



Research on the color Innovation Strategy of the Gannan Hakka Children's Hats Based on Visual Cognition and Natural Color System

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Abstract. In order to analyse the color characteristics of the Gannan Hakka children's hats through visual cognition and the Natural Color System (NCS), and to construct an innovative development strategy that adapts Hakka children's hats to modern society. Firstly, the artistic characteristics of Hakka children's hats are classified macroscopically, and their color distribution and artistic characteristics are analysed; secondly, the reasons for the formation of the color visual art effect of children's hats and their evolution history are discussed from the dimensions of history and culture, folk customs and aesthetic concepts in the light of the socio-cultural background; next, The Natural Color System (NCS) was employed to quantitatively analyse the color characteristics of Hakka children's hats. Then, the Natural Color System(NCS) is used to quantitatively analyse the color characteristics of Hakka children's hats, and accurately extract the key features such as hue, brightness and saturation; finally, incorporating modern design concepts and market needs, it puts forward the inheritance protection and innovative development strategy of Hakka children's hats. The color of Hakka children's hats is influenced by culture, production technology, and other factors. Its color characteristics are dominated by a specific color system, with brightness and saturation showing a unique distribution pattern. The color matching style is deeply rooted in the Hakka cultural flavour. By applying the visual cognition and NCS methods, the color characteristics of Hakka children's hats can be effectively obtained, providing a scientific basis and practical strategy for the inheritance and innovation of Hakka children's hats, and significantly promoting the protection and development of intangible cultural heritage in the South Jiangxi Province.

Keywords: The Gannan Hakka children's hats; color character analysis; NCS; heritage and innovation; design strategy

1 Introduction

Hakka culture, a bright pearl among the diversified cultures of the Chinese nation, uniquely shines in southern Jiangxi. On this land, the Hakka people, with their diligence and wisdom, have created a rich and colorful variety of folk arts and handi-

crafts, among which the Hakka children's hats are one of the most representative cultural heritages. Hakka children's hats not only carry the memories of Hakka children's growing up but also are the concentrated manifestation of Hakka culture, aesthetic concepts, and handicraft techniques. Their unique decorative patterns and color combinations are not only pleasing to the eye but also contain deep cultural connotations and symbolic meanings.

Visual cognition, as an important way for human beings to perceive the world, has an irreplaceable role in understanding the color aesthetics of Hakka children's hats. Through visual cognition, we can deeply analyze the constituent elements of the color of Hakka children's hats, the rules of collocation, and the cultural information conveyed, to reveal its unique aesthetic value and cultural significance. Meanwhile, with the development of color science, especially the introduction of color analysis tools such as NCS (Natural Color System), we are provided with a more scientific and objective method to study and analyse the color characteristics of Hakka children's hats.

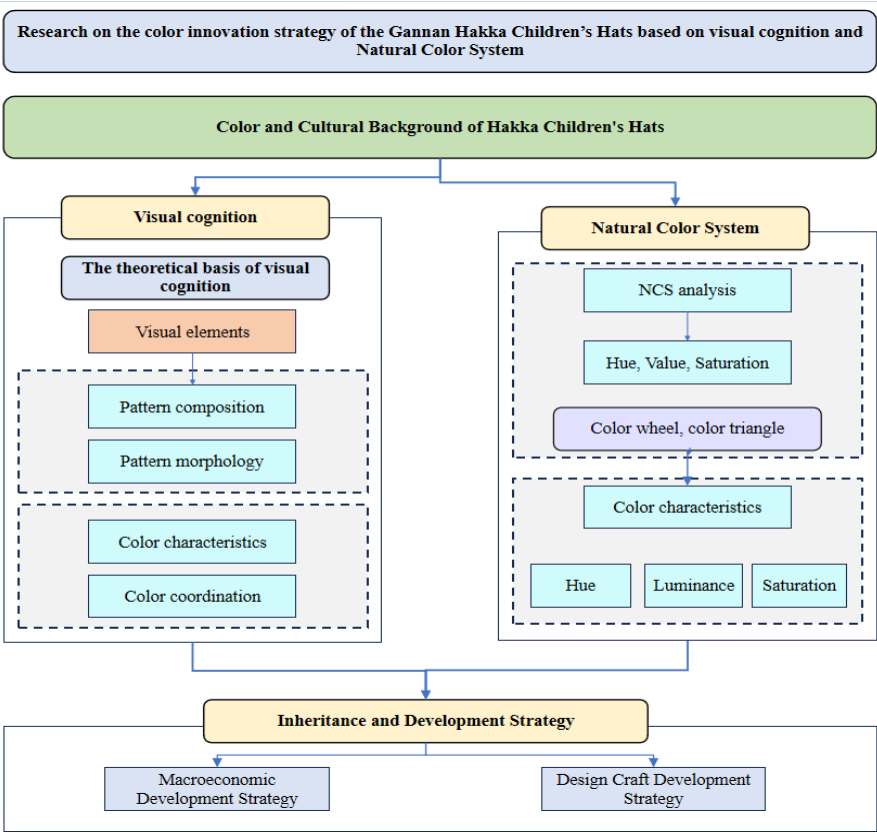


Fig. 1. Framework diagram

However, most of the current studies on the color of Hakka children's hats remain at the cultural level of interpretation and description, lacking in-depth analysis and

quantitative research based on scientific methods. Therefore, this study aims to conduct a comprehensive and in-depth analysis of the color characteristics of The Gannan Hakka children's hats through the combination of visual cognition and the NCS color analysis system, and on the basis of which to propose inheritance and innovation strategies in line with the development trend of the modern society, so as to contribute to the protection and development of the intangible cultural heritage of the southern Jiangxi with new ideas and methods. As shown in Figure 1 (framework diagram).

2 Literature Review

Hakka clothing is an important part of the traditional Chinese culture, in recent years it has been a hotspot topic of research in the field of cultural heritage protection. In these studies, Hakka children's hats, as a highly representative clothing accessory, have received widespread attention for their unique color scheme and artistic style. With the continuous progress of color science, how to scientifically and objectively analyze the color characteristics of Hakka clothing has also become an important topic in current research.

2.1 Research on Hakka Clothing

Regarding the study of Hakka clothing, scholars have explored the artistic characteristics, cultural connotation, and inheritance development of Hakka clothing from multiple perspectives. Hu Xiaoping and Xu Jiahui (2018) took Hakka children's hats in Meizhou, Guangdong Province as the research object, and revealed the unique artistic style and regional characteristics of Hakka children's hats through detailed field research and historical document analysis¹. Lin Koon (2024), on the other hand, from the perspective of rural revitalization, explored the important role of The Gannan Hakka children's hats in cultural heritage and rural development².

2.2 Research on the Colors of Hakka Children's Hats

In the artistic characteristics of Hakka clothing, color is an important aspect that cannot be ignored. The color scheme of Hakka children's hats not only matches the lively nature of children but also reflects the aesthetic concepts and cultural traditions of the Hakka people. Zhao Xin and Ning Jun (2021), in their study of Miao costumes in Qiandongnan, although mainly concerned with the color of embroidery patterns, their research methods and ideas provide useful references for the study of the color of Hakka children's hats³. Han Lu's (2022) analysis of the colors of the "Hundred Seedlings" flower and seedling costumes of the Qing Dynasty also provides a new perspective for understanding the color characteristics of Hakka children's hats⁴. However, the current research is more from the perspective of cultural heritage and folk customs, but relatively few specific quantitative studies on the color of Hakka children's hats.

2.3 NCS-based Color Study of Clothing

NCS (Natural Color System), as a scientific and objective color analysis system, has a wide range of applications in apparel color research. It provides researchers with a more accurate and intuitive color analysis tool by quantifying and classifying colors according to elements such as hue, lightness, and saturation. Zhang Wanyu and Yang (2024) used the NCS color system for quantitative analysis in their study of elderly furniture color design and proposed an NCS-based color design method for elderly furniture⁵. Chen Jinmei, Li Youyou and Tan Kun (2012), on the other hand, used the NCS color system to conduct an in-depth analysis of the colors of traditional themed websites, revealing the laws and aesthetic characteristics of their color usage. These studies provide strong support and methodological reference for the scientific analysis of the color of Hakka children's hats⁶.

In summary, although the research on Hakka children's hats has achieved certain results, there are still some shortcomings. In the future, we can further use NCS and other scientific methods to conduct in-depth analysis and quantitative research on the colors of Hakka children's hats, in order to reveal the laws and aesthetic value of their color application; and we can also explore how to combine the color characteristics of Hakka children's hats with modern design, so as to promote their inheritance and innovative development in the modern society.

3 Theory and Methodology

3.1 Overview of Hakka Children's Hat

Hakka children's hats, as an important part of the Hakka costume, are one of the indispensable accessories for Hakka children during their growth⁶. It is usually made of fabric, satin, cotton thread, and other materials, and the top and brim of the hat are embroidered with exquisite decorative patterns⁶, such as prosperity brought by the dragon and the phoenix, flowers, birds, fish, and insects, etc., which is not only beautiful and generous but also means good luck⁶. Hakka children's hats come in a variety of styles, including soft hats for babies and hard hats for older children, with different colors and decorative patterns for different styles of children's hats.

The color characteristics of Hakka children's hats are an important reflection of their unique aesthetic value. Hakka people pay attention to harmony, contrast, and unity in the use of colors, and are good at using bright and vivid colors to create a cheerful and festive atmosphere. Furthermore, the color combination of Hakka children's hats is also deeply influenced by the Hakka culture and is usually dominated by the five colors of red, yellow, blue, white, and black, which have important symbolic significance in the Hakka culture, such as red for festivity, yellow for dignity, blue for serenity, white for purity, and black for solemnity. The clever combination of these colors not only makes the Hakka children's hats more visually appealing but also reflects the aesthetic concepts and cultural traditions of the Hakka people. As shown in Figure 2.



Fig. 2. Gannan Hakka children's hat decoration pattern

3.2 Visual Cognition Theory

Visual cognition is one of the important ways in which humans perceive the world, which involves the process of receiving, processing, and understanding visual information⁶. In the process of visual cognition, people receive light signals from the outside world through their eyes and convert them into neural signals that are transmitted to the brain for processing and analysis⁶. The brain interprets and understands the visual information according to the existing knowledge and experience, so as to form the cognition of things.

Color is an important part of the visual information of Hakka children's hats. Firstly, through the theory of visual cognition, we can deeply analyze the constituent elements and collocation rules of Hakka children's hats' colors, and reveal their unique aesthetic value and cultural significance. Secondly, visual cognitive theory can also help us understand the visual effects and influences of Hakka children's hats, such as the influence of the contrast between light and dark, warm and cold on people's visual perception. Finally, through the visual cognitive theory, we can also explore the intrinsic connection between the color of Hakka children's hats and Hakka culture and social environment, so as to provide more in-depth theoretical support for the inheritance and innovative development of Hakka children's hats.

3.3 Natural Color System

NCS (Natural Color System) is a scientific and objective color analysis system⁶, which consists of color rings and color triangles, and it provides researchers with a precise and intuitive color analysis tool by quantifying and classifying colors according to the elements of hue, lightness, saturation, etc.⁶. The NCS color analysis system has the following advantages in the study of Hakka children's hat colors:

(1) Accuracy: The NCS color analysis system can accurately quantify and classify the colors of Hakka children's hats, which avoids the ambiguity and subjectivity in the traditional color description. Through the NCS system, we can accurately obtain the color parameters of Hakka children's hats, such as hue, brightness, saturation, etc., which provides a scientific basis for the in-depth study of their color characteristics.

(2) Intuition: The NCS color analysis system displays the characteristics and distribution laws of colors in a graphical way, which enables the researchers to have a more intuitive understanding of the color composition and collocation of Hakka children's hats. This intuitiveness not only helps us deeply understand the color aesthetics of Hakka children's hats but also provides a more convenient visual reference for the design and innovation of Hakka children's hats.

(3) Comparability: Through the NCS color analysis system, we can objectively compare and analyze the color characteristics of different Hakka children's hats. This comparability not only helps us to reveal the regional differences and changes of the Hakka children's hat colors but also provides a more scientific basis and ideas for the inheritance and innovative development of Hakka children's hats.

Ncs color rings and color triangles are shown in Figure 3.

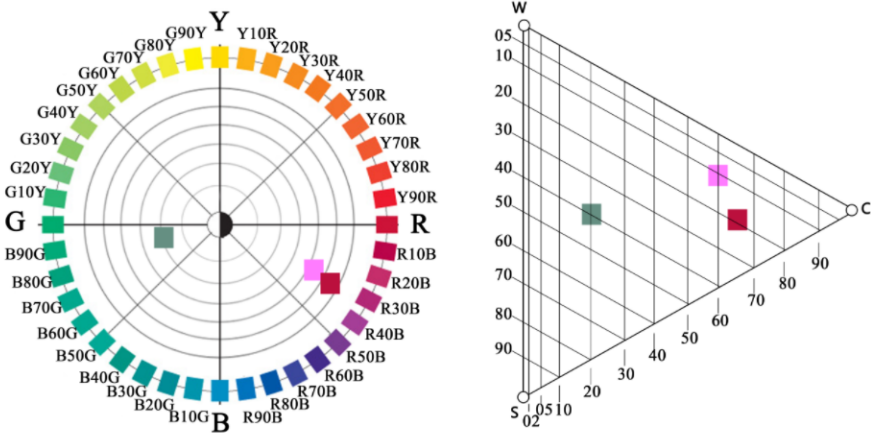


Fig. 3. NCS hue ring and color triangle

4 Analysis of Color Characteristics of Hakka Children's Hats Based on Visual Perception and NCS

4.1 Macro Description of the Color Characteristics of Hakka Children's Hats

Through fieldwork and collection of several Hakka villages in southern Jiangxi, we have acquired a large number of representative samples of Hakka children's hats. These children's hats present distinctive regional characteristics and cultural flavour in the use of color. From a macro perspective, the color characteristics of Hakka children's hats are mainly expressed in the following aspects:

(1) Rich and varied colors. The use of colors in Hakka children's hats is very rich, covering a wide range of colors such as red, yellow, blue, green and purple. These colors appear in different proportions and combinations on children's hats, forming a colorful visual effect.

(2) Warm colors dominate. In the color composition of Hakka children's hats, warm tones such as red, yellow and orange dominate. These warm colors are not only in line with children's lively nature, but also reflect the Hakka people's pursuit of a warm and festive atmosphere.

(3) Contrast and harmony coexist. Hakka children's hats pay attention to both contrast and harmony in color matching. Through the contrast of light and dark, warm and cold, etc., the hat is visually more prominent and attractive. In addition, through the harmonious matching between the colors, it also makes the child hat as a whole present a sense of coordination and unity of beauty.

4.2 Analysis of the Sociocultural Background of the Color Characteristics of Hakka Children's Hats

The color characteristics of Hakka children's hats do not come out of nowhere, but are deeply influenced by their social and cultural background. By studying deeper into the historical origins, folk customs and aesthetic concepts of Hakka culture, we can better understand the reasons for the formation and evolution of the color characteristics of Hakka children's hats.

(1) Influence of the five elements concept. Hakka culture is deeply influenced by the five elements concept in ancient china, believing that the five elements of gold, wood, water, fire and earth constitute all things, and these five elements correspond to the five colors of white, green, black, red and yellow respectively. In the use of colors in Hakka children's hats, these five colors are cleverly incorporated to form a unique color-matching style. Especially red and yellow, as the representative colors of fire and earth, occupy an important role in Hakka children's hats, symbolizing auspiciousness, festivity, and wealth.

(2) Influence of folk activities. Folk activities in the Hakka region are colorful, such as traditional festivals like the Spring Festival, Dragon Boat Festival and Mid-Autumn Festival, as well as various temple fairs and celebrations. These folk activities are often associated with specific colors, such as red during the Spring Festival, which represents joy and good luck, and green during the Dragon Boat Festival, which represents vitality and hope. As an important accessory for children, the use of colors in Hakka children's hats is also deeply influenced by these folk activities, forming color characteristics that echo the atmosphere of the festivals.

(3) Influence of aesthetic concepts. Hakka people have formed unique aesthetic concepts in their long-term production and life, focusing on harmony, symmetry, balance, and other aesthetic principles. These aesthetic concepts are fully reflected in the use of color in Hakka children's hats. For example, the Hakka hats pay attention to the contrast between light and dark, warm and cold, and other techniques in color matching, so that the colors both complement and coordinate with each other, forming

a unique sense of beauty. The aesthetic fusion diagram of the five elements folk custom are shown in Figure 4

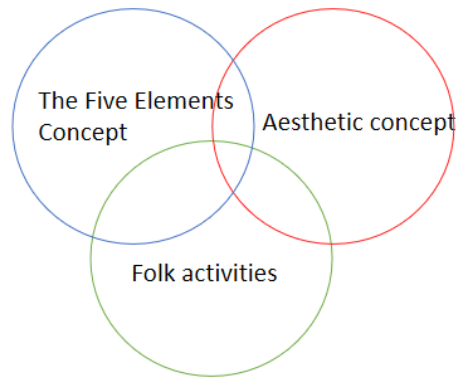


Fig. 4. The aesthetic fusion diagram of the five elements folk custom

4.3 Quantitative Analysis of Color Characteristics of Hakka Children's Hats Based on NCS

By collecting representative pictures of Hakka children's hats, as shown in Figure 5.



Fig. 5. Gannan Hakka children's hat series

In order to gain a deeper understanding of the color characteristics of Hakka children's hats, we quantitatively analyzed the collected samples of Hakka children's hats using the NCS color analysis system. The distribution maps of color rings and color triangles were formed, as shown in Figure 6.

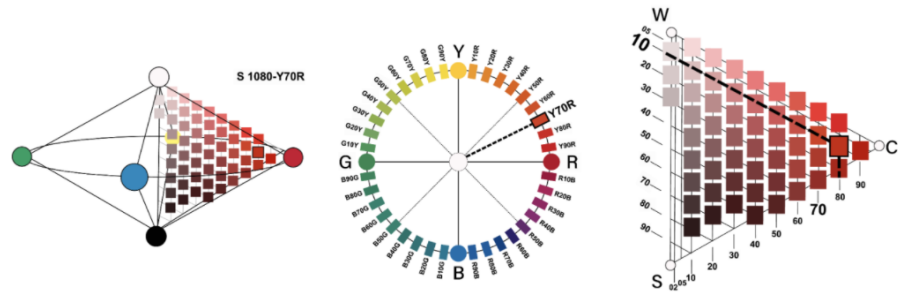


Fig. 6. S 1080-Y70R

The analysis led us to the following conclusions:

- (1) Characteristics of hue distribution: The hue distribution of Hakka children's hats is relatively wide, covering a number of hue regions such as red, yellow, blue, green and purple. Among them, the red and yellow areas are the most concentrated and dominate the hue distribution. This further verifies the color characteristics of Hakka children's hats, which are dominated by warm tones.
- (2) Characteristics of brightness distribution: The brightness distribution of Hakka children's hats shows a certain regularity. Generally speaking, the brightness of the main part of the hat is higher, while the brightness of the decorative pattern and the edge part is lower. This brightness distribution not only enhances the sense of three dimension of the hat, but also makes the colors more distinct and prominent.
- (3) Characteristics of saturation distribution: The saturation distribution of Hakka children's hats also has certain characteristics. In the main part, the saturation is usually higher, making the colors more bright and eye-catching. On the other hand, in the decorative pattern and edge part, the saturation is relatively low, forming a sense of hierarchy and rhythm. This saturation distribution not only enriches the color level of the children's hat, but also enhances its visual appeal[7].

Hakka children's hats are rich in colors, and their decorative patterns are unique in shape, generally based on a combination of red and green color schemes, as shown in Figure 7.





Fig. 7. Hakka children's hat keying

5 Color Inheritance and Innovative Development Strategy of the Gannan Hakka Children's Hats

5.1 Strategies for Inheriting and Preserving the Color Culture of Hakka Children's Hats

(1) Strengthening cultural education: through Hakka cultural education activities in schools, communities, and other places, people's awareness and understanding of the color culture of Hakka hats can be raised. Hakka cultural inheritors, folk artists, and others can be invited into classrooms and communities to explain to the public the historical origins, cultural connotations, and production techniques of Hakka hats, to enhance the public's cultural self-consciousness and awareness of protection.

(2) Establishment of an archive database: systematically collect, organize, and classify Hakka children's hats in southern Jiangxi, and establish a detailed archive database. Through digital technology, the pictures, sizes, color parameters, and other information of Hakka children's hats are recorded and preserved to provide a reliable basis for subsequent research and conservation.

(3) Promoting inheritance and innovation: Encourage and support the inheritors of Hakka hats and folk artists to carry out inheritance and innovation, combining traditional skills with modern design, and creating Hakka children's hats with traditional flavor and modern aesthetics. Design competitions, exhibitions, and other activities

can be held to stimulate the creative enthusiasm of designers and promote the inheritance and innovative development of the color culture of Hakka hats[8].

5.2 Application Strategies of Hakka Children's Hat Colors in Modern Designs

(1) Color extraction and reconstruction. Use the NCS color analysis system to extract and reconstruct the color characteristics of Hakka children's hats, and apply their unique color matching and composition elements to modern design. For example, the red, yellow, and other warm tones in Hakka hats, as well as the contrast and harmony of color matching can be applied to the design of clothing and household items to create a visual effect of Hakka style[9].

(2) Innovative pattern design. The innovative design of decorative patterns in Hakka children's hats extracts its essence and recreation. Combined with modern aesthetic trends and market demand, designers can design a pattern that has traditional flavor and meets modern aesthetics, and apply it to various product designs, such as textiles, ceramics, and so on[10].

(3) Cross-border cooperation and branding. Through cross-border cooperation with famous designers and brands, the Hakka children's hat color culture is combined with modern fashion elements to create a product series with unique charm. At the same time, strengthen brand shaping and promotion efforts to improve the influence and popularity of Hakka children's hat color culture in the field of modern design.

5.3 Future Trends of Hakka Children's Hat Color Predictions

(1) Diversification: With the strengthening of globalization and the diversification of people's aesthetic needs, the use of colors in Hakka children's hats will become more diversified. In the future, Hakka children's hats may incorporate more internationally popular colors and elements to form a unique and diversified style.

(2) Technology integration and innovation: with the continuous progress and innovation of science and technology, the use of colors in Hakka children's hats will also be integrated with science and technology. For example, modern technological means such as smart wearable technology and AR/VR technology can be used to add more interactivity and fun to Hakka children's hats and enhance their added value and market competitiveness.

(3) The concept of sustainable development: In the future, the concept of sustainable development will become more and more popular. The color of Hakka children's hats will also pay more attention to environmental protection and sustainability. For example, natural dyes and environmentally friendly materials can be used to make children's hats, which not only preserves traditional skills but also meets the modern concept of environmental protection.

6 Conclusion

This paper discusses deeply the color characteristics of The Gannan Hakka children's hats, revealing their unique aesthetic value and deep cultural significance. Combining visual cognition and the NCS color analysis system, we have gained a more comprehensive and in-depth understanding of the color composition of Hakka children's hats, their matching rules, and the cultural information they convey. Based on these findings, we propose strategies to inherit and protect the color culture of Hakka children's hats, explore the application of Hakka children's hat colors in modern design, and predict the future development trend of Hakka children's hat colors.

The colors of Hakka children's hats are deeply influenced by the combination of the five elements concepts, folk activities, and aesthetic concepts, forming their unique color characteristics and aesthetic charm in the unique social and cultural context of the Hakka region. NCS analysis shows that the colors of Hakka children's hats are characterized by sharpness and richness, mainly in red, blue, and green, creating a colorful visual effect. The predominantly warm color characteristics give Hakka children's hats their unique charm.

As an important part of Hakka culture, the color of The Gannan Hakka children's hats carries rich historical information and cultural connotations. The protection and inheritance of this intangible cultural heritage should be strengthened, and its application value and innovative development in modern society should be actively looked for. Through unremitting efforts and innovations, we expect that the colors of Hakka children's hats of south Jiangxi Province in China will take on new life and vitality in modern society.

Future research could further explore how to use digital means to preserve the colors of Hakka children's hats, opening up new paths for the preservation and dissemination of this traditional art.

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