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# Research on the Structural Characteristics of *Cantonese-style* Furniture: based on the Perspectives of Technology and Society

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**Abstract:** The characteristics of *Cantonese-style furniture* in function, form, construction, materials, and craftsmanship are all products of a specific historical time and space. Based on the investigation of social history, this study uses historical materials and image analysis, interviews with inheritors, 3D scanning, digital reconstruction, dismantling, and other methods to explore the characteristics of the structure of *Cantonese-style* furniture and analyze its causes by combining elements such as function, form, materials, and craftsmanship. Thus, we can further understand and comprehend *Cantonese-style* furniture from the perspective of the integration of Chinese and Western cultures and the characteristics of Lingnan local culture and provide evidence for its design and production.

**Keywords:** *Cantonese-style* furniture; Structural features; Digital disassembly

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## Introduction

During the Ming and Qing dynasties, Guangzhou, a port city located in the core of Lingnan, entered its most prosperous period in history with the development of foreign trade, and was once known as the *Southern Treasury of the Emperor*. In a strong atmosphere of material and cultural exchange between China and foreign countries, regional styles with local names emerged in fields such as architecture, landscaping, ceramics, furniture, and clothing. Among them, *Guang-zuo* (广作) furniture originated in the late Ming Dynasty, flourished during the Kangxi, Yongzheng, and Qianlong periods, and has been passed down to this day, including four categories: *Ming style*, *Qing court style*, *Western style*, and *Cantonese-style*. In the late Ming Dynasty, most *Guang-zuo* furniture imitated the *Soochow style* (苏式, Suzhou, formerly known as Soochow). During the early to mid-Qing Dynasty, *Guang-zuo* furniture was primarily based on imperial court designs, characterized by opulence, grandeur, and magnificent presence. The export-oriented *Western-style furniture* (洋装家具) produced in *Guang-zuo* was designed according to European demands, integrating traditional Chinese elements with Baroque and Rococo styles. The *Cantonese-style* furniture that flourished in the late Qing Dynasty and early Republic of China was a more mature style that incorporated various forms, intricate decorations, and exquisite freshness, showcasing the characteristics of Cantonese culture [1].

Current research on *Cantonese-style furniture* mainly focuses on aspects such as styling, decoration, and overall style, with relatively little research on its construction. In terms of what is denoted, construction is the sublimation of structure. Construction is a connected art that encompasses the meaning of technology; therefore, construction refers not only to the

combination of components... "[2]. From the perspective of construction, artificial objects provide greater space for design research, both from a technical perspective and a social perspective. The construction of furniture includes two levels: functional organization and component connection. Due to changes in conditions, *Cantonese-style* furniture has its own characteristics in functional organization and component connection. This article is based on the *Research on Cantonese-style* furniture project jointly conducted by the Guangzhou Academy of Fine Arts and the Guangzhou Intangible Cultural Heritage Protection Center [3]. Social and historical investigation, historical materials and image analysis, interviews with inheritors, 3D scanning, digital reconstruction, and disassembly [4] are used to study the structural changes and objectives of *Cantonese-style* furniture by combining elements such as functionality, form, materials, and craftsmanship.

## **Social Factors Influencing the Development of *Cantonese-Style* Furniture**

The formation, development, and prosperity of *Cantonese-style* furniture were all driven by specific temporal and spatial conditions. Specifically, the export of furniture in foreign trade, the procurement and production of furniture in the palace, and the consumption and use of local social classes were the main factors.

### **One Port Trade and Furniture Export**

During the Qing Dynasty, Guangzhou served as a *window* to the outside world. In the 22nd year of the Qianlong reign, the Qing government restricted trade to only Guangzhou, giving it an exclusive advantage in foreign trade. Among the commodities exported in large quantities, furniture was a significant item. The two picture books, *Guangdong Wuchang Sour Branch Furniture* and *Guangdong Wanquan Sour Branch Furniture* (《广东五常酸枝家私》和《广东万全酸枝家私》), passed down from the late Qing Dynasty, show the export situation of furniture at that time. The names *Wuchang* (五常) and *Wanquan* (万全) in the two picture books are respectively the names of two commercial firms. The interior pages mainly depict furniture styles, each with detailed size numbers. The cover and inner pages of the album are in both Chinese and English, and the dimensions are also marked in English, clearly for overseas customers to view and customize. Two picture books were printed, distributed, or used by foreign firms acting as agents, depicting nearly a thousand furniture styles together, demonstrating the prosperous export of furniture in the late Qing Dynasty and indirectly reflecting the flourishing of the design and production industry in Guangzhou driven by overseas demand.

### **Procurement and Manufacturing Office of the Palace**

From the prescript *Referring to the system of the Han people and incorporating the traditions of the Jin people as appropriate* (参汉酌金) to the postscript *The Qing Dynasty inherited the system of the Ming Dynasty* (清承明绪) [5], the early rulers of the Qing Dynasty adopted a two-way cultural policy of mutual gathering and also maintained a relatively open attitude towards material culture. Therefore, the use of objects and creations in the Qing court also reflected the mutual integration of grassland culture, Han culture, and

even Western culture [6]. *Cantonese-style* furniture with a Western court style was highly admired by the court, and the elaborate and luxurious characteristics of *Cantonese-style* furniture matched its psychology and aesthetics. In the first year of the Qianlong reign, the Ministry of Internal Affairs officially established the *Guangmuzuo* (广木作) office and the Qing court recruited Guangdong carpenters to work in the palace. At the same time, the palace also arranged for local officials in Guangdong to customize furniture through procurement. Under the parallel development of procurement and manufacturing, Guangzhou became an important source of palace furniture, and its design and production scale and level developed accordingly.

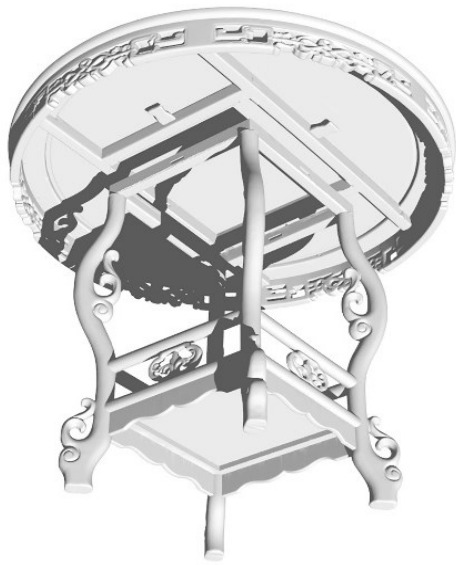
### Consumption and Usage of Local Social Classes

The prosperous industry and commerce accumulated a large amount of wealth for the local area, and the local consumer demand also created the prosperity of *Cantonese-style* furniture. The merchant class, who participated in foreign trade activities and had strong economic strength, was the leader of the new trend, especially the Thirteen Factories merchants with official and commercial status. They not only showcased their wealth and extravagance in building mansions and gardens, but also recruited skilled craftsmen who spared no expense in manufacturing furniture for display and use. By the end of the Qing Dynasty and the beginning of the Republic of China, the use of sourwood furniture was very common among the people in Guangzhou. Generally, well-off households had sourwood furniture, and public places such as guilds and ancestral halls often had complete sets of furnishings, with no less than ten pieces per set. The most popular *public chair* (公座椅), which was improved from the Grand Tutor's Chair and the Official Hat Chair, reflected the popularization of *Cantonese-style* furniture. From urban to rural areas, from wealthy merchants to commoners, the consumption and use of various social classes in the local area further promoted the prosperity of *Cantonese-style* furniture.

## Lifestyle, New Varieties, and Overall New Structures

The lifestyle change is one of the manifestations of the spread of Western influences to the East (西风东渐). During the late Qing Dynasty, Guangzhou, as an important region for transportation between China and foreign countries, underwent new changes in its daily lifestyle under the influence of the official and business classes. New concepts and behaviors led to the emergence of new varieties of furniture. According to incomplete statistics by the author, the new varieties included at least: 1. Bed type: half bed, Western-style bed; 2. Cabinets: arch-style Bo Gu cabinets, wardrobes, and wardrobes; 3. Several types of tables: connected tables, stacked tables, round tables, independent tables, writing tables; 4. Chair and stool categories: armchair, sofa swivel chair, bench, public chair, X-shaped chair, lounge chair; other items such as dressing tables and dressing mirrors were gradually appearing. The new furniture variety had a completely new overall structure. Here are just a few examples to observe its new construction:

Round dining table. Due to the traditional concept of representing *heaven with a round sky and a square earth* (天圆地方), tables before the Qing Dynasty were all square, and circular dining tables originated from Western-style furniture. After Emperor Yongzheng ordered the design of the *Fan Hua Du Ting Round Table* (番花独挺圆面桌), the round table that was endowed with the meaning of reunion was called the trendy table system, which has continued to this day [7]. After being transformed by Guangdong craftsmen, it has also become a typical structure of *Cantonese-style* furniture.

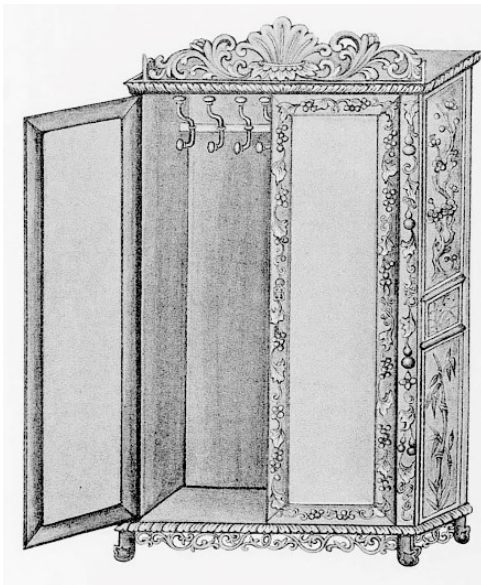


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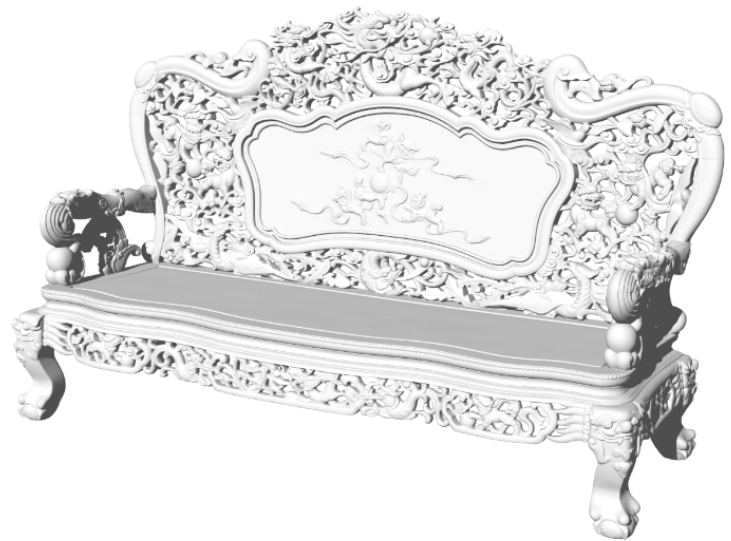


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**Figure 1.** 3D scanning of the Cantonese-style round dining table produced by Guangzhou Mingjiangju; **Figure 2.** 3D scan of the treasure tripod sofa at Guangzhou Songyuan Redwood Museum.



3



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**Figure 3.** Wardrobe (Five Constant Acid Branch Furniture from Qing Dynasty Cantonese-style Furniture by Cai Yi'an); **Figure 4.** The furniture is a 3D scanned "Qilin Long Sofa" made by Guangzhou Donglang Redwood Craft Co., Ltd.

The *Cantonese-style* round table (**Figure 1**) is divided into two sets of components: a tabletop and a bracket. The tabletop is composed of a surface edge, a tooth plate, a marble core plate, and a bottom crossbeam, which together form a whole and provide a large area of load-bearing; the bracket is connected by four legs, and upper and lower crossbeams form a whole, with the four legs recessed inward. Compared to the clear hierarchy of traditional Chinese square tables, circular dining tables reflect a more relaxed and close relationship between people and furniture, as well as between people. The combination of chairs, stools, and tables is more flexible.

“*Cantonese-style*” bench. The *Cantonese-style* bench (**Figure 2**) is a new kind of furniture created by Guangdong craftsmen inspired by Western furniture and integrating the characteristics of Chinese armchairs and Arhat beds. The height and depth of the bench are similar to that of a single chair, but the width is larger, allowing multiple people to sit together, sit, lean, or lie down.

In the process of development, benches gradually became the center of hall furniture due to their increasingly important functions and larger sizes, evolving into larger-sized long sofas in modern times (**Figure 3**). Benches or long sofas also provided possibilities for more public space and closer interpersonal relationships. At the same time, the diversification of its usage also reflects the various needs of home space.

WARDROBE: The most prominent representative of cabinet furniture in the Ming and Qing dynasties is the four-piece cabinet, which is divided into two layers of cabinets: upper, small, and lower, with a total of four doors and multiple shelves inside for storing clothes. It also has built-in drawers for storing important items. Traditional Chinese clothing is cut flat and does not emphasize three-dimensional shapes. Therefore, clothing is mainly stored after folding and is suitable for the layered partition structure of a four-piece cabinet. But driven by the demand for *Western-style* clothing and the direct influence of Western-style furniture, the four-piece cabinet evolved into a large wardrobe with double doors. The overall size of the wardrobe in (**Figure 4**) is spacious, with no partitions inside. Multiple hooks are installed on the top to meet the needs of hanging and storing *Western-style* standing-cut clothing.

## Aesthetic Concept, Furniture Form, and Connection Structure

As mentioned earlier, lifestyle drives new functional design, layout, and organizational methods, which are very evident in new furniture varieties, and in almost all furniture, the connection structure of components has also changed. The change in connection structure is a requirement for shaping furniture form under the influence of aesthetic standards. Taking Ming-style furniture as a reference point, the aesthetic concept of *Cantonese-style* furniture has shifted from appreciating the structural beauty of furniture to appreciating the beauty of form and decoration. If explanatory furniture is constructed in a simple linear form, and its connection method can clearly reflect the mortise and tenon structure, then *Cantonese-style furniture*, which advocates dynamic changes, makes the structure retreat

behind the form in the shaping of curved forms and tries to hide the mortise and tenon as much as possible.

The result of *Cantonese-style* furniture hiding the structure is the extensive use of dowel/hidden tenon (暗榫, half tenon). The dowel/hidden tenon directly penetrates the object, with a large contact area, making it very sturdy and practical. However, the exposed tenon head has a significant impact on the integrity of the carved shape, and at the same time, the processing difficulty of forming a completely curved surface by matching the cross-sectional shape of the tenon head with the outside of the tenon hole is relatively high. The dowel/hidden tenon joints are relatively short, and the dowel/hidden tenon holes are not chiseled through, which can preserve the integrity of the surface of the object and the roundness of the material. However, in order to achieve a tight connection between mortise and tenon joints, higher requirements are placed on size and craftsmanship. *Ming-style furniture* only uses mortise and tenon joints in some linear components and where other connection methods are not applicable, while in *Cantonese-style* furniture, the use of mortise and tenon joints has significantly increased. The front and sides of furniture are basically *dowel/hidden tenon* joints, and even entire pieces of furniture use *dowel/hidden tenon* joints to ensure the integrity of the curved surface shape.

This is particularly evident in the connection between column materials. The *grid corner tenon* (格角榫), an un-hidden tenon used for connecting the corners of desktop and chair frames, is commonly used in *Ming-style* furniture.


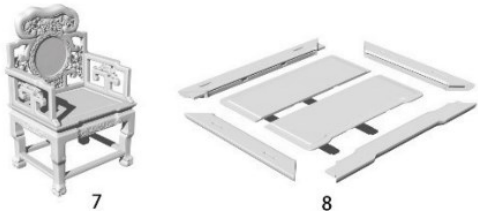
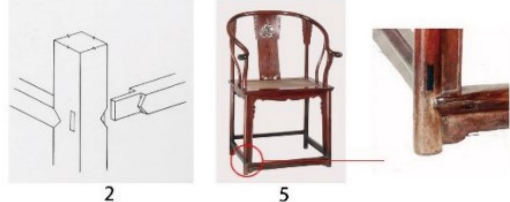


The tenon holes on the short side are chiseled through, and the tenons on both ends of the long side pass through the tenon holes. The exposed tenons are usually visible on the side of the frame of the table and chair; *Cantonese-style* furniture, on the other hand, often uses concealed mortises and tenons, meaning that the mortise and tenon holes are not drilled through and the tenon heads are hidden inside the mortise and tenon holes. Another example is the *grid shoulder tenon* (格肩榫) used for the T-shaped connection of column materials, which is commonly seen in the connection structure between seat legs and crossbeams, and can also demonstrate its structure. For example, the four horizontal beams at the bottom of *Ming-style* seats are often made using the method of *rushing beams* (赶枱), which means that the front and rear beams are lower, the sides are slightly higher, or the front beam is lower, the sides are slightly higher, and the rear beam is the highest. The reason for this is the use of Ming tenons, which require the tenons of the two horizontal beams on one leg to be staggered with each other. A small number of Ming-style seats have also begun to avoid exposing tenons on the front of furniture, using concealed tenons on both sides of the horizontal beams and exposed tenons on the front and rear horizontal beams, or using *large in and small out* (大进小出) tenons to reduce the exposed area of the tenons [8].

In *Cantonese-style* seats, the bottom crossbar is often on the same horizontal plane, and the *grid shoulder tenons* connecting the legs and crossbar often use hidden tenons, even on the back of furniture. For example, the *brown corner tenon* (棕角榫) commonly used in furniture such as cabinets, tables, and bookshelves, which connect three columns, is also commonly used in Ming-style furniture to enhance its solidity due to its precise connection position. The *Cantonese-style* often uses *dowel/hidden tenon* joints, and the top of each

column is chamfered at a 45-degree angle. After the combination, only the boundary line is visible, and there are no other structural traces.

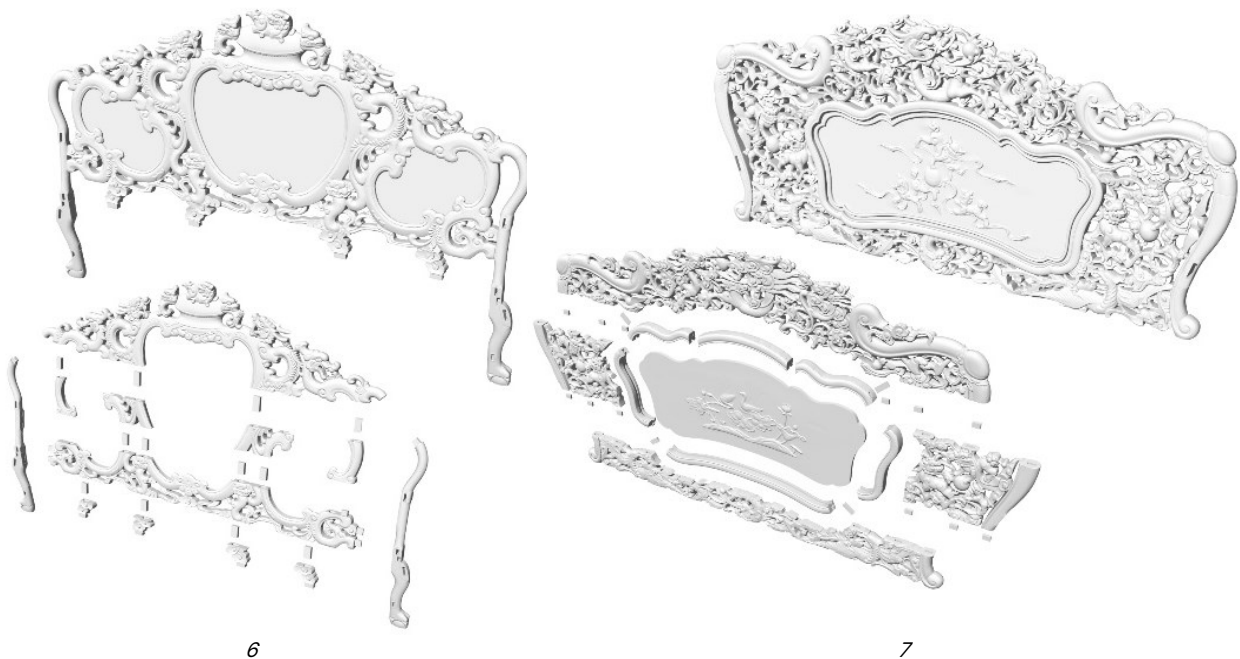
*Planting tenons* (栽榫) is a special type of hidden tenon that was used before the Qing Dynasty. It is usually made of wood to prevent furniture horizontal tenons from breaking and is used for connection. Sometimes it is also used to connect detailed decorative components. Although Guangzhou style furniture is characterized by its wide and luxurious shape, with the pursuit of large-sized irregular forms and large-area carved decorations, not all components can be completed with complete large blocks of material due to the limitations of the size of the original wood.

Therefore, it is necessary to be able to form a perfect shape while using wood reasonably and to make it in a small to large and short to long way. In this way, more hidden *mortise and tenon* connections are used in the connecting structure, that is, mortise and tenon holes are opened on two components, and wood is used to make mortise and tenon connections so that the connecting structure is hidden in the shape (Figure 5).

	Ming-style furniture	Cantonese style furniture
grid corner tenon		
grid shoulder tenon		
brown corner tenon		

**Figure 5.** Comparison between visible tenons and hidden tenons

1-3 are from Wang Shi-xiang's *Research on Ming-style Furniture*; 4 is the Ming Dynasty Huanghuali wood rose chairs collected by the Shanghai Museum; 5 is the Ming Dynasty Huanghuali carved backrest circular chairs in the collection of Shanghai Museum; 6 is the Ming Dynasty Huanghuali wooden grid collected by the Palace Museum; 7-9 are the nave chairs made by Guangzhou Famous Craftsmen's Residence for this research project; 10-11 are the second level table produced by Guangzhou Gengsuantang for this research project.



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**Figure 6.** The backrest of the Baoding Sofa in the collection of Guangzhou Songyuan Redwood Museum; **Figure 7.** The backrest of the "Qilin Long Sofa" made by Guangzhou Donglang Redwood Craft Co., Ltd.

If not carefully examined, it is difficult to find traces of connection between complex forms and carvings. Like the *Baoding* (宝鼎) sofa (**Figure 6**) and *Qilin* (麒麟) sofa (**Figure 7**), after digital scanning, reconstruction, and disassembly, combined with the personal account of the inheritor, this study found that each backrest is composed of more than ten pieces of material, connected.

## Analysis From the Perspectives of Technology and Society

As mentioned earlier, *Cantonese-style* furniture is shaped by the C-shaped and S-shaped curves of Baroque and Rococo styles, and the surface shape follows the curves to form smooth and vivid free-form surfaces. At the same time, it is decorated with concrete and delicate carvings. Unlike the decorative components of Ming-style furniture that are attached to the main form of architecture, the components of *Cantonese-style furniture* are treated as a whole with the main form, forming one or more complete and continuous curved surfaces. In this case, a design logic that prioritizes form and decoration has been formed, which is different from the design logic of Ming-style furniture, that is, from determining the structure first and then adding decoration, to considering the overall form first and then distinguishing the structure. The armrest of the long sofa in Figure 4, although its structural features are roughly distinguishable, is actually closer to a complete three-dimensional carving. In terms of visual effects, the structural features of furniture are weakened, and the morphological features are strengthened. The name *selling flowers* (卖花) of *Cantonese-style furniture* also confirms the design and production logic of placing form and decoration above function and structure.



The establishment of the new style of *Cantonese-style* furniture is reflected in the shaping of its appearance and is achieved through hidden connection structures, that is, using hidden tenons instead of exposed tenons. To achieve an overall curved shape and overall decoration, the connecting structure of furniture - mortise and tenon joints - must be integrated into the form or hidden behind the form to obtain a more complete, coherent, and refined appearance. It can be said that giving way to hidden tenons is a technological choice and an improvement in the process. From the perspective of cultural ecology, this also shows the phenomenon of *cultural adaptation* (文化适应) of technology.

In addition, using the *dowel/hidden tenon* is also more convenient for disassembly and transportation during export and tribute. *Cantonese-style* furniture was exported in large quantities overseas. Due to the long sea transportation distance, in order to maximize the use of cabin space, furniture could only be disassembled into parts and shipped in boxes, and then reassembled and installed at the destination. Due to the lower assembly difficulty of mortise and tenon compared to open tenon, and the reduction of damage to the outer surface of furniture during disassembly and assembly, it became a more suitable technical choice. In practical operation, in order to facilitate assembly after arrival, the disassembled components were often packaged according to their size numbers. In this study, we observed a double-layered circular table with numbered markings on the bottom of the table. As mentioned earlier, the round table also has movable pins that are easy to disassemble and assemble to connect the upper and lower components. During transportation, the circular tabletop could be separated from the bracket.

Whether serving the shaping of formal styles or facilitating the disassembly and assembly of long-distance transportation, the changes in the connection structure of *Cantonese-style* furniture are a reflection of its cultural integration and material exchange between China and foreign countries. They are evidence of its internationalization as a product, reflecting the cultural and social adaptation of technology.

It is worth noting that, on the same scale, the firmness of the *dowel/hidden tenon* is inevitably inferior to that of mortise and tenon joints. However, *Cantonese-style* furniture provides greater mortise and tenon space with its wider form and larger components, allowing the tenon head to meet the requirements of stable installation even though it is not protruding. However, sturdy mortises have higher requirements for wood. Guangzhou is located along the coast and enjoys the advantage of importing timber. It is precisely the hardwood materials imported in large quantities from Guangzhou Port during the Qing Dynasty that ensured processing accuracy with their high density and strength, making the fit between mortise and tenon joints tighter and creating conditions for the improvement of mortise and tenon technology.

**Author Contributions:**

The co-authors declare that they jointly negotiated and wrote this article.

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**Conflicts of Interest:**

The co-authors have declared that there are no conflicts of interest related to this research.

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3. The project was completed in stages according to the plan. In the first phase, 16 classic style furniture pieces were selected and analyzed, some of which were from the Qing Dynasty and the Republic of China, and some were made by contemporary inheritors. The first criterion for selection was to reflect the unique lifestyle concepts and ways of life in the Guangfu region; secondly, it had continuity in function, form, decoration, construction, and craftsmanship, reflecting the inheritance and development of Cantonese furniture.
4. Digital reconstruction and disassembly have played a crucial role in furniture construction research as a new approach. The analysis of the internal structure originally required physical disassembly for observation and recording, but it is difficult to execute in practical work because: on the one hand, most of the *Cantonese-style* furniture passed down from the Qing Dynasty to the Republic of China has become cultural relics or collections, and disassembly can cause irreparable damage; on the other hand, in the modern furniture production process, craftsmen began to use adhesives such as fish glue based on mortise and tenon joints to enhance the stability of furniture. After using adhesives, hardwood furniture is actually non-removable. Therefore, using 3D scanning and reconstructing the details of the connection structure in software to achieve digital disassembly, combined with authoritative inheritors' oral and literature materials, has become a more suitable method.
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