildings, wooden beams repair Huizhou ancient building restoration so that wooden buildings back to basics, so that the tourism industry and the green hills and mountains perfect fusion. Promote the comprehensive development of Huizhou culture. Shows the results of the cultural work of rural revitalization, in the realization of rural revitalization, industrial prosperity, ecological livability, civilized countryside, living a rich life and other aspects have direct practical significance and bring far-reaching impact.

## 5 Conclusion

To summarize, this paper numerically demonstrates the characteristics of modern new reinforcement technology to improve and enhance the problems existing in the repair of Huizhou ancient buildings. Its advantages are.

(1) Briefly describe the development trend of Huizhou ancient architecture, historical and cultural heritage is non-renewable, irreplaceable and valuable resources, and the current restoration of the industry to analyze the problem, pointing out that the current industry problems.

(2) In the analysis at the same time also combined with modern science and technology, to give targeted repair methods and measures, in the analysis of the principle of reinforcement technology, combined with three types of technology, to solve the industry of large-scale, the lack of a large period of time and other issues.

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