Research on the Construction of Knowledge Graph of Traditional Chinese Pattern Literature

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Abstract—This paper aims to show the development and application of pattern design application research in the past 30 years, and enable designers to clearly identify and understand the research hotspots and new trends in the field of pattern design applications. VOSviewer was used to systematically analyze 2313 pattern design studies published in CNKI core journals from 1992 to 2021 in terms of publication volume, annual output, authors, research institutions and keyword maps. Coupled analysis methods and multi-scale dissimilarity matrices show collaboration between authors and the distribution of research topics. The cultural inheritance of traditional patterns, shape grammar, cultural and creative design, and women's wear design will become new trends in the future; The lack of close cooperation in institutional research, the lack of many prolific authors, and the lack of obvious innovation in research methods and research theory are the main limitations of research at this stage.

Keywords-traditional patterns; CiteSpace knowledge map; VOSviewer; time evolution context

1. Introduction

Academic journals are important carriers of expressive scientific activities and the most important formal channels for scientists' research and scholarly exchanges. The strength of the coupling relationship and the co-citation relationship can reflect the kinship, distance, and proximity of journals, and the relationship between academic journals can be explored and classified through coupling analysis, and the knowledge structure and connection within the discipline can be investigated.

The coupling analysis method was first used in the study of literature coupling, by using the coupling strength to measure the similarity between authors, and showing the ability of scientific research and the collaboration between authors, author keyword coupling networks for comparative studies. Keywords and time overlays can observe the evolution of the study. As a concrete thing, the pattern has the symbolism of the times. The style and content of an era pattern often reflect the spirit of that era, and then become a symbol of the era [1]. As the trend of journal data becomes more and more obvious, in order to obtain more rigorous data indicators, VOSviewer software will be used to analyze the literature data in this paper. VOSviewer has a powerful user graphical interface and mapping visualization [2]. Authors and keywords can be analyzed for documents from CNKI, and authors and keywords can be visualized. Based on the review of systematic analysis of traditional pattern literature, this study will comprehen-

sively review the overall situation of traditional pattern design in China and describe its research and development path through this software.

2.   Study design

2.1   Research methods and data sources

The data search in this article is limited to CNKI database to obtain articles related to traditional pattern design. The specific search steps are: CNKI database with the subject words "pattern design" or "traditional pattern" as the search term, the search time is from 1992 to 2021, a total of 2313 documents are filtered, and the literature is systematically analyzed in terms of annual output, authors, research institutions and keyword maps Table 1.

Table 1 Literature data source retrieval information table

Search for Content	
Data Sources	CNKI database of CNKI
Search format	Theme = "traditional pattern" or "pattern design"
Document language	Chinese
document type	SCI source journals, EI source journals, Peking University core CSSCI, CSCD journals, master and doctoral dissertations
Literature screening	Eliminate documents with missing author information and foreign patterns
Refining results	2313

2.2   Publication volume analysis

0 shows the annual trend of domestic pattern design publications. It can be seen that the number and time changes of pattern design literature are positively correlated. The study of Chinese pattern design can be divided into 3 stages: the embryonic stage, the development stage and the prosperity stage. The first stage was the embryonic stage (1992-2004). During these 10 years, there were only six articles in 2004. The second stage was the development phase (2004-2016), when the literature began to accelerate significantly, rising to 193 in 2016. The third stage is the boom phase (2016-2021), which publishes more than 200 articles per year and peaks at 329 articles in 2022.
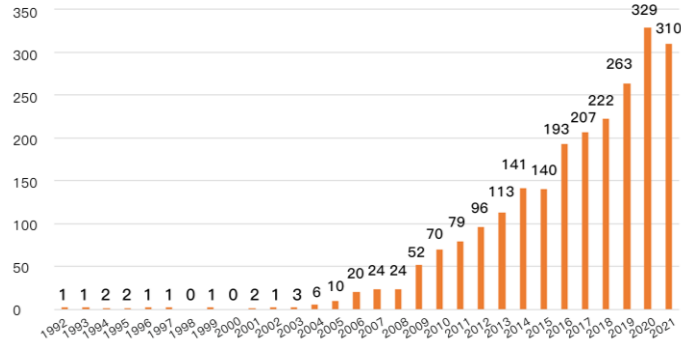
Figure 1 Time distribution map of research results in the field of pattern design from 1992 to 2022. (*self-drawn*)

2.3 Core author distribution

Journal author coupling is a kind of journal coupling relationship generated by academic journals sharing the same publishing author. The author publishes a paper in a journal, indicating that the topic of the journal is similar to the author's research topic; The fact that a large number of authors publish in a journal indicates that these authors have similar research topics, that is, they are also research topics in journals. By mapping the knowledge map, you can identify outstanding authors in the field and understand the context of a field's development. Table 2 lists the top 10 authors with the highest number of publications. According to the data, between 1992 and 2021, the two authors were the most productive, and the number of articles published was 8, namely 1 Zhang Yu (Zhejiang Sci-Tech University, 8 articles) and 2 Huang Zijuan (Suzhou Vocational and Technical College of Economics and Trade, 8 articles). The formation of the disciplinary branches of these scholars' articles plays a fundamental role [3].

Table 2 Top 5 authors by number of articles

Serial Number	Number of publications	Year	Name	Author Institution
1	8	2008	Yu Zhang	Zhejiang University of Science and Technology
2	8	2014	Zijuan Huang	Suzhou Vocational and Technical College of Economy and Trade
3	7	2009	Yi Zhang	Jiangnan University
4	7	2006	Gaoming Jiang	Graduate School of Chinese Academy of Sciences
5	6	2011	Hui'e Liang	Wuxi Technology Vocational Technology College

2.4 Distribution of research institutions

In the institutional analysis of the research on traditional pattern design from 1992 to 2021, the output of documents published in descending order was 1. Zhejiang Sci-Tech University (118 articles), 2. Jiangnan University (84 articles), 3. Soochow University (80 articles) The main school of application of traditional Chinese pattern design is the School of Art Design and Fashion Design Table 2.

3. Distribution of research hotspots

3.1 Keyword graph analysis

In a multidimensional scale analysis plot, the relative position of each point reflects the similarity between the analyzed objects. Multidimensional scale analysis is usually analyzed using a dissimilarity matrix, which is more intuitive than factor analysis and cluster analysis because all variables are located. The core vocabulary summarized in a certain field is keywords, which represent the hot spots and frontiers of research in a certain field. High-frequency co-occurrence keywords can illustrate the research hotspots of traditional patterns in the past 30 years. The data of 2314 articles was imported into VOSviewer software for visual analysis, the keyword frequency was set to 10, and 169 keywords were finally selected after filtering and merging synonyms. As can be seen from Fig. 2, the keywords of the same color are the same cluster, forming a total of 5 main clusters, namely cluster #1 pattern, cluster #2 traditional pattern, cluster #3 application, cluster #4 design, cluster #5 decorative pattern.

3.2 Discussion of content of main research hotspots and knowledge groups

In order to analyze the field of pattern design in depth, it is a very effective method to establish a hot knowledge group [4]. As can be seen from 0, the main clusters of the study are shown below. Based on the clustering subnetwork, cluster #1 - pattern contains 63 members, mainly including design, decoration, application, traditional culture, cultural and creative products and other keywords. The analysis of the cultural significance of patterns is relatively profound, and innovative applications are carried out from shape, pattern, shape, color, etc., and the application objects range from traditional textiles [5]to cultural and creative products and clothing, reflecting the in-depth analysis of China's design on the multi-angle in-depth analysis of patterns, colors and cultural inheritance and the active exploration of application in different fields.

Cluster #2 traditional patterns contain 58 cluster members, mainly including traditional patterns, design, application, traditional culture, decorative patterns, innovative design and other keywords. These patterns are applied to furniture design and interior design, as well as modern women's clothing, and pay more attention to the decorative nature of patterns on different objects and scenes [6]. It reflects the redesign and innovation of patterns that reconstruct indigenous culture, and applies them to interior design, furniture design, etc.

Cluster #3 The application contains a total of 52 cluster members, mainly including keywords such as traditional culture, traditional patterns, clothing design, innovative design, and modern design. This cluster mainly studies the innovative application of traditional decorative patterns, the evolution and development of patterns with decorative characteristics such as auspicious

patterns, cloud patterns, lotus patterns, and plant patterns, highlighting the decorative role of patterns and the inheritance of culture.

 Cluster #4 - design, mainly contains 34 cluster members, mainly contains pattern modeling, pattern, traditional pattern, application research, and other keywords, design pays more attention to the pattern modeling redesign of traditional patterns, through this decorative art application research on jacquard fabrics and cultural and creative products[7].

Cluster #5 - decorative patterns, mainly contains 31 members, mainly including traditional patterns, Song Dynasty, Qing Dynasty, design, color, shape, pattern, and other keywords. This cluster is designed and applied to modern clothing and architectural decoration through the artistic characteristics of decorative patterns, mainly reflecting the artistic value of patterns [8]. The research hotspots of cluster 5 can be summarized as follows: by using traditional pattern color, shape, pattern and other artistic characteristics, the decorative pattern reflects its artistic value through modern clothing and architectural decoration.
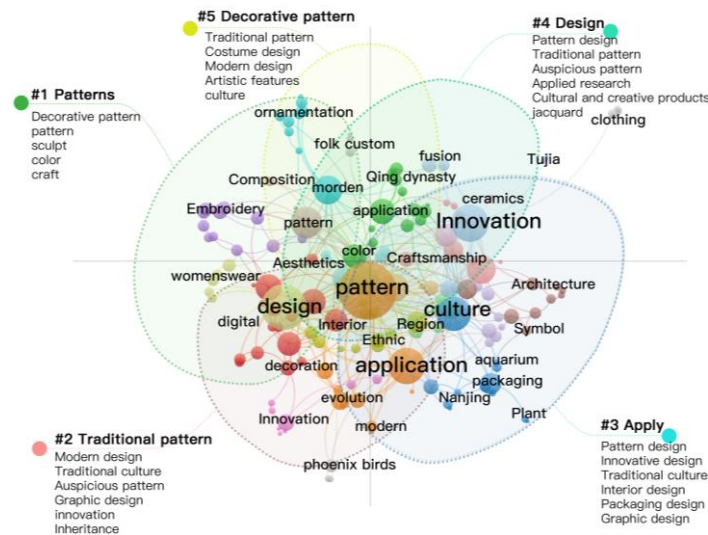

Figure 2 Keyword co-occurrence cluster map of Chinese traditional pattern design literature. (self-drawn)

3.3   Study temporal evolution context analysis

In order to further study the frontier themes and development trends of traditional pattern design research, the average occurrence time of keywords was statistically analyzed, and 0 time-keyword clustering overlay graph was obtained by superimposing it on the original cluster chart. 0 lists the keywords of the top 25 of sudden intensity, and it can be seen in chronological order that the research hotspots are divided into 4 obvious intervals.

The period from 1992 to 2018 was the most intensive high-frequency keywords, reflecting that this period was the golden period of pattern design. The literature mainly redesigns the pattern under the premise of retaining its cultural connotation, and then uses the pattern in warp knitting and modern design to realize the innovative application of traditional patterns. From 2019 to 2021, there were a total of 902 articles related to traditional pattern design (including 263 in 2019, 329 in 2020, and 310 in 2021), and the high-frequency keywords in this

range mainly include traditional pattern (53 times), innovative design (42 times), and decorative pattern (38 times). High-frequency keywords highly overlap with keywords in the 1992-2018 range, reflecting the recent application of traditional pattern design redesign or conventional design methods and design theory, and the innovation in design methods and design tools and design theory is not obvious, and the application fields are mainly concentrated in packaging design (21 times), cultural and creative products (32 times), women's wear design (13 times), etc., and have become more extensive in application scenarios and design objects.
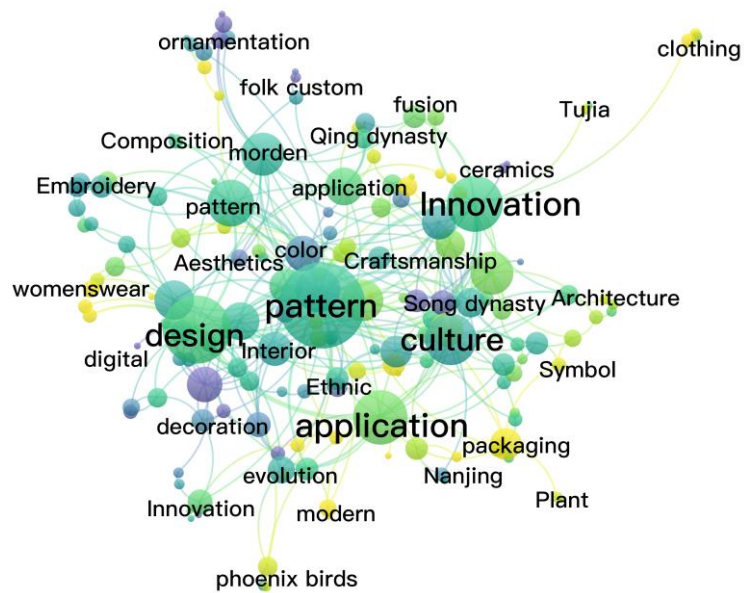

Figure 3 Overlay of co-occurrence clusters of keywords in traditional Chinese patterns. (self-drawn)
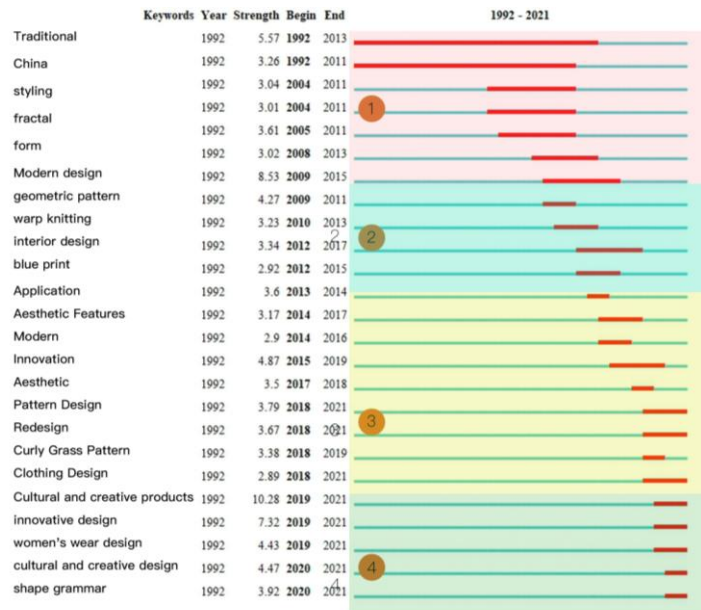
Figure 4 Keywords Burst Term. (self-drawn)

4. Conclusion

Academic journals are important carriers of scientific literature and important platforms for scholars to exchange and disseminate knowledge. The coupling relationship between journals can explore the relationship between academic journals, investigate the connection between journals, and analyze the knowledge structure within the discipline. Through the coupling analysis of journal authors, not only can the different research topic branches of the discipline be separated, the relationship between the research branches can be presented, which is convenient for a deeper understanding of the discipline, but also some subtle relationships within the discipline can be investigated. The journal author coupling analysis method, which can be used in the study of subject knowledge aggregation, is a new method for probing the structure of subject knowledge and a new perspective for evaluating the structure of the domain.

The output of traditional pattern designs has generally shown an upward trend in literature output, and has increased rapidly in the past two years. The main objects of design include geometric pattern design, interior design, gradually applied to cultural and creative design, product design, packaging design, women's wear design and other fields. Zhang Yu, Huang Zijuan, Zhang Yi and other authors are prolific authors of traditional pattern research. Through keyword clustering, the visible pattern design innovation is widely used, and the application is mainly distributed in the "innovative application" problem.

In the field of design in China, a number of highly cited literature that has an influence on traditional pattern design has been produced. The literature is divided into two categories: one is: the traditional pattern from the perspective of semiotics, history, folklore and other perspec-

tives, in the theoretical in-depth analysis of the cultural meaning and cultural value of the symbol of the expression, mainly to protect the traditional culture and inherit cultural heritage in the future. The other is to explore the combination of traditional Chinese patterns and modern design, and integrate people-oriented design concepts to make traditional Chinese patterns regional.

5. Prospect

In terms of disciplinary background, design, as an interdisciplinary field, integrates multidisciplinary knowledge such as science, engineering, literature and art. Because the time proposed by the traditional Chinese pattern design is relatively short, the relevant theory is not yet mature, and the application and protection of traditional pattern is still in the exploration stage. In the process of development, the relevant theories in this field have problems such as limited level, vague development ideas and lack of communication with the outside world. It is necessary to continuously expand the innovative application of pattern design, explore research tools such as three-dimensional digitization[9], brainwave technology, and eye tracking instruments[10], and pay attention to the practical application of technology to the application and protection of traditional pattern design.In the intelligent era of digital transformation, the recognition and protection of traditional Chinese patterns driven by computer technology is the future development trend, and it will also promote the development of other disciplines and technologies.

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