

# Digital Protection of 3D Printing Technology in Traditional Folk Furniture

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**Abstract:** The study of Chinese traditional folk furniture form as one of the important contents of genetic protection of intangible culture to a certain extent. Based on the sustainable development of design ideas, 3D printing technology can provide an effective way for digital protection. With the traditional folk furniture digital protection potential of the continuous mining, this technology has gradually become the core technology in the practice of preserving cultural heritagein. Through the effective utilization of high speed digital technology, combined with the 3D printing technology which is highly precise, generalization, portable and intelligent. The traditional Chinese folk furniture can be the real form of the maximum protection and restoration.

Nowadays, people pay more attention to the protection of China classical furniture, but the protection of traditional folk furniture form has not been highly valued, which leads to many traditional folk furniture is gradually facing the breakage and disappearance of the situation. Therefore, it is imperative to use 3D printing technology to realize the digital protection of traditional folk furniture.

## 1. The Status of Research on Traditional Chinese Folk Furniture Protection

China traditional folk furniture produced in a certain historical environment, is a kind of instrument widely used in people's daily life and production. In general, in the production and manufacturing process of furniture, craftsmen are mostly looking for materials from the ground, the use of traditional folk technology to adapt to local conditions, to create the furniture shape has a very obvious simplicity and economic practicality, and very distinctive local color<sup>[1]</sup>.

There are a wide variety of folk furniture in different parts of China, on this basis and the indoor environment of the building together to build a mutually coordinated spatial relationship. When the furniture is detached from the original space environment, it is likely to lead to the incomplete recording of the full folk furniture environment, and even the lack of furniture, so that it can not be comprehensive research on the folk traditional indoor space environment. In recent years, with the increasing awareness of the protection and inheritance of traditional furniture, domestic and foreign scholars have carried out extensive research and attention to this phenomenon. Many scholars have begun to scientific determination of the specific structure of traditional furniture by using a numerical simulation method of the computer, or establish a special database which is based on the historical stages and categories of furniture development, or use the digital technology means to establish the digital program of classical furniture and applied to the specific research process. Through the collation of a variety of literature, it is not difficult to find that the existing literature on traditional furniture is very much, but the traditional furniture heritage and protection is not much.

## 2. Digital Protection Technology

In recent years, with the increasingly rapid development of social economy and the progress of science and technology, digital technology in information field gradually have been widely used in people's lives, and this transformation process that digital system completely replaced traditional analog system make people's production and survival has brought great changes to a certain extent<sup>[2]</sup>. Using the computer to save all kinds of information, processing and traditional media change to promote the information to achieve maximum dissemination and promotion. In this digital era of openness, sharing and compatibility, the study of the traditional form of creation is

gradually incorporated into the development of digital technology, for which the traditional form of furniture to be a comprehensive development and protection, and be able to regain a new life in another way.

### **3. Ways to Protect Traditional Folk Furniture**

**3.1 Using Virtual Reality Technology, Simulation and Reconstruction of Indoor Space.** Since the end of last century, domestic and foreign scholars have used virtual reality technology to realize the protection of traditional architecture and indoor furniture, the principle of technology is to make full and effective use of historical data, pictures and images, in order to build a more detailed model in the modeling software, through the virtual roaming function of the software development platform, the reproduction of the existing ancient buildings in the furniture scene and space<sup>[3]</sup>. Such as the digital simulation image of " virtual Qian Ling" " Old Summer Palace restoration" and " Suzhou garden panorama ", in the vivid display of the internal structure of the building, can also reproduce the scene from multiple angles, all-round reality.

**3.2 Use the 3D Laser Scanning Technique, Digital Restore Indoor Space.** The 3D laser scanning technology is also called real replication technology, have been produced in the last century and the middle of 90s, a method mainly through high-speed laser scanning for accurate measurement of the residential interior space. This technique can be geometric image data obtained by indoor furniture form a collection of discrete point form, and can be indoor space the point information rapid and extensive collection, on this basis, the accurate and efficient 3D image model is established rapidly, now this technology has been in the measurement of Antiquities and protection of folk furniture was widely applied. Such as digital reduction of "Dunhuang Grotto murals"<sup>[4]</sup>.

**3.3 Establish Spatial Database, Further Improve the Indoor Space Information.** China traditional folk furniture **spatial database** is an database of organically integrated of building and furniture space position and attribute information. The spatial information including 3D model building and remote sensing image, architecture and furniture layout, attribute information mainly include the history of literature, statistical data, form the folk building furniture materials the type and size of components, and color.

In the process of repairing the traditional folk furniture, using the method of manual measurement in the measurement of a higher degree of complexity of the interior space and family form, Due to man-made reasons caused damage to the indoor furniture structure, so the efficiency and accuracy of measurement will be greatly reduced<sup>[5]</sup>. At the same time, the development of virtual reality technology is relatively mature, mainly used in the 3D roaming demonstration of indoor space, but cannot be applied to solid furniture, and the function of protecting the internal furniture is very weak. However, the existence of 3D laser scanning technology can effectively resolve the measurement error which because of the traditional manual measurement is too dependent on subjective experience and clinical judgment, but it is difficult for the folk furniture profiled component spatial characteristics accurately depicted.

### **4. Application of 3D Printing Technology in Digital Protection of Traditional Folk Furniture**

3D printing technology is mainly through the continuous stacking of the physical layer, to achieve the layer by layer to promote the technology of three-dimensional solid formation, it is known to be add fabrication. As a kind of comprehensive application technology, it will integrate a lot of advanced technical knowledge to a certain extent, such as mechanical and electrical control, materials science, information, digital modeling and chemistry, contains very high technical content, it has the characteristics and advantages of digital and reduced dimension manufacturing, using the network to realize the transmission of the new production mode, such as "decentralized manufacturing". Its appears to a certain extent break the restrictions of the original protection of folk furniture digital conditions, the virtualized digital model can be reduced to an entity, and the contents of the digital protection are updated. Based on the characteristics of "layer by layer stacking" of the technology, the fine and complicated furniture components are manufactured

rapidly, in order to ensure the recovery of the traditional folk furniture material uniformity, it will have a certain gradient and shape of the device to maximize the interpretation, and the material can also be effective savings. With the help of this convenient and efficient manner in the process of digital protection can get rid of the production line, thus contributing to significantly reduce funding costs, to a certain extent to saving costs. Take the protection of Zheng Guofan's former residence as an example.

Zeng Guofan's former residence "Fuhou Tang", covers an area of more than 40,000 square meters, earth and stone brick structure, the internal furniture components are mostly wooden institutions, due to open to the outside world more years (visitors touch) lead to the damage is very serious, and the use of 3D printing Technology to a certain extent, can be achieved on the physical restoration. First, Incomplete armchair of the left deputy area - infrared scanning of contour dimension by means of 3D, record the collected information in the computer, on this basis, the three-dimensional digital model will be established<sup>[6]</sup>. Second, according to the damaged parts of the appropriate selection of suitable materials, the use of plastic fibers or numerical materials applied to the left side of the armchair on the handrail, and then in the 3D printer under the auxiliary group to complete the photo-curing printing. Third, according to the use of 3D printing technology after the damaged handrails and finished products, perform the necessary polishing and grinding treatment, on this basis, use the riveted form connect it to the main part of the chair, and then deployment of the paint, paint color the repaired parts, after drying that means recovery success.

## 5. Concluding Remarks

3D printing technology and digital protection play a vital role in the storage of folk furniture, the establishment of virtual model space and restored interior components. In the study of the protection of Chinese traditional folk furniture form, the use of digital means to a certain extent help to achieve its repair and record, contribute to the continuation and inheritance of traditional cultural heritage.

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