The enablers and challenges in using Parameterized Graphic Design Method to create innovation in the Guangxi Zhuang Brocade Graphics from a multiple perspective

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Abstract

The objectives of this research were: to explore the application of Guangxi Zhuang Brocade graphics in parametric graphic design methods, and as well as the innovative driving factors and challenges of application. The derivation rules of shape grammar are transformed into parameterized grammar expressions, and a series of systematic grammar rules are used to control the emotional generation process of pattern parameters. The sample Huang brocade octagonal patterns as Grasshopper. They were selected by this article will conduct an in-depth study of this issue from multiple perspectives. This study advocates the application of parametric design theory to deeply explore the graphic innovation of Guangxi Zhuang brocade. The research instrument for the data collection were through the analysis of the history, culture, and artistic characteristics of Guangxi Zhuang Brocade, as well as the understanding of parametric graphic design methods, the derivation rules of shape grammar are transformed into parameterized grammar expressions, and a series of systematic grammar rules are used to control the emotional generation process of pattern parameters. The statistics for data analysis analyzes the parameterized construction process of Zhuang brocade patterns from the perspectives of morphology, color, etc., and explores in detail various derivative methods based on parameterized design, from single elements to overall composition, from two-dimensional to three-dimensional, and from static to dynamic. Taking the parameterized cultural creative design of Zhuang brocade octagonal patterns as a case study, Grasshopper, a parameterized tool, is used to reconstruct patterns.

The research results were found as follows;

1) The potential application of parameterized Zhuang brocade graphics in creative product design is explored. This practice provides practical experience and reference for the integration of digital technology and modern graphic creative product design, which is conducive to promoting the development of modern cultural creative products.

2) With the rise of artificial intelligence and the continuous evolution of computer technology, the digital creative industry has received strong support from cutting-edge technologies. In order to meet the aesthetic needs of Guangxi Zhuang brocade patterns in the new era and improve the design and production efficiency of Zhuang brocade.

Keywords: Parameterized graphic design; Zhuang brocade; Cultural and Creative design; Creative design

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Introduction

Since the implementation of the (Traditional Chinese Craft Revitalization Plan), the issue of how to revitalize traditional crafts has become the focus of attention. In order to explore the path of Zhuang Brocade revitalization, on the basis of previous research, a field survey was conducted on the inheritance and development status of Zhuang Brocade. It was found that the revitalization of Zhuang Brocade is facing many difficulties such as lack of funds, lack of successors, lack of innovation ability, etc. Innovation is the key to realizing creative transformation and innovative development of Zhuang Brocade in the context of revitalizing traditional crafts (Fan Daozhi. and Wan Fubin, 2018 (04): 45- 51). From this, we can know that， under the impact of the modernization wave, the development and inheritance of Zhuang brocade face great challenges. On the one hand, traditional Zhuang brocade struggles to meet the changing aesthetic needs of modern people. On the other hand, the design and manufacturing process of traditional Zhuang brocade is complex, with high production costs and low efficiency. As a result, Zhuang brocade has gradually shifted from a traditional physical form to a mere graphic representation, with most works remaining on the surface level of graphic art, failing to deeply engage the public's emotions.

Guangxi Zhuang Brocade is a traditional handmade textile that originated in Guangxi, China. It has a long history and profound cultural heritage. This unique form of textile art had its initial development during the Song Dynasty and reached its peak of prosperity during the Ming and Qing dynasties (Fan Daozhi. and Wan Fubin, 2018, (3): 102- 103) Zhuang Brocade is renowned as the "Oriental Art Treasure" for its rich colors, exquisite patterns, and superb craftsmanship. In 2006, it was listed in the first batch of national-level intangible cultural heritages.

Therefore, research, taking the octagonal pattern of Zhuang brocade as an example, refines its color and graphic genes, and through the construction of a parametric model, the application of shape grammar and derivation rules, innovates and reconstructs traditional patterns, and designs an evaluation system to explore how traditional culture can continue to be inherited and developed in contemporary society.

Research Objectives

1) To deeply explore the cultural connotation and artistic characteristics of Zhuang Brocade in Guangxi, providing rich materials and inspiration for graphic design.

2) To use parametric graphic design methods to innovate the design approach and production process of Zhuang Brocade in Guangxi, improving its market competitiveness.

3) To verify the feasibility and advantages of parametric design in the creative design of Zhuang Brocade graphics in Guangxi through Zhuang Brocade as the research object, providing reference for design innovation in related fields.

Research Methodology

1) Literature review method: Systematically combing domestic and foreign literature on parametric design, as well as parametric Zhuang brocade design, as the theoretical basis for writing this paper and reference for relevant research experience.

2) Semi-structured interview method: Through interviews with teachers, students, and creative designers, understand the feasibility and applicability of parametric graphic design to pattern graphics analysis.

3) Case study method: Taking Guangxi Zhuang Brocade as an example, based on the related concepts of parametric design, explore how parametric design should be applied in the graphic creative design of Guangxi Zhuang Brocade.

4) Shape grammar: Using Grasshopper, a parametric tool, to reconstruct the pattern, transforming the derivation rules of shape grammar into parametric syntax expression, utilizing a series of systematic shape grammar rules to control the perceptual generation process of pattern parameters, and exploring the application of parametric Zhuang Brocade graphics in creative product design.

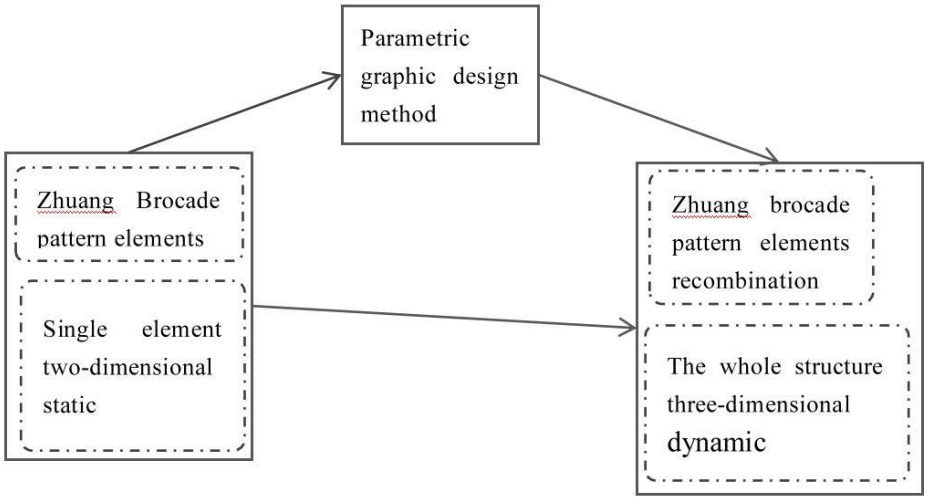


Figure1: Model studied
Source: Drawn by the author

Research Scope

This study is based on literature review and the concepts and characteristics of Guangxi Zhuang Brocade and parametric graphic design. It mainly focuses on the correlation between parametric design and Zhuang Brocade patterns, the parameterization construction of Zhuang Brocade patterns, and the derived strategies for the creative redesign of Zhuang Brocade patterns through parametric design. It selects suitable parametric design software and modularized derivative methods for Guangxi Zhuang Brocade graphic design, laying a foundation for the application of parametric Zhuang Brocade graphic creative design. Finally, it applies the parametric tool Grasshopper to reconstruct the Zhuang Brocade patterns, transforming the derivation rules of shape grammar into parametric syntax expression, and utilizing a series of systematic grammar rules to control the perceptual generation process of pattern parameters. It explores the potential application of parametric Zhuang Brocade graphics in creative product design.

Literature review

1. Zhuang Brocade and parametric graphic design overview

"Zhuang brocade," a mysterious silk fabric meticulously crafted by the Zhuang people of China, is renowned for its unique weaving techniques. It features distinctive weaving patterns, durable quality, and is listed alongside "Yun brocade," "Shu brocade," and "Song brocade" as one of the four famous silks in China.

2. Parametric Graphic Design Concept in Guangxi Zhuang Brocade Graphic Creative Design

2.1 The application of parametric design in Zhuang brocade patterns

The digital economy era, graphic design technology has taken a qualitative leap, and parametric design has begun to be widely applied to the innovative design of traditional ethnic patterns. Many designers have introduced parametric design into the design of Zhuang brocade and have conducted a lot of beneficial practices, evolving the art of Zhuang brocade patterns into an innovative "design language". This design language is based on the basic framework and process of parametric design, breaking down complex Zhuang brocade patterns into basic graphic elements and colors, and defining and encoding these resources one by one. Then, according to design needs, rules are established, and the computer generates various complex modeling effects based on the internal logic of the rules by adjusting parameters. With the help of this method, not only can the design effect be more diversified, and the design efficiency greatly improved, but it can also provide designers with broader design ideas.

2.2 The Association of Parametric Graphic Design with the Characteristics of Zhuang Brocade

The composition of points, lines, and planes in Zhuang brocade patterns is rich in the ethnic characteristics of the Zhuang people, with bright colors and distinct warm and cool layers, resulting in a strong contrast effect and visual impact, which is distinctly different from other ethnic patterns (Deng Yan. and Chen Shuwei, 2020, (15), 149-155).

2.3 Graphic Construction of Zhuang Brocade Patterns

"Modularization" is the interaction of mathematical logic and modular thinking within the concept of parametric design. In practical application, it is akin to using different architectural components to build a house, or like a typesetter arranging content "blocks" in the most rational layout on a newspaper page. It allows for the random combination of design "modules" under specific rules to achieve a variety of creative outcomes, with the derivation carried out by computer parametric design programs (Liu Jing, 2020, (24), 294-300).

2.4 Color Construction of Zhuang Brocade Patterns

This "extraction-induction-construction" process retains the traditional color characteristics of Zhuang brocade, providing a foundational reference for subsequent color matching and adjustment (Chi Ningjun. and Xie Jia, 2022, (12): 257-262) ensuring that the subsequent cultural and creative design preserves the traditional color genes of Zhuang brocade to the greatest extent.

3. Derivative Strategies for Creative Reconstruction of Zhuang Brocade Patterns Based on Parametric Design

3.1 Derivation from Single Graphic Elements to the Entirety

Extract geometric patterns, animal patterns, plant patterns, and character patterns from Zhuang brocade patterns. Within the framework of traditional Zhuang visual aesthetics,

recombine these graphic elements or integrate the extracted graphic elements with traditional patterns to form a layout of two-dimensional continuity and four-directional continuity. Then, apply symmetrical treatment to the combined graphics, evenly divide their overall structure, and thus achieve a diversification of the composition of Zhuang brocade elements (Jia Xiaojun et al., 2020, (01), 110 - 117).

3.2 Derivation from Two-Dimensional to Three-Dimensional

select a representative frog pattern graphic element and use three-dimensional modeling software Rhino for solid modeling treatment, transforming the flat frog pattern into a three-dimensional white model frog. In three-dimensional form, operations such as rotation, scaling, and deformation can be used to control the spatial attributes of the frog model. This allows the traditional flat pattern to transcend the limitations of two dimensions and, by combining with a three-dimensional.

3.3 Modular Derivation Method

Dynamic graphics originate from the original animated films and broadly include all dynamic graphics. In today's design field, dynamic graphic design refers to the use of computer technology to dynamically express static

graphics. Parametric dynamic graphic design, on the other hand, is a method where designers, according to design needs and creativity, rely on computer software algorithms to control the generation and motion changes of graphics

through parameterization. Zhuang brocade patterns can also be derived and created using the design method of parametric dynamic graphics. Colors can also be added to enrich the expression of the graphics.

Research Results

1. Extraction of the Genetic Pattern of the Octagonal Zhuang Brocade Pattern

Based on this research finding, we analyzed the octagonal Zhuang brocade pattern and observed that the composition of the octagonal pattern also contains a "modular" design thinking. In the octagonal Zhuang brocade pattern, there are 24 parallelograms that follow specific combination rules, forming the decorative matrix to ensure the accurate transmission of Zhuang traditional cultural connotations. Other patterns are composed of easily replaceable decorative units. By adjusting and replacing these decorative units, creators can continuously and efficiently generate new works of art, all of which are derived from established cultural patterns. To further extract the genetic pattern of the octagonal Zhuang brocade pattern, this study employed the widely used graph quantification method in the field of archaeology. By profiling the contour lines of samples, a graph system is established to visually compare the differences, similarities, and inheritability of each sample's shape. Therefore, when extracting cultural genetic patterns, it is essential to strive for the greatest degree of objectivity and accuracy (Li Zhiwei, 2021, (5), 205- 207).

2. Establishing a Parametric Model of the Octagonal Zhuang Brocade Pattern

The basis for constructing this parametric model is to determine the geometric structure of its key graphics and to build a data structure framework through software and programs. Taking the octagonal Zhuang brocade pattern observed that the entire pattern is composed of three parallelograms A, B, and C, which are the key graphics of the pattern. To construct the entire pattern, it is first necessary to determine the position, size, and combination of A, B, and C. After combining A, B, and C into a basic unit, mirror copy processing is performed on

this unit to form an expanded graphic unit. From the above text, it is known that mirror symmetry in four directions is one of the important cultural genes of the Zhuang brocade pattern. Therefore, as long as the expanded unit is rotated to 0°, 180°, and 270° in three directions, and finally
combined, the complete pattern model can be obtained.

3. Parametric Translation of Shape Grammars

After constructing the parametric model of the octagonal Zhuang brocade pattern using Grasshopper, it is necessary to establish inference rules and carry out the procedural translation of shape grammars through the Grasshopper plugin to achieve the derivation of the pattern.

The parameters of the inference rules and their corresponding variable definitions:

1) Translation parameters. t_x Indicate the distance that the graphic element is translated along the x-axis, and t_y indicate the distance that the graphic element is translated along the y-axis;

2) Scaling parameters. s_x and s_y respectively represent the scaling multiples of the graphic element in the x-axis and y-axis directions;

3) Rotation parameters. C represents the center of rotation, and C（x_c, y_c）represents its coordinates. θ represents the angle at which the graphic element rotates counterclockwise around the center C;

4) Shear parameters. h_x represents the shear amount of the graphic element on the x-axis, and h_y represents the shear amount of the graphic element on the y-axis;

5) Mirroring parameters.（x_m, y_m） are the coordinates of the mirror symmetry point within the coordinate system, and （x_v, y_v） are the coordinates of the normal vector of the axis of symmetry;

6) Array parameters. N, Δd, （x_c, y_c）, and （x_v, y_v）respectively represent the number of arrays, spacing, center coordinates, and vector coordinates;

7) Bezier curve parameters. n represents the order of the curve, and i represents the number of control points.

After defining the above parameters in the Grasshopper software, save the shape grammar. Thereafter, you can adjust the corresponding parameters through the Grasshopper plugin, and the computer will execute the shape grammar to realize the inference of graphic elements according to the inference rules.

Table 1 Modification Rules and Transformation Matrix

Modification Rules	Transformation Matrix
Translation	$T=\begin{bmatrix}1 & 0 & t_x\\ 0 & 1 & t_y\\ 0 & 0 & 1\end{bmatrix}$
Scaling	$S=\begin{bmatrix}s_x & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$
Rotation	$R=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ x_c & y_c & 1\end{bmatrix}\begin{bmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}s_x & 0 & 0\\ 0 & 1 & 0\\ -x_c & -y_c & 1\end{bmatrix}$
Mirroring	$T=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ x_m & y_m & 1\end{bmatrix}\begin{bmatrix}1-2x_y^2 & -2x_y y_y & 0\\ -2x_y y_y, & 1-2y_y^2 & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}s_x & 0 & 0\\ 0 & 1 & 0\\ -x_m & -y_m & 1\end{bmatrix}$
Shearing	$S=\begin{bmatrix}1 & h_x & 0\\ h_y & 1 & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}\cos(2\pi i/N) & \sin(2\pi i/N) & 0\\ -\sin(2\pi i/N) & \cos(2\pi i/N & 0\\ 0 & 0 & 1\end{bmatrix}\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ -x_c & -y_c & 1\end{bmatrix}$
Directional Array	$\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ i\cdot\Delta d\cdot x_y & i\cdot\Delta d\cdot y_c & 1\end{bmatrix}$
Bezier Curve Variation	$B(t)=\sum_{i=0}^{n}\binom{n}{i}pi(1-t)^{n-i}t^{i},t\in[0,t]$

4. Design Case of Evolutionary Rules

After establishing the parametric model and completing the definition of shape grammar parameters, the software can perform logical operations on the graphics for evolution by applying different evolutionary rules.

This study takes the hexagonal pattern as an example and applies different evolutionary rules:

At the beginning, implement the pattern Rule1 mirroring rule 6 times: Set the corresponding parameters as follows: Ym, xv, yv are respectively n5.5, 0, 1, where n is between 1 and 6, which can generate a single column of hexagonal pattern graphics.

Then, let the basic figure implement Rule2 mirroring rule: Set the corresponding parameters as follows: xv, yv, i represent 45, 0, 5, respectively, where Δd is reduced according to the conic curve function, which can generate an array of graphics with decreasing distance.

Finally, let the most basic unit implement Rule3 scaling rule: Each basic figure can scale proportionally to the nearest distance, which refers to the shortest distance between the center point of the figure and the upper line segment in the figure. After scaling treatment, the final derived graphics are generated.

From the above example, it can be seen that by establishing different evolutionary rules and continuously adjusting parameters, the derived graphics can continuously

5. Modular Parametric Shape Grammar Evolution of Zhuang Brocade Pattern

According to different design needs and pattern carriers, a set of basic initial pattern parametric models can be first established, and then a specific set of shape grammar derivation rules can be formulated and applied on this basis. The combination and sequence of these shape grammar rules determine the evolution path and final form of the basic pattern. Within the established rule framework, the basic pattern will generate a variety of design schemes (QIN Zhen, 2021, 33(10), 1595-1603).

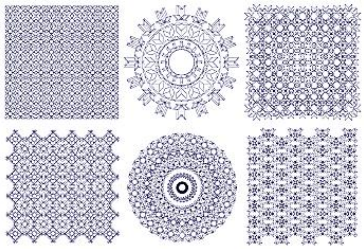


Figure 2 Octagonal Zhuang Brocade Pattern Parametric Combinational Derivative Pattern
Source: Photographed by the author

6. Optimal Selection of Different Zhuang Brocade Pattern Schemes

The Utility Evaluation Method (QIN Zhen, 2021, 33(10), 1595-1603) is a basic technique for characterizing the overall performance of the object being evaluated using quantitative means. This method can be used to optimize the selection of various schemes generated, and the specific steps are as follows.

$$o = \{(C_1, V_1), (C_2, V_2), (C_3, V_3)\}$$

Based on the creative design of ethnic traditional culture, it is necessary to maintain and transmit the ethnic cultural genes while also meeting the aesthetic needs of modern people. Therefore, the design has put forward higher requirements in terms of pattern graphic design and color selection. Reflected in technical indicators, indicator c3 is "Especially important" relative to c1, while c2 is "Significantly important" relative to c1. Based on the ratio scale of these three evaluation indicators, a judgment matrix is constructed, as shown in formula.

$$A=\begin{bmatrix}1 & 1/3 & 1/4\\ 3 & 1 & 1/2\\ 4 & 2 & 1\end{bmatrix}$$

Using the characteristic vector method to calculate the weight coefficients of each measurement indicator, the results are obtained as follows:

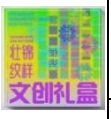
$\alpha_1 = 0.1220$, $\alpha_2 = 0.3196$ $\alpha_3 = 0.5584$ 。

3）Construct the correlation function. For the parametric shape grammar derivation scheme of the octagonal Zhuang brocade pattern, a discrete correlation function is constructed to comprehensively evaluate the aesthetics of the derived graphics, the adaptability of the carrier, and the accuracy of the key semantics (compared with the description of the design requirements), see formula.

$$K_i(x)=\begin{cases}5, x=\text{Very Beautiful/ Very Suitable/V ery Accurate}\\ 4,\ x=\text{Somewhat Beautiful/ Somewhat Suitable/S omewhat Accurate}\\ \text{Average}\\ 3,\ x=\text{Average}\\ 2,\ x=\text{Not Beautiful/ Not Suitable/N ot Accurate}\\ 1,\ x=\text{Very Ugly/Very Unsuitable/Very Inaccurate}\end{cases}$$

As shown in Table 4, with the cultural and creative gift box serving as the carrier for the Zhuang brocade pattern, professional designers evaluate the aesthetics (c1), carrier adaptability (c2), and key semantic accuracy (c3) of six Zhuang brocade pattern schemes from three different perspectives, and record the evaluation characteristic values of the six schemes.

Table 2 Evaluation Characteristic Values of Each Derived Scheme

Pattern carrier	Evaluation characteristics						
	Beauty c_1	Average	Very beautiful	Average	Somewhat beautiful	Somewhat beautiful	Average
	Vector suitability c_2	Not Suitable	Average	Average	Very Suitable	Very unsuitable	Somewhat Suitable
	Key semantic accuracy c_3	Very accurate	Very inaccurate	Somewhat accurate	Somewhat accurate	Not accurate	Very inaccurate

$$\begin{cases}k_{C_1}=(3,5,3,4,4,3)\\ k_{C_2}=(2,3,3,5,1,4)\\ k_{C_3}=(5,1,4,4,2,1)\end{cases}$$

4）Apply formula to calculate the rule correlation degree for each derived design method, where formula is:

$$k_i(o_j)=\frac{k_i(o_j)}{\max|k_i(x)|}(i,j=1,2,3,\cdots,n)$$

The standardized correlation degrees of the 6 derived Zhuang brocade pattern design schemes obtained.

$$\begin{cases} K(P_1)=(0.6,0.4,1) \\ K(P_2)=(1,0.6,0.2) \\ K(P_3)=(0.6,0.6,0.8) \\ K(P_4)=(0.8,1,0.8) \\ K(P_5)=(0.8,0.2,0.4) \\ K(P_6)=(0.6,0.8,0.2) \end{cases}$$

5) Calculate the utility degree of each Zhuang brocade pattern design scheme, see formula.

$$C(K_p)=\sum_{i=1}^{n}\alpha_i k_i(x_j)(i=1,2,3,\ j=1,2,3,4,5,6)$$

Substitute the correlation degrees of each item into the utility calculation formula to calculate, and the utility values for schemes P1 to P6 are obtained in sequence as 0.7594, 0.4254, 0.7117, 0.8639, 0.3849, and 0.4406, respectively. It is not difficult to see from the data that the utility value of Scheme P4 is significantly higher than that of the other schemes, indicating that the derived pattern of Scheme P4 is more suitable for the packaging scheme of the cultural and creative gift box.

during the parametric design process, designers can select and provide feedback on the results, making further adjustments to the existing design outcomes. By appropriately adjusting the parameter values of the patterns, they can further refine the form and expressiveness to achieve the most satisfactory effect.

Discussion

The previous section mainly demonstrated the derivation methods of Zhuang Brocade pattern elements from single elements to overall composition, from two-dimensional to three-dimensional, and from static to dynamic based on parametric design. Taking the parameterized cultural and creative design of Zhuang Brocade octagonal pattern as a case study, the pattern was reconstructed using the parametric tool Grasshopper. The deduction rules of shape grammar were transformed into parametric syntax expressions, and a series of systematic grammar rules were used to control the perceptual generation process of pattern parameters. The main data collection tool of this study is individual interviews with respondents. And the interview results were analyzed and summarized.

This study firstly adopts semi-structured interviews to explore the specific elements of innovation promotion of Guangxi Zhuang Brocade graphics using parametric graphic design methods in teaching, learning, and innovative design among design institute teachers, students, and creative designers. It identifies the cognitive effects of teachers, students, and creative designers on parametric graphic design methods, providing theoretical practice for subsequent empirical research. In terms of interview sample selection, it mainly chooses design full-time teachers, students, and creative designers who have direct relationship with this study (see Table 1), conducting semi-structured interviews on issues related to the use of parametric

design methods, and gradually exploring the degree of use of parametric design methods in design using sequential interview method.

Table 3 Basic information of interviewees

number	Name	sex	s e x	job
1	Miss Liu	female	30	Teacher
2	Miss Wang	male	33	Teacher
3	Miss Chen	male	35	Teacher
4	Classmate Huang	male	23	Pupil
5	Classmate Liu	female	22	Pupil
6	Classmate Yuan	female	22	Pupil
7	Designer Lee	male	30	Designers
8	E u r o p e a n designer	female	28	Designers
9	Designer Chen	male	27	Designers

This study focuses on conducting interviews with the above-mentioned interviewees regarding five questions. Question 1: Do you have any knowledge of parametric graphic design methods? Question 2: Has the parametric graphic design method been helpful in bringing innovation to your designs? Question 3: Would you recommend using parametric graphic design methods in design? Question 4: What do you think are the advantages and disadvantages of using parametric graphic design methods in creative design? Question 5: In terms of innovation, what areas do you believe can be improved or innovated further?

1. The recognition of parametric graphic design method is not high

According to the interview results, Teacher Liu and understanding of parametric graphic design Teacher Liu and Teacher Wang have some understanding of parametric graphic design methods, but Teacher Chen is not very familiar with it. This indicates that the teaching and popularization of emerging technologies in the field of education still need to be strengthened. All three students have some understanding of parametric graphic design methods. Although Huang has not used it before, he has gained some understanding through learning; Liu has used it in design projects and is familiar with its basic principles and functions; Yuan is at the basic stage, but can also feel its powerful functions and has used relevant software.

For creative designers, they are much more familiar with parametric graphic design methods and often use them in their work to handle complex graphic design tasks. This means that designers not only understand this method, but can also proficiently apply it to complete specific tasks.

2. The use of parametric graphic design method and innovative design

The parametric graphic design method has a positive effect on design innovation to some extent. Interviewees believe that the parametric graphic design method can help users more accurately control the shape and proportion of graphics, and create more complex and unique designs. This method can help designers create more unique and innovative designs, which shows that they regard the parametric graphic design method as an important driving

force for design innovation.

Therefore, when facing complex graphics and design problems, interviewees consider using the parametric graphic design method to improve design efficiency and solve difficult problems. They believe that the parametric graphic design method has significant advantages in handling these tasks, but also need to choose and apply it according to specific situations.

3. The pros and cons of using parametric graphic design methods in creative design

1）Advantage

Interviewees believe that parametric graphic design methods can improve design efficiency and generate complex design effects, such as quickly generating complex and accurate designs, improving efficiency, increasing design flexibility, etc. It allows designers to better realize their creativity and ideas. It enables the generation of multiple different design variations in a short time, making it easier to find the best design solution.

2）Disadvantages

Teachers believe that the repetitiveness and lack of personalization in designs may limit designers' creativity and thinking abilities. This indicates the need to balance efficiency with innovation when using parametric graphic design methods. Students believe that over-reliance on technology can restrict creativity and hinder the development of thinking skills, while also being costly to learn. Designers, on the other hand, believe that excessive dependence on software can limit their creativity and imagination. Additionally, there may be other limitations, such as a lack of flexibility in handling complex design problems, which can lead to neglecting one's own creativity and imagination.

4. Create new suggestions in creative design

Teachers believe that innovation can be made in the use of color. With the development of the times, the colors of Zhuang Brocade can also be more abundant, innovative and fashionable. Regarding the designer's perception of the world, current innovations are more reflected in the innovation of design concepts and technology, but the more important innovation is in design thinking. It concerns how the designer perceives the world, what mindset and perspective to pay attention to the world, and how to present it in design. This is a more valuable innovation. As a traditional ethnic handicraft, Zhuang Brocade can be innovative in terms of materials and techniques, combined with modern technology, using modern materials to innovate tools for making Zhuang Brocade or even production techniques, pursuing higher efficiency and quality to keep up with the times.

Students believe that innovation can be made in the use of color as well as from cultural inheritance and technological innovation. They can deeply explore Guangxi's ethnic culture and history, and explore more possibilities for innovative design. They can try to make innovations from two aspects: design materials and methods. They can also try to use modern technology tools such as 3D printing technology and laser cutting technology to improve the efficiency and accuracy of Zhuang Brocade graphics. In terms of design methods, they can make innovations from functionality, culturality, and artistry. Or they can start from the cultural connotation of Zhuang Brocade, apply its patterns, colors, and symbols to modern design, and create more design works with unique ethnic cultural characteristics. In addition, they can draw on some modern art techniques such as abstract art and expression art to further excavate and innovate the artistic value of Zhuang Brocade.

Designers believe that exploration and attempts can be made from multiple aspects such as form, material, function, concept, method, etc. from concept generation to final product implementation. The innovation of design concept is the core driving force for the development of design. Designers are encouraged to pay attention to social hotspots, user needs, and industry trends, propose new design concepts and ideas with unique perspectives and ways of thinking. This will create more unique and practical design works, while also improving product quality and production efficiency.

Conclusion

Regarding the specific steps of Zhuang brocade cultural and creative design, it is necessary to scientifically set the three-dimensional parameters first, and then integrate the parametric pattern model with visual design, thus creating a Zhuang brocade pattern vase, allowing consumers who purchase this vase to experience the cultural atmosphere of the Guangxi Zhuang ethnic group brought by the Zhuang brocade. The specific process is as follows:

Firstly, two types of Zhuang brocade patterns, the diamond pattern and the frog pattern, are selected for analysis. The reason for this choice is that these two types of patterns are relatively easy to 3D model. In the computer modeling software, the patterns are constructed parametrically to build a model, for details, please refer to (Figure 3). The advantage of this approach is not only the ability to optimize the parameters within the software but also the ability to quickly build the relevant models.

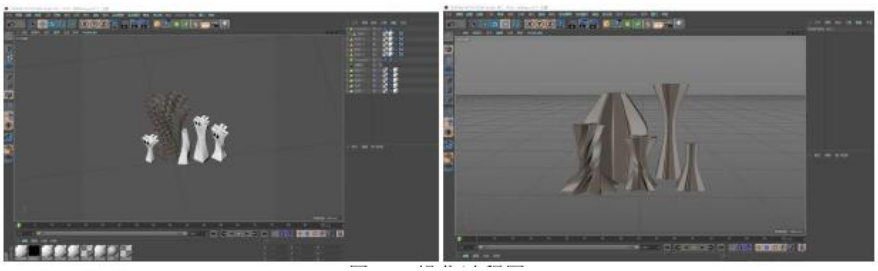


Figure 3 Specific
Operational Procedure
Source: Photographed by the author

Suggestions

1) In-depth study of Zhuang Brocade culture: conduct in-depth research on the history, patterns, colors, and production techniques of Zhuang Brocade to understand its cultural connotations and aesthetic characteristics. This helps to ensure the originality and authenticity of the design.

2) Mastery of parametric design tools: learn and master advanced parametric design software such as Grasshopper, Rhino, etc. These tools can help designers quickly realize complex design ideas and make real-time adjustments to the design.

3) Innovation in design elements: on the basis of traditional Zhuang Brocade pattern elements and traditional colors, try to introduce modern design elements, explore new color combinations such as abstract geometric patterns, dynamic visual effects, etc., to increase the modern feel and attractiveness of the design and create works that have both traditional charm

and conform to modern aesthetics.

4) Integration with modern art concepts: draw on the expression techniques and concepts of modern art, integrate them into the design of Zhuang Brocade elements, consider the use of environmentally friendly materials and the sustainability of production processes, so that the design works are not only beautiful but also have a sense of social responsibility. It is more innovative and artistic in form.

5) Interior design. With the improvement of living standards, people's pursuit of life quality has become increasingly strong. The personalized demand for interior design is no longer limited to a certain group, but rather it applies to the majority of people who grew up in this era of scarcity and specialization. Perhaps in the near future, parametric graphics will be applied to art decorations, wall stickers, artistic wallpapers, etc. Just imagine if this kind of graphic is applied to wallpapers, it not only avoids the uniformity and rigidity of traditional graphics, but also its inherent sense of space can make the room appear larger (Li Jinchen, 2014: 110-115).

6) New media. If the derivation process of parametric graphics is presented to the audience through a new media expression method, then this beauty will not only exist in the understanding of a minority group, but will be known by more people. If we use new media to present the beauty of parametric graphics, it brings art closer to life, allowing more audiences to personally experience the mystery and beauty of the graphic's derivation process (Li Jinchen, 2014, 110-115).

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