Visual Analysis of Ming and Qing Style Furniture Research Based on CiteSpace

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Abstract. In order to understand the research hotspots of Ming and Qing style furniture in China in the past 20 years, and provide reference for the research direction of Ming and Qing style furniture. Based on the CiteSpace software, comparative analysis method and quantitative analysis method were used to visually analyze 539 journal papers in the field of Ming and Qing style furniture from 2000 to 2019 in the CNKI database. The results show that the relevant research literature from 2000 to 2012 found a significant growth trend, which began to decrease in 2013. At present, stable core author groups have been formed, but there is relatively little cooperation between various groups. Northeast Forestry University is the main research institution, but other inter-provincial institutions have less cooperative research. Hot research contents mainly focus on the shape, decoration and materials of Ming and Qing style furniture. Eight clusters formed by the keywords have good clustering effect, which can fully reflect the key research interests in this research field. To sum up the results, in the future, we should strengthen the communication and cooperation between the authors and between the institutions, and establish a systematic database for research on Ming and Qing style furniture. Through reasonable design techniques, the symbols of Ming and Qing furniture could be merged into modern design, new materials and instruments could be combined to further promote the inheritance of Ming and Qing style furniture.

1. Introduction

Chinese traditional furniture is from "sit on the ground" short model furniture, to "hang one's feet and sit" tall model furniture, evolve to the furniture of the Ming and Qing dynasty of heyday period finally[1]. Ming-style furniture refers to furniture made in the early Ming and Qing dynasties with beautiful materials, elegant and simple shapes [2]. Qing style furniture focuses on form and advocates rich and luxurious furniture, which is influenced by Baroque, Rococo and arts and crafts movement style[3]. In order to inherit the reasonable structure and function of classical furniture and strengthen the application of traditional craftsmanship in the design and manufacture of modern furniture, design scholars have carried out research work on Ming and Qing furniture. With the continuous improvement of research methods, design scholars have The research has been continuously enriched, and related research on Ming and Qing furniture has been conducted from different perspectives and methods [4-7]. However, there are few literatures on the research of furniture in the Ming and Qing Dynasties, and most of them are inductive summaries of literature materials, and lack of summarization and summary of literature materials based on knowledge graphs. The CiteSpace software was developed by Professor Chen Chaomei. Based on methods such as co-citation analysis,
pathfinding network algorithm, etc. through data mining, information analysis, and map drawing, the knowledge structure of a specific subject area is displayed, which can intuitively represent the evolution process of knowledge groups. Research fields such as computer science, information science, and medicine are widely used [8], but rarely used in furniture research.

Therefore, this article attempts to use the bibliometrics software CiteSpace to draw a scientific knowledge map of Ming and Qing furniture research based on the Chinese academic journal database (CNKI total database). A quantitative comparative analysis was made on the chronological distribution, author distribution, institution distribution and research hot spots of the furniture research in the Ming and Qing dynasties, in order to grasp the current research situation of Ming and Qing furniture, and provide a reference for the related research of Ming and Qing furniture in the future.

2. Data sources and research methods

The literature data in this article comes from the Chinese Academic Journals Database (CNKI), with a search span of 2000-2019, with the theme of "Ming and Qing Furniture" as the subject, and 539 articles from specific journals were obtained. The download_1.txt file named CiteSpace can be recognized. Stored in the input folder as a basis for analyzing the data. CNKI data conversion is performed using CiteSpace software.

The knowledge mapping tool used in this study is the CiteSpace software developed by Professor Chaomei Chen of Drexel University in the United States based on the Java platform, version 5.5.R2. By drawing network maps such as keyword co-occurrence, author co-occurrence, and hot research co-occurrence. a comparative analysis of the chronological distribution, author distribution, organization distribution, and research hotspots in the Ming and Qing furniture was conducted to understand the development and research power dynamics in this field.

3. Temporal and spatial distribution characteristics of Ming and Qing furniture research

3.1 Time distribution characteristics

The chronological distribution of Ming and Qing furniture research literature from 2000 to 2019 is shown in Figure 1. It can be seen from the figure that the number of research papers in this research field showed an overall upward trend before 2012, and the number of papers gradually decreased after 2012. During the 20 years, the research process can be divided into three stages: (1) From 2000 to 2003, the number of documents in this stage was relatively small, mainly because scholars were beginning to study the Ming and Qing furniture. In the 1980s, Wang Shixiang and Chen Zengbi published books on the research of Ming-style furniture, which promoted the development of research in this field. (2) From 2004 to 2012, it was in the stage of rising volatility. The research literature at this stage has increased significantly, although some years have declined, but the overall trend is rising. The most published articles in 2012 reached 58. This phenomenon may be caused by the development of research technology and people's preference for traditional furniture. (3) Since 2013, the number of articles published in this research field has declined. This phenomenon is due to multiple reasons such as the economic reasons of modern people, the impact of foreign cultures, and the complicated materials and crafts of Ming and Qing furniture. The market began to decline, so research on Ming and Qing furniture began to decrease [1].

Figure 1. Chronological distribution of Ming and Qing furniture research literature from 2000 to 2019
3.2 Spatial distribution characteristics

3.2.1 Author and institutional distribution  This article discusses the distribution of Ming and Qing furniture research authors by analyzing the cooperation between core authors and authors. The core author refers to a researcher who has an important influence in this research field, and his research direction represents the focus and future trends in this field, and largely reflects the level of this research field [9]. And the cooperation between different authors can promote the exchange and development between disciplines, to a certain extent, it also reflects the research level and development stage.

This article statistically found 539 documents retrieved, and the author who published the most articles was Song Kuiyan, who published 13 articles in total. According to price law, the core author's authentication formula is $M \approx 0.749 \times \sqrt{N_{\text{max}}}$. In the formula, $N_{\text{max}}$ is the number of articles published by the most authors; $M$ is the minimum number of documents for core authors [10]. After calculation, $M \approx 0.749 \times \sqrt{13} = 2.701$, so the author who publishes at least 3 articles is the core author. This article counts 25 core authors (the top five core authors are shown in Table 1.) and has published 118 papers, accounting for 21.89% of the total number of papers. It can be considered that the current Ming and Qing furniture research field has basically formed a stable core author group. It can be seen from the cooperation map of the authors of the literature (Figure 2.) that the current core authors in this research area are partly concentrated and diversified as a whole. There is relatively little communication and cooperation among the groups. It is necessary to strengthen communication and cooperation to jointly promote the research on furniture in the Ming and Qing development of.

It can be seen from Figure 3. that the research institution with the largest number of articles is Northeast Forestry University, which formed the main research institution of Ming and Qing furniture. From the perspective of the cooperative relationship, the cooperative research among various institutions is scattered. There are 9 nodes that reflect the cooperative research relationship, but most of them have only two nodes, and they are usually in the same city or department. Judging from the cooperative research of institutions, there are few cooperative researches in other provinces.

![Figure 2. Author's cooperation atlas](image)

![Figure 3. Organization distribution map](image)

| Serial number | Author          | Number of post(piece) |
|---------------|-----------------|-----------------------|
| 1             | Song Kuiyan     | 13                    |
| 2             | Zhang Bingchen  | 10                    |
| 3             | Zhou Mo         | 10                    |
| 4             | Hu Desheng      | 8                     |
| 5             | Yang Aixia      | 7                     |

4. Analysis of research hotspots in Ming and Qing furniture

Research hotspot mining is achieved through keyword co-occurrence. Keywords are the theme of the article, which can reflect the core content of the article. Therefore, statistics and clustering analysis can
be carried out based on the frequency of the occurrence of keywords, so as to grasp the hot spots in this research field. The retrieved 539 documents were imported into CiteSpace software, and the time division was 1 year. Pathfinder, Pruning sliced networks, and Pruning the merged network were used for network pruning to highlight important structural features, and keyword co-occurrence maps were obtained (Figure 4.). The cluster label extraction method is the log-likelihood algorithm, and other settings are set to default values, and the keyword clustering map is obtained after running (Figure 5.). It can be seen from Figure 5. that based on keyword co-polymerization into 8 categories, the average value of modularity is 0.7089, the average value of silhouette is 0.6339, and the silhouette values of these 8 clusters are not less than 0.70, indicating that the clustering effect is good.

In order to conduct a more comprehensive analysis of the research hotspots in this research field, this article analyzes the research hotspots in depth from the comparison of the Ming and Qing furniture styling, decoration and materials.

Comparison of Ming and Qing furniture styling: Ming-style furnitures pay particular attention to beautiful lines and reasonable functions. Emphasis on the changes in the contours of the outer contours of furniture, giving people a strong line beauty [11-12]. The Qing-style furnitures are characterized by their gigantic appearance, delicate workmanship, rich decoration, and abundant materials. They show a thick, tough, majestic, and powerful northern momentum [13-14].

Comparison of Ming and Qing furniture decorations: In Ming-style furniture, only the most appropriate parts are decorated with subtle relief or openwork in a small area. Make the whole furniture look bright and concise [15-16]. Qing Dynasty furniture wins with decoration, and likes to use carving, engraving, inlay, gold and silver painting and other decorative techniques in large areas. The decoration method gathers the essence of the past dynasties [17-19].

Comparison of Ming and Qing furniture material: The materials of Ming-style furniture mainly include wood, stone, and auxiliary materials. Ming-style furniture mostly uses hardwoods such as mahogany, red sandalwood, rosewood, wenge, and iron pears, among which yellow rosewood has the best effect. Ming-style furniture seldom uses paint, only rubbing transparent wax, it can show the texture and natural beauty of the wood itself [20]. Qing style furniture mainly uses red sandalwood, acid twig and rosewood as the main materials, and the most valuable material is red sandalwood, which is known as the "king of hardwood" in the industry. Red sandalwood itself has stable wood properties and hard quality wood, suitable for clever and tight tenon and mortise structure and exquisite and complicated carving decoration. The advantages of the furniture made are durable, graceful and luxurious[21-22]. The styling, decoration and materials of the Ming and Qing furniture all reflected important information such as human life information, customs and cultural characteristics at that time. They have profound historical and cultural values and are inspiring to the design of new Chinese furniture [23].
5. Conclusions and prospects
This article uses CiteSpace software to compare and analyze the literature in the field of Ming and Qing furniture in the CNKI database, and draws keyword clustering maps, keyword evolution trend maps, publication time maps, author maps and institutional maps in this research area. The main conclusions were as follows: 1) From the perspective of the literature years, the number of published papers fluctuated from 2000 to 2012, and the research literature increased significantly. Since 2013, the number of posts in this research field has declined. 2) According to Price Law and literature statistics, there are 25 core authors in the field of furniture research in the Ming and Qing Dynasties, of which Song Kuiyan is the core author who published the most articles. From the author's cooperation graph, we can see that the cooperation within the research group is frequent, and there is less cooperation between the groups, which is in a state of partial concentration and overall divergence. 3) From the perspective of the distribution of research institutions, Northeast Forestry University is the main research institution, and there are few inter-provincial collaborative researches. 4) The eight clusters formed by the hot research content have a good clustering effect, which can fully reflect the key research in this research field.

From the above analysis results, it is found that there are still directions worth exploring and researching in the future.

1) In the study of Ming and Qing furniture, there was little cooperation and communication between the authors and the authors and between the institutions and institutions, which may cause the research to progress slowly. In the future, we should strengthen communication and cooperation between authors and institutions. Establish a systematic database of research on Ming and Qing furniture, such as the establishment of Ming and Qing furniture decoration form database, as a material for appreciation and research of Ming and Qing furniture.

2) To make the design of Ming and Qing furniture still come to life in modern design, we should summarize its design ideas based on a large number of design methods, find a reasonable design method and integrate the symbols of Ming and Qing furniture into modern design. With the emergence of new materials and new instruments, the problems of rare materials, expensive materials and the combination of tenon and mortise encountered in the manufacture of antique furniture will be improved, which will further promote the research of Ming and Qing furniture. Making Ming and Qing furniture better heritage and establish a true modern Chinese furniture style.

3) At present, the research of Ming and Qing furniture tends to be diversified, such as the analysis of differences in wood carving decoration of Ming and Qing furniture based on spss software, the application analysis of modern Chinese furniture design based on symbolic thinking, and the Ming and Qing based on CiteSpace used furniture research atlas analysis in this article, etc. With the development of interdisciplinary subjects, more methods will be used in the future to study Ming and Qing furniture from different perspectives.

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