

Research on the Design and Application of the Tang Dynasty Joint Bead Pattern in Household Textiles

Zhang Nan¹, Jia Dongyi^{2,a,*}

¹College of Art and Design, Shaanxi Fashion Engineering University, Xi'an, 712046, China

²College of Design and Art, Shaanxi University of Science and Technology, Xi'an, 710021, China

^a201022005@sust.edu.cn

*Corresponding author

Abstract: In order to broaden the use of traditional patterns in modern design applications, a design method is proposed with the Joint bead pattern of Tang Dynasty as the research object. Firstly, the development and characteristics of the joint bead pattern in the Tang Dynasty are analyzed, and the scope of pattern sample collection is selected on the basis of clarifying its meaning and aesthetic characteristics. Secondly, the digital quantitative design method is applied to the extraction and analysis of the design factors of the joint bead pattern in the Tang Dynasty, and based on this, the innovative combination is carried out. Finally, the innovative design of the bead pattern is applied to household textile through modern design methods to enhance the cultural connotation of household textile and provide reference for the innovation of cultural and creative products.

Keywords: Joint bead pattern of Tang Dynasty; Digital Quantization Design; Cultural Creative Design; Household Textile

1. Introduction

The Tang Dynasty had a strong national strength, prosperous economy and active foreign exchanges. Under the background of this era, the beaded pattern, as a product of the integration of foreign culture and local culture, has high research value in the composition and connotation of the pattern, and the pattern can also provide inspiration for modern design. If the pattern is applied to household textiles, it can add cultural heritage to household textile, and carry out cultural inheritance and design innovation on traditional patterns.

2. Development and significance of the study of Joint bead pattern.

There are many studies on the Joint bead pattern in the Tang Dynasty. Most of them have studied the types and development process of the Joint bead pattern, and there are few studies on the design and application of the Joint bead pattern. Li XiaoQing^[1] applied the innovative design of the Joint bead pattern to the packaging through the method of deconstruction and reorganization; Guan Ziwei et al^[2] analyzed the composition and color of the Joint bead pattern in the Tang Dynasty, and combined the Dunhuang Buddhist Hands and the beaded pattern in the costume design. Ye Lijun^[3] clarified the value and significance of the application of Dunhuang Joint bead pattern in visual communication design by exploring three application principles. The existing research on the design and application of the Joint bead pattern is mostly in the form of element extraction and combination of the Joint bead pattern. There are few studies on the composition rules and inheritance and innovation rules of the patterns. In the era of digital design as the mainstream, few authors have discussed the quantitative design of the Joint bead pattern in the Tang Dynasty.

3. Analysis of the Joint bead pattern in Tang Dynasty

3.1. The development of the Joint bead pattern in the Tang Dynasty

After being introduced into China from Western Asia, the Joint bead pattern has integrated with the local culture of the Central Plains and innovated in absorption. From no meaning to auspicious meaning, it has become an integral part of the Central Plains pattern system. With its continuous development and

integration in the Tang Dynasty, the Joint bead pattern has become an artistic symbol with Chinese cultural characteristics, forming a pattern with the cultural and artistic characteristics of the Tang Dynasty, and has been widely used in various textile fabrics^[2]. It has become one of the typical representative decorative patterns of the Tang Dynasty and has a unique aesthetic feeling. The development of the Joint bead pattern can be divided into three periods: the early Tang Dynasty, the middle Tang Dynasty and the late Tang Dynasty. The expression of the Joint bead pattern in each period is different.

The Joint bead pattern was popular in the early Tang Dynasty and was the most popular pattern in the Persian Sassanid dynasty. The skeleton structure of the Joint bead pattern as a pattern is a round shape with the same size of the round bead arranged in a ring. The ring is decorated with animal, character, flower and other theme patterns^[4]. The Joint bead pattern of this period retains a distinct Persian style.

In the middle Tang Dynasty, the pattern of the Joint bead pattern gradually changed compared with the early period. The elements of the outer ring are not only limited to small round beads, but also have flower patterns or deformed Joint bead pattern. The middle was mainly filled with animal patterns. The theme of the pattern was mostly birds, lions, deer, horses and eagles^[4].

In the late Tang Dynasty, Dou Shilun absorbed and transformed the form of the Joint bead ring of the Joint bead pattern, and merged the symmetrical animal structure in the Joint bead group, creating the later 'Linyang Gongyang sample', which was deeply loved by the Tang people at that time^[5]. At first, the pattern in the ring was a single animal pattern, then developed into three pairs, and then reduced to one pair^[4]. The outer ring of the Joint bead also has a new form, with a Cirrus cloud pattern instead of the original round bead shape, or in the form of a double-layer the Joint bead pattern ring^[6].

3.2. The composition characteristics of the Joint bead pattern in the Tang Dynasty

The Joint bead pattern alias Ball pattern, Ring belt pattern, is a skeleton structure formed by a series of round bead with basically equal size, which can be filled with animals, plants, characters and other patterns. Based on this basic unit, it is generally arranged in cluster two or cluster four^[7]. As shown in Figure 1. The Joint bead pattern has geometric symmetry and sense of order in structure, and is decorative and symbolic in visual expression.

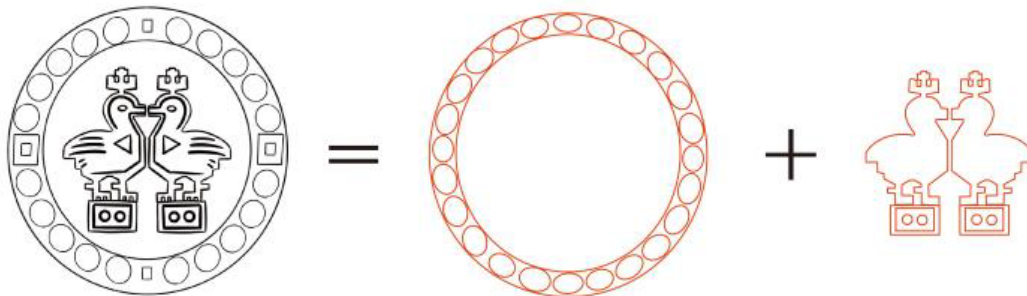


Figure 1: Composition of the Joint bead pattern

3.3. The cultural connotation of the Joint bead pattern in the Tang Dynasty

Through the above structural analysis, the Joint bead pattern is divided into two parts. The outer ring is a non-closed ring formed by the combination of round beads, and the inner part is filled with the theme pattern. The main pattern is divided into two types: single and symmetrical. Sasanian the Joint bead pattern is characterized by placing a separate theme pattern in the ring, while most of the Joint bead pattern brocade patterns found in China are in the ring^[7]. It shows the symmetrical and harmonious Chinese aesthetics, and also contains the beauty of perfect and good things. In order to facilitate the study of commonality, the research object of this paper mainly selects symmetrical the Joint bead pattern for digital quantitative analysis and design applications.

4. Design characteristics of the Tang Dynasty Joint bead pattern

According to the above research, the Joint bead-to-deer pattern, Joint bead-to-horse pattern, Joint bead-to-peacock pattern and Joint bead-to-bird pattern were selected respectively, and the reduction and description were carried out according to the museum collection map, as shown in Figure 2. The outline of the outer ring is mostly elliptical. Since the pattern is widely used in the fabric, considering the

technology at that time, the outline of the outer ring is established according to the restoration map of the Chinese Silk Museum. In the ring inside of the pattern is a filling pattern. The size of the pattern is not fixed, but the overall shape is oval, which is smaller than the outer ring. The composition of the pattern has rules to follow. Based on this, the ratio range between the area of in the ring filling pattern and the area of the overall pattern can be calculated, which provides a basis for the free combination and innovation of the Joint bead pattern.









Name	Picture (local)	Self-drawn	Source
Joint bead-to-deer pattern			Chinese Silk Museum
Joint bead-to-horse pattern			Qinghai Provincial Institute of Cultural Relics and Archaeology
Joint bead-to-peacock pattern			Xinjiang Uygur Autonomous Region Museum
Joint bead-to-bird pattern			Xinjiang Uygur Autonomous Region Museum

Figure 2: Sample selection diagram

Firstly, the quadrilateral is determined according to the size of the outer ring and the intersection point is found. This intersection point is the center of the pattern. From the center, the longest and shortest edges of the internal filling pattern are found, and thus draw the ellipse, as shown in Figure 3.

The Pattern samples were selected for numbering and the Pattern contours were vectorized to facilitate later calculations.

First, determine the rectangle tangent to the outer circle of Pattern n, which has length a_n and width b_n , and calculate the rectangle area from formula (1) and count it as S_n ; second, find the center point of the rectangle, and count this point as the center of Pattern n. Then find the longest side c_n and the shortest side d_n of the interior filled graph from the center and draw the ellipse from it, and calculate the area of the ellipse counted as Q_n by formula (2), details are shown in Figure. 3, where the green area is S_n and the red area is Q_n . The ratio of internal filling pattern to the area of the pattern is counted as β_n , and the calculation method is shown in formula (3). Finally, the proportion of the internal filling pattern in the innovative pattern design is determined according to the value range of β_n , so as to better inherit the design characteristics of the linked bead pattern.

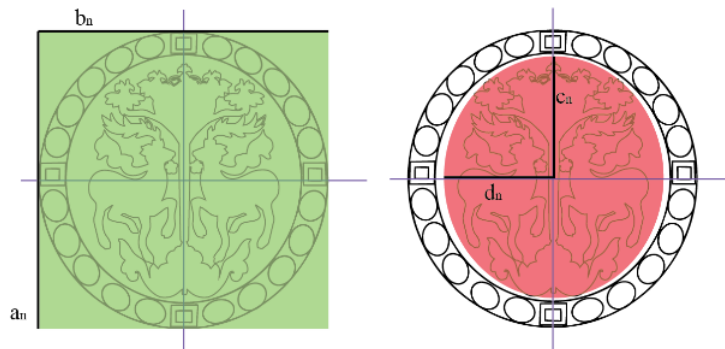


Figure 3: Schematic of the sample area

The formula is as follows:

$$S_n = a_n b_n \tag{1}$$

$$Q_n = \pi c_n d_n \tag{2}$$

$$\beta_n = \frac{Q_n}{S_n} \tag{3}$$

Based on the above method, the ratio of the internal fill pattern of each representative pattern was calculated as shown in Figure 4.

















Numbering	Pattern	Contour Vectorization	Total area of pattern S_n	S_n Area	Area in the ring Q_n	Q_n Area
1				$S_1 = 714.44$		$Q_1 = 343.14$
2				$S_2 = 714.44$		$Q_2 = 329.73$
3				$S_3 = 714.44$		$Q_3 = 337.02$
4				$S_4 = 714.44$		$Q_4 = 250.65$

Figure 4: Sample area calculation chart

The proportions of each representative pattern as follows: $\beta_1=0.48$, $\beta_2=0.46$, $\beta_3=0.47$, $\beta_4=0.35$. In the process of innovative design of the Joint bead pattern, the ratio between the internal filling pattern and the overall pattern should be between 0.35 and 0.48.

5. Design and application of Joint bead pattern in Tang Dynasty

Randomly select the single pattern in the Joint bead pattern and form a pair of central patterns, which can better inherit the meaning of the Joint bead pattern and also more in line with the aesthetics of the Chinese people. According to the above method, the ratio of the central pattern to the overall pattern is 1.71, which is in line with the proportion range, as shown in Figure 5.



Figure 5: Recombination pattern diagram

In the Tang Dynasty, the Joint bead pattern was more used in the brocade at that time. In order to make its pattern better displayed in modern design, the reorganized Joint bead pattern was applied to household textile, and the traditional pattern was better integrated into modern life scenes. It is used in household textile by designing methods such as pattern rotation, amplification, and arrangement, as shown in Figure 6.

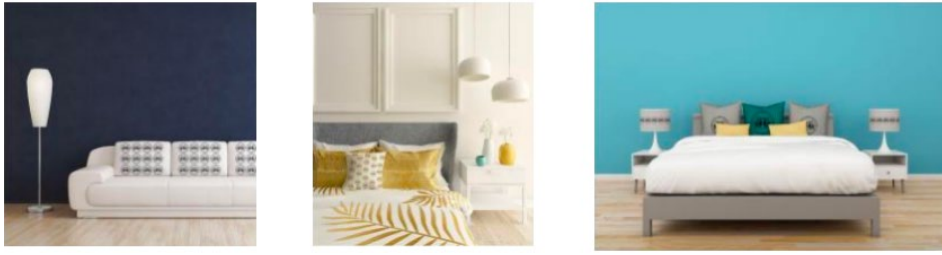


Figure 6: Application display

6. Conclusion

The formation and development process of the Joint bead pattern in the Tang Dynasty is essentially the integration of design ideas and aesthetic points under different cultural backgrounds, which is also consistent with the increasing trend of global cultural exchanges. Therefore, the study of the Joint bead pattern in the Tang Dynasty can provide many ideas for the current design work. The main purpose of this study is to transform the traditional patterns into decorative patterns that conform to the current aesthetics. That is, under the original structure of the pattern, the presentation of the pattern is redesigned. Based on this idea, this paper summarizes the composition rules of the Joint bead pattern in the Tang Dynasty, divides the patterns into two parts : the outer ring and in the ring, and calculates the area ratio between the filling patterns in the ring and the overall patterns. By controlling the proportion, the sense of composition balance of the Joint bead pattern is explored, and based on this, the patterns are modernized and innovated. Finally, the patterns after innovative design are applied to household textile, and the innovation and application path of the Joint bead pattern in the Tang Dynasty are explored.

References

- [1] Li Xiaoqing. *Application of Lianzhu Pattern in Modern Packaging Design*[J]. *Packaging Engineering*, 2019,40(14):304-307.
- [2] Guan Ziwei, Lü Zhao, Li Minyue. *Inheritance and innovative design of linked-pearl motif decoration in Tang dynasty*[J]. *Wool Textile Journal*, 2023,51(2):71-76.
- [3] Ye Lijun. *Application of Morphological Characteristics of Dunhuang Lianzhu Pattern in the Visual Communication Design*[J]. *Packaging Engineering*, 2015,36(10):104-107.
- [4] Zhang Ru. *Study on the application of bead pattern of Tang dynasty couplet in modern cultural and creative design*[D]. *Lanzhou university*, 2021.
- [5] Chen Yan. *Product design method based on the traditional culture Research—a case study of the element of water application in modern products*[D]. *East China University Of Science And Technology*. 2013.
- [6] Feng Shengbin. *Application of Han and Tang Dynasty cultural elements in modern packaging design* [J]. *China Packaging Industry*, 2013, (06): 83-84. DOI: 10.14047/j.cnki.cpi.2013.06.054.
- [7] Chen Man. *Research on the Innovation and Application of Linked-Pearl Pattern on the Silk of the Tang Dynasty in Modern Knitted Garments* [D]. *Wuhan Textile University*, 2022