



Study on the Sustainable Development of Jingzuo Hardwood Furniture

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Abstract. It is an active exploration that the digital technology applies in the protection of intangible cultural heritage. This paper discusses the significance of digital technology application in Jingzuo hardwood furniture of intangible cultural heritage. By combining the living characteristic of intangible cultural heritage with sense of existence, interaction and immersion of virtual reality technology, a digital path was proposed with virtual reality exhibition hall as the carrier. This research suggests that the design and implementation of digital technology is an effective means for the sustainable development of Jingzuo hardwood furniture.

Keywords: Jingzuo hardwood furniture · Digital protection · Protection of intangible cultural heritage

1 Introduction

Jingzuo hardwood furniture making technique is a traditional craft created by Chinese craftsmen, which contains the cultural values, wisdom and practical experience of the Chinese, and is a part of intangible cultural heritage. In 2007, it was listed in the Beijing municipal intangible cultural heritage and in national intangible cultural heritage next year. Ten years later, it was included in the first list of national traditional craft revitalization directory [1].

Sustainable development refers to the development that can meet the needs of contemporary people without harming the ability of future generations to meet their needs (*Our Common Future*, 1987). The sustainable development of Jingzuo hardwood furniture can be divided into two aspects. Firstly, it's required the designer to conceive full life cycle assessment system at the beginning of the design, which includes the whole production process, material selection, recycling and reuse. The waste materials will also enter the ecological chain and become the new nutrients of other industries, so that the materials can be recycled continuously and meet the requirements of sustainable development to a great extent. Secondly, the sustainable development of Jingzuo hardwood furniture is studied on the basis of digital platform construction by using digital records and intelligent+. To protect the continuity and growth of the cultural vitality of Jingzuo hardwood furniture is a positive protection for sustainable development which will create new living space and growth opportunities for traditional culture [2].

2 Significance of Digital of Jingzuo Hardwood Furniture

Government work report of 2022 proposed to inherit and carry forward the excellent traditional Chinese culture, strengthen the protection and utilization of cultural relics, ancient books and inheritance of intangible cultural heritage, and promote the construction of national cultural parks. The protection of intangible cultural heritage has always been a concern of the government. In 2005, the *Opinions of the General Office of the State Council on Strengthening the Protection of China's Intangible Cultural Heritage* put forward the basic work ideas for the filing, preservation, dissemination, protection and development of intangible cultural heritage. In 2011, the *Law of the People's Republic of China on Intangible Cultural Heritage* began to be implemented, and established the principles and policies of protection, rescue, rational utilization, inheritance and development. In 2019, the National People's Congress and the Chinese Political Consultative Conference put forward the important concept of intelligence+ to promote Artificial Intelligence strategy at the national level. With the wide application of big data, artificial intelligence, 5th generation mobile communication technology, augmented reality/virtual reality and other new technologies, the construction and development of digital platforms in intangible cultural heritage protection, education, museums and other industries has become an inevitable trend, and online learning and communication become normal [3].

Jingzuo hardwood furniture has a complex production technique, which combines practicality and artistry. It comprehensively uses a variety of production techniques, and has high artistic and academic value due to its precious materials, reasonable structure and solemn shape. The digitization of Jingzuo hardwood furniture includes the material, shape, decoration, structure, technology, tools and other aspects of Jingzuo hardwood furniture. For the main factors of the artistic value of the material, shape, and decoration of Jingzuo hardwood furniture, it can be obtained by surveying and mapping the existing ancient furniture, manually entering, scanning pictures and words. However, for the structure and process, it is a relatively hidden factor. It cannot be obtained only by analyzing and studying the appearance. It must be explained by professionals. Its protection isn't just solved by inputting information.

At the present stage, the handmade craft of Jingzuo hardwood furniture is seriously lost. At the same time, with the industrialization process and the introduction of modern furniture processing equipment, part of the craft of Jingzuo hardwood furniture which is purely handmade, has been gradually replaced by mechanized production. The young generation of craftsmen relies on mechanical processing and neglect manual skills. It's important to achieve balance of ensure the traditional furniture manufacturing process and meet the needs of current production and output. It is an effective means to utilize the idea of sustainable design, establish digital technology to protect Jingzuo hardwood furniture.

It is the main way to realize the sustainable development of Jingzuo hardwood furniture, which is forceful developing the digital platform and establishing the digital protection system of Jingzuo hardwood furniture. The concrete method includes the digital recording, preservation, display and dissemination, as well as the further development of research and education platform. The data and information formed in the digital protection process of Jingzuo hardwood furniture are also digital cultural heritage for sustainable development [4].

3 Digital Construction of Jingzuo Furniture

This design focuses on the construction of digital exhibition of Jingzuo hardwood furniture digital platform. The digital platform of Jingzuo hardwood furniture culture was based on digital technology, and the information of the digital display platform of Chinese traditional furniture culture.

For the complex production method and structure of Jingzuo hardwood furniture, simple digital recording cannot meet the demand. In the process of digital protection and inheritance of Jingzuo hardwood furniture, static technology will show the historical development, shape and some details of Jingzuo hardwood furniture. However, it will not express the process of acquisition raw materials, polishing and assembly of materials. Pictures and videos can't satisfy learners to experience the art beauty. The interactive digital display method is used to encourage consumer to actively participate in the learning of the scene. It is not only to passively receive information through traditional images, but also to guide learners to transform into active experience, participation and interaction, and then to trigger thinking.

The VR technology is used to establish a digital experience center of Jingzuo hardwood furniture, which can create an immersive feeling of vision, hearing and touch to meet the needs of users.

3.1 VR Technical Features

Virtual Reality (hereinafter referred to as VR) uses computers technology to create a virtual world in three-dimensional space, simulate multiple sensory effects, and observe objects in three-dimensional space instantly and without limitation, which make users feel as if they are experiencing their own situations. VR has three characteristics: sense of existence, interaction and immersion. Sense of existence refers to the feeling that VR technology brings people to a place other than where they actually are. Interaction means that users can manipulate their virtual environment in real time. Immersion means that the behavior activities are completely in the virtual illusion. When users wear VR devices, their own positions move, and the computer can calculate, generating three-dimensional world influence and sending it back to the visual device to create an immersive game experience. VR technology integrates computer simulation, computer graphics, artificial intelligence, network parallel processing and other technologies to achieve results [5].

3.2 Design Scheme

The virtual scene of Jingzuo hardwood furniture digital exhibition hall is divided into three modules, namely “getting to know Jingzuo hardwood furniture (module 1)”, “exploring the beauty of structural patterns (module 2)”, and “enjoying the masterpieces (module 3)”. After wearing the VR device, the experiencer starts from the starting point and displays, experiences and learns in three modules step by step according to the Moving line plan shown in Fig. 1. Even user, who have no basic knowledge of Jingzuo hardwood furniture, can start from preliminary understanding, gradually enter into in-depth learning, finally master technical knowledge, and personally operate and experience the production process of woodworking skills.

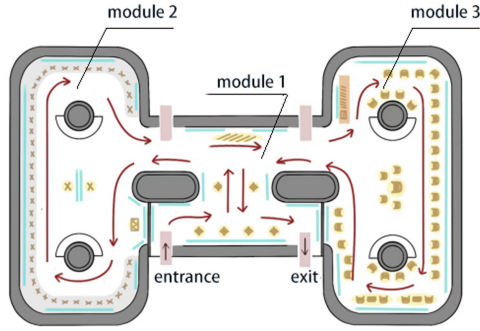


Fig. 1. Moving line plan. Image source: Drawn by the author

3.2.1 Getting to Know Jingzuo Hardwood Furniture

This module is basically designed to provide user Jingzuo hardwood furniture related preliminary materials for guidance and understanding. It uses VR equipment to click, slide up and down, and other operations to carry out reading, learning, retrieval experience, which help user understand the historical background, development process of Jingzuo hardwood furniture and the retrieval of Mortise-Tenon Joint structures of various types of furniture. The charm of decorative art is also presented in this module, which can be retrieved through different decoration methods, or through auspicious patterns of different themes to match the exquisite furniture works. At the same time, it also supplies the experience of Luban lock splicing and disassembling, and user can try splicing games by himself.

3.2.2 Exploring the Beauty of Structural Patterns

This module presents hundreds of mortise-tenon components through different combination forms, with detailed classification. It is not only suitable for sightseeing, but also for academic study and research. Each component can enter the relevant page for 360 degree comprehensive appreciation and learning, and explore its assembly and disassembly principle and force bearing mode (Fig. 2).

3.2.3 Enjoying the Masterpieces

The exhibition hall of this module is to display and splice according to the classification of furniture, which leads the users to enter the experience of woodworking skills center, such as the display of traditional woodworking tools. In ordinary museums, users can only present them in glass display cabinets, but in the VR technology experience center, you can personally pick up handsaws and planes to observe and operate. In addition, the core game of this module is the whole process experience of traditional woodworking

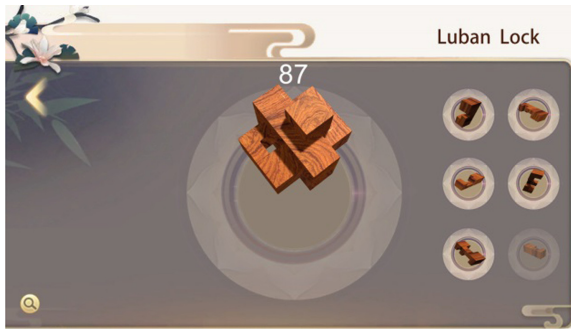


Fig. 2. Schematic diagram of multi angle view. Image source: Drawn by the author

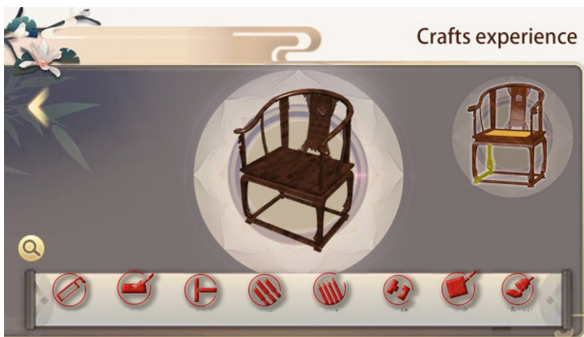


Fig. 3. Loop chair for completing trial assembly steps. Image source: Drawn by the author

skills. Participants can complete their own woodworking works in this link from wood cutting to final assembly (Fig. 3). Through experiencing all the links, user will not only learn the traditional woodworking technology, but also deeply feel the charm of intangible cultural heritage.

Through the immersive virtual experience of the virtual museum of Jingzuo hardwood furniture culture and the interactive experience based on the touch screen, we can realize the experiential cognition of Jingzuo hardwood furniture culture and stimulate cross-cultural users' deep concern for Jingzuo hardwood furniture culture.

4 Conclusion

Based on the perspective of the spread of traditional cultural diversity, a digital virtual exhibition scheme is developed for the relevant contents of Jingzuo hardwood furniture. The exhibition content provides experience modules from the historical background, furniture structure, furniture decoration, furniture production and other directions, so as to promote the sustainable development of the cultural connotation of Jingzuo hardwood furniture and spread Chinese excellent traditional culture.

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