A Study on the Extraction of Texture from Ethnic Minorities by Shape Grammar

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Abstract. Objective to study the application of shape grammar in the extraction of minority nationality pattern symbols, construct minority nationality symbols and extract the pattern symbols that can be used in modern design, so as to spread minority culture. Method by collecting minority pattern symbols, in-depth analysis of the different minority pattern connotation, by using the method of network information and shape grammar extraction minority pattern symbols represented by zhuang, miao, yi, jino, put forward different ethnic symbols element is proposed, implemented as a minority pattern combined with modern design theory basis. The conclusion demonstrates the feasibility of the method, provides a theoretical basis for the combination of symbols of ethnic minorities and modern design, and infuses vitality into modern design for ethnic minorities. It is an inevitable choice for the innovation and development of ethnic minorities' patterns in modern design, which is conducive to the dissemination of ethnic minority patterns and the promotion of cultural inheritance of ethnic minorities.

Introduction

With the improvement of economic level, people gradually cannot meet the material life rich, pay more attention to spiritual life. At the same time, with the development of science and technology, the rapid rise of electronic products, people's life is more convenient. But all these have brought a series of consequences to people, the fast pace of life leads to people's irritability, more people choose to travel, away from the hustle and bustle of the city. To the quiet and plain countryside and minority areas to experience ethnic customs, people for the pursuit of minority handicrafts is more and more high, this for the quality of handicrafts to improve, how to innovate minority pattern applied in the new handicrafts urgently need to solve. However, the extraction of ethnic minority patterns has become a difficult problem for innovation.

Research status of shape grammar: shape grammar is a design and analysis method based on the formal language theory proposed by American design and calculation theorists George Stiny and James Gips in 1972 \cite{1}. Shape grammar has definite geometric shape elements and grammatical rules, which make the trace of the figure to be found when it is used. Shape grammar is often used in painting and decorative art. Design of palladio villa, shenzhen concert hall. The works of op artist Victor Vasarely are all designed by applying the basic method of shape grammar. The study of shape grammar is valuable for the extraction of minority patterns.

Design Ideas of Shape Grammar and Pattern Extraction

Shape grammar is a design method used to calculate shape evolution, which can make shape deduce new form and symbol elements according to specific evolution rules \cite{2}. It can not only retain the original shape and form, but also deduce new symbolic elements. The methods used in shape grammar include rotation, translation, mirror image, deformation and so on. The basic patterns of
ethnic minorities are obtained by searching for information, and the basic patterns of ethnic minorities are obtained by summarizing and summarizing. Shape grammar can be used to extract ethnic minority patterns, increase the innovation of extraction, and provide help for the application of modern design of ethnic minority. For the extraction of patterns, the most basic patterns of minority patterns, namely, geometric patterns and text patterns, are used for the following reasons: 1. 2. The use of shape grammar requires simple patterns; 3. The other patterns are too complicated to be read after transformation.

**Shape Grammar Concept**

Shape grammar originated from the "symbolic language" proposed by American computer theorists in 1972, which is a design and analysis method based on shape. It first appeared in automobile, painting, graphic design, decorative art and web design. In daily life, the arrangement of pavements, the pattern design of Chinese Windows, the composition rules of tangram and the design of roof ridge all come from the changing rules of shape grammar. Shape grammar is a formula, according to the formula to increase or decrease, rotation, parallel to form a new pattern, the resulting pattern is traceable. Because of this characteristic, more and more designers begin to use shape grammar to study.

**Ideas for Shape Grammar Extraction**

First establish element, the element from the basic patterns of ethnic minorities, according to the characteristics of each element rotation, parallel, the change of the vertical mirror, change shape grammar rules one pattern of the 45° rotating, rotation Angle and frequency to be decided according to the characteristics of the pattern, after translation, finally after a vertical mirror to a new pattern. You can also translate it and then rotate it, and rotate it a couple of times or translate it a couple of times is subjective definition, and you end up with a new pattern.

![Figure 1. Change rules for shape grammar.](image)

**Extraction of Basic Minority Patterns**

Ethnic patterns in the process of the formation and development of each nation formed its own national characteristics, in the process of exploring ethnic patterns found that most of the minority pattern symbols have word of geometric lines, plant grain, grain, animal grain pattern of these patterns such as the original may be a copy of a specific image or subject, or from some plants, animals and natural objects evolved, or some kind of totem sign [3]. Each nation forms its own ethnic pattern according to its own living habits, history, culture and legends. Geometric pattern is the most common national pattern, almost appear in every national pattern history proves that geometric pattern is the earliest appearance, in ancient times geometric pattern has been used, has been continued until now, so geometric pattern has become the most basic pattern of every nation. From the most simple geometric lines is slowly becoming complicated, thus forming the plant, animal grain
gradually become modern we see the rich variety of ethnic patterns as people focus on ethnic minorities, ethnic handicrafts, clothing and a series of related products people's favour, ethnic patterns gradually applied in modern design, used in modern design in the process, the patterns of the ethnic minorities to extract be applied to the problem of modern design, strong particularity because of ethnic patterns, the difficult to extract in applying in modern design, want to innovative features is difficult to [4].

**Brief Introduction of Ethnic Minority Patterns**

The appearance of ethnic minority patterns is in the long history, beginning in ancient times. The process of development has gone through three stages. First, in ancient times, in ancient times, there was no writing to convey events through patterns. Now we can see quite a few patterns on the excavated rocks. Over time, these words gradually evolved into the patterns of different peoples. Second, the pattern of arts and crafts formed in ancient China has become an important part of the formation process of national patterns. Third, the influence of modern society, under the influence of modern society ethnic minority patterns gradually into the modern.

Geometric patterns are mostly composed of regular shapes and irregular shapes. Regular shapes include triangles, squares, etc. Irregular shapes are the deformation of regular patterns. The geometric patterns of minority nationalities are composed of these two parts. Most of the geometric patterns of minority nationalities in southwest China are mainly circular and square. According to different living environment, geometric patterns may be different, but in addition to being restricted by taboo colors, national geometric patterns are basically consistent in their artistic construction, reflecting their unique aesthetic orientation [5]. As shown in figure 2:

![Figure 2. Geometric pattern.](image)

The peach blossom pattern in the figure below is a common pattern of plants of miao nationality. Most of the patterns of plants of ethnic minorities are deformed on the basis of real objects, making the patterns of plants mainly include totem plants, sacrificial plants and living plants [6].

![Figure 3. Plant patterns. Image courtesy of Baidu.](image)

The minority nationality's writing pattern is not the normal state of the traditional nationality pattern, the writing pattern originates from the minority nationality's recording symbol, is the minority nationality's writing pattern art and the writing symbol joint development joint product, also is the minority nationality calligraphy art origin. The pattern of characters is mainly based on the hieroglyphs of minority nationalities, but there is no lack of abstract characters. Such as the Tibetan masses auspicious
Symbols are basically based on the artistic abstraction of Tibetan, which implies deep blessings in the text folding [7]. Figure 4 is the early minority writing patterns. The text pattern here mainly comes from the ten thousand glyphs on ancient pottery POTS.

![Figure 4. Ten thousand text patterns. Image courtesy of Baidu.](image)

Animal patterns are usually used in national costumes through deformation and exaggeration. The animals used by different nationalities are different, such as: the zhuang yao worshipping cattle, the hui pig, and the miao butterfly. The most common animal prints are cows and pigs. Butterfly, man, elephant, deer, dog, rabbit, rat, chicken, fish, bat, butterfly, shrimp, bee, bird, horse, lion, frog, loach. Geese, ducks, sheep, dragons, phoenixes, unicorns in the imagination, human and beast conjoined in the primitive witchcraft myths and legends, human ghosts and ghosts, etc[8].

![Figure 5. Animal pattern. Image courtesy of Baidu.](image)

**Application of symbol Extraction of Zhuang, Miao, Yi and Jinuo Nationalities**

There are commonalities among nationalities, but each has its own personality. Due to the same development process and origin of patterns, the patterns of various nationalities are almost the same. However, different lifestyles and living environments formed in the development process of each nationality make the same patterns of different nationalities have different meanings. After the passage of time, each ethnic group has formed its own ethnic pattern and culture. How to use shape grammar to extract minority patterns? Representative elements of 56 ethnic minorities were randomly extracted. First, four ethnic minority patterns of zhuang, miao, yi and jinuo were found as research representatives. Secondly, the glyphs and geometric patterns of these four ethnic groups were found for comparison. Finally, the glyphs and geometric patterns of these four ethnic minorities were extracted and compared by using shape grammar. Through the method of comparative experiment, a new pattern was obtained by using shape grammar to extract minority patterns.

**Zhuang**

Characters often appear in the embroidery of zhuang people. These characters include xi, shou, tian, mi and jing, which symbolize the yearning and pursuit of a better life. Different characters and patterns represent different meanings, which are used in the national costumes. The characters are unique in shape and meaning. Zhuang people also accepted the characters with complex historical background, such as swastikas, which appear in the composition of zhuang costumes [9]. These show that the zhuang people have deep feelings for character print. In the following diagram, the swastika pattern was extracted, and elements were extracted according to the rules of shape grammar. The new
element pattern, figure 6, was obtained by means of parallel, rotation, deformation and vertical mirror.

Miao

As one of the ethnic minorities with a large population in China, the miao nationality enjoys its own development and prosperity. The patterns of longteng can often be seen in the dress patterns of the miao nationality, and there are often flowers and plants in the plant patterns, while there are more peony flowers. At the same time, it is found from the literature of the miao nationality that the national costumes are quite similar to those of the palace maids and guards, mainly because the palace maids and guards in the ancient war-torn palace fled to the southwest and brought their costumes to the miao tribe to influence the clothing patterns of the miao people. As for the geometric patterns of miao costumes, some of the patterns themselves represent a certain meaning, while some of the overall symbolic meaning is expressed by comprehensive patterns. Some are hieroglyphs of Chinese characters and abstract patterns transformed by morphed characters \cite{10}. The cross pattern of the miao nationality pattern is adopted in the extraction of the miao nationality pattern. In figure 7, the rules of shape grammar are used to extract the miao nationality elements, and the new element pattern is obtained by means of parallel, rotation, deformation and vertical mirror.

Yi

Yi geometric patterns are composed of points, lines and surfaces. The geometric pattern in the figure below is very clear to see the point, line, plane geometric pattern. His modeling is concise and concise, which precipitates a long aesthetic tradition and often combines with other concrete natural symbols to form new patterns \cite{11}. It will become more and more difficult for the yi nationality's pattern inheritance to be ignored by the young people. Elements are extracted by combining the rules of the yi nationality's geometric pattern and shape grammar, and new elements are obtained by means of parallel, rotation, deformation, vertical mirror, etc. The application and modern design inject vitality into the yi nationality's pattern inheritance.

The basic graphic evolution of Zhuang shape grammar.

The basic graphic evolution of Miao shape grammar.

The basic graphic evolution of Yi shape grammar.
**Jinuo**

As a minority nationality, the number of people is relatively small. Therefore, people have little knowledge about the jinuo nationality and lack of relevant knowledge on the characteristics of ethnic patterns. The following figure is the geometric pattern of jinuo nationality. These patterns are derived from plants, and it is easy to make them by cross-stitch method. Therefore, its application range is very wide, and almost every branch of jinuo nationality is using geometric patterns. At the same time, it is relatively difficult to apply the ethnic patterns of jinuo in modern design. Shape grammar was used to extract the patterns of the jinuo nationality, and the ethnic characteristics of the jinuo nationality were better and faster displayed in modern design. The following figure obtained the new patterns through the evolution of the rules of shape gramma.

Figure 9. The basic graphic evolution of Jinuo shape gramma.

**Conclusion**

This paper constructs minority pattern elements based on minority pattern patterns. At the same time, the paper also discusses the application of zhuang, yi, miao and jinuo patterns. The principle of shape grammar deduces the basic patterns of zhuang, miao, yi and jinuo nationalities. In this paper, the shape grammar USES translation, rotation, symmetry, mirror vertical and other methods. Translation and symmetry are applied in zhuang, yi and miao nationality, and can be applied in plane design background design and packaging design. The vertical rotation and mirror image method is reflected in the extraction of jinuo patterns, which can be used in web design. Using shape grammar to extract minority patterns, the extracted patterns have good visual effect, so as to be used in modern design. The results show that it is reasonable and effective to extract minority patterns from shape patterns, and the new patterns can promote the protection and inheritance of minority patterns. How to apply the obtained new patterns in these designs will be the future work of this study. In this paper, the extraction of minority patterns only adopts simple graphic elements, while the extraction of other minority patterns remains to be studied.

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**References**


