Color Application in Ancient Shu Cultural Landscape Based on Data Quantitative Analysis

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Abstract. As an important factor in the landscape experience, color has attracted more and more attention. This paper investigates and collects the color application of the ancient Shu cultural landscape in five sites where the development of ancient Shu culture is relatively mature. Based on the quantitative analysis of the data, it is concluded that there are some problems between landscape's subject and carrier colors in hue, value and chroma. Meanwhile, the corresponding suggestions are also made.

Key words: Color Application, Ancient Shu Culture, Landscape Construction

1. Introduction

The ancient Shu culture, as the maternal culture of Chengdu Plain [1], is the historical source of the development of Chengdu's civilization for more than four thousand years and the development of the city for more than two thousand years. It has always been a key research topic for various urban planning departments to pass on culture through landscape design. Since the tourism development of ancient Shu culture is ongoing, the study of the ancient Shu cultural landscape is also imperative. In the process of landscape experience, color, as an important element of visual perception, has also received increasing attention [2].

Color is a visual feeling that can arouse people's common aesthetic pleasure. It can influence the creation of objects' aesthetic meaning and philosophical meaning. Hue, value and chroma are the three standards for distinguishing various colors. Value is the perceived intensity of light. Hue is the qualitative appearance and tendency of color. It is the primary feature of color. Value is the perceived intensity of light and chroma refers to the degree of the vividness and purity of color [3]. The perception of color includes two aspects: physical perception and psychological perception. The physiological perception of color is the response generated by the comprehensive stimulus of the prop color of the object, the light source color, and the color discrimination function of the human eye [4]. The environmental atmosphere created by different colors stimulates the visual analyzer of the user, mobilizes other sensory cognitions as well, which can make the user have different psychological associations and emotional responses. For example, red represents joy and excitement; black often represents composure, calmness and solemnity; white represents purity, sacred, and indifference; gray represents simplicity, low key, and introvert [5]. In addition, the cognition of color is influenced and restricted by history and culture. The meaning of color in different historical periods has different...

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meanings. Whether it is city construction or street construction, it should follow the continuity of history and should be expressed by color [6]. Therefore, the color application in the cultural expression of the landscape needs to be carefully selected according to the specific cultural connotation of the site [7].

2. An Investigation of Color Application in Ancient Shu Cultural Landscape

2.1. The Selection of Sites

The survey took the representative ancient Shu relics and cultural landscapes derived from ancient Shu cultural symbols on Chengdu Plain as the research objects. First, it investigated the current situation of tourism planning and landscape development of the ancient Shu culture on Chengdu Plain to get a preliminary understanding of the application scale and basic situation of ancient Shu culture in the landscape. Then, from the perspective of tourism development, the investigators selected five scenic spots that are closely related to ancient Shu culture and have been developed more maturely. They are: theme heritage park-Sanxingdui National Archaeological Relic Park, theme park-Jinsha Site Museum, monumental garden-Wangcong Temple, city square-Tianfu Square, historical and cultural theme municipal park-Deyang South Park.

2.2. The Content and Methods of the Investigation

First, according to the color adaptability of human vision, the distinctive features of the subtropical monsoon climate of Chengdu, which are humid, cloudy and foggy with short sunshine time, and tourist/citizen’s visit time, the investigators chose 9:30-12:00 and 14:30——17:00 on cloudy days (according to the fluctuation of the light intensity of the day). The CBCC Chinese architectural color card with 1026 colors was used to collect the colors of the ancient Shu cultural landscape symbols in chosen scenic spots.

Then, referring to the method used by Japanese colorist Shingo Yoshida in Environmental Color Design Techniques: Block Color Creation (2011), the three elements of color are used as variables, the X axis is the hue, and the Y axis is two separate groups—— Value and chroma. According to the color characteristics of the CBCC Chinese architectural color card with 1026 colors and Munsell color solid, the researchers arranged 10 hues (H) on the X axis from left to right, namely: R (red), YR (Red-yellow), Y (yellow), GY (yellow-green), G (green), BG (blue-green), B (blue), PB (purple-blue), P (purple), PR (purple-red) (Supplement: N is neutral color, listed separately). Each hue was divided into 10 equal parts, a total of 100 main hues. The value (V) of the Y axis was divided into 10 stages from bottom to top. 1-3: low brightness, 4-7: medium brightness, 8-10: high brightness. The chroma (C) of Y-axis was divided into 12 stages from bottom to top. 1-4: high chroma, 5-8: medium chroma, 9-12: low chroma. Each of both stages was divided into 10 equal parts, a total of 100 main values, 120 main chromas. The researcher converted the data collected by the CBCC China building color card into corresponding numerical values, made a scatter plot with Excel, and used Photoshop for further integration.

Finally, through the three attributes of hue (H), value (V), and chroma (C), the application of ancient Shu culture in the landscape in the color level was described and analyzed.

3. The Results of the Investigation of Color Application in Ancient Shu Cultural Landscape

3.1. Results and Analysis

3.1.1. Sanxingdui National Archaeological Relic Park. In Sanxingdui National Archaeological Relic Park, the range of the main color hues of the ancient Shu cultural symbol landscape application is mainly R (red)-GY (green-yellow). The values are mainly medium and high, ranging from 4 to 9, and the chromas are mainly medium and high, ranging from 1 to 7. The range of the hues of the auxiliary
colors is also mainly R (red)-GY (yellow-green), the values are mainly middle and high, ranging from 4 to 8, and the chromas are mainly middle and high, ranging from 1 to 6 (see Figure 1).

From the point of view of a single object, the main colors and the auxiliary colors of the symbols are mostly the adjacent hue contract (about 60 degrees apart on the color wheel), and their values and chromas are relatively close.

From the perspective of the entire park, when symbols are combined with small-scale carriers such as landscape sculptures, and facilities, the range of the hues is Y-GY, which merges with the hue of the background plants (G) to form an adjacent color contrast. When combined with large-scale carriers such as landscape architecture and scenery walls, the range of the hues is R-Y. The adjacent color contrast is used to increase the integration. Therefore, the color vitality of the ancient Shu cultural symbol landscape application is better, the color is clear and the integration with the site is good.

![Fig 1. Landscape symbols’ chromaticity diagram of sanxingdui archaeological relic park main color(left) auxiliary color (right)](image)

3.1.2. Deyang South Park.

In the park, the range of the main colors hues of the ancient Shu cultural symbol landscape application is mainly R (red)-GY (green-yellow), the values range from 3 to 9, with medium and high values (7 to 9) mainly. The chromas range from 1 to 9, with high chromas (1 to 3) mainly. Neutral colors range largely from 2.5-9. The hues, values and chromas of the main colors and the auxiliary colors are basically the same, and the adjacent color contrast is adopted. From the point of view of the area used, the colored area occupies a smaller area and appears less frequently. The neutral colors are almost the main colors of the landscape symbols in the entire site. The application area of a single object is small, but it appears frequently and the total amount is large. The landscape symbols are mainly monochromatic and mostly gray. Even if there are multi-color symbols, chromatic and neutral colors are often used for comparison, and the chroma span is large. Therefore, the ancient Shu cultural symbol landscape application is mainly solemn and clean, and the overall vitality is not strong. The large-scale gray tones combined with the cloudy and scattered light weather of the Chengdu Plain makes people feel monotonous and depressing (see Figure 2).
3.1.3. Wangcong Temple. In the memorial garden of Wangcong Temple, the range of main color hues of the ancient Shu cultural symbol landscape application is R (red)-Y (yellow), which are warm and concentrated. The values range from 3 to 9, the chromas range from 1 to 11. The ranges of values and chromas are large, and the color tone is not clear. The range of auxiliary colors hue is R to RP, the values range from 3 to 9, and the chromas range from 1 to 12. Similarly, the ranges of values and chromas are relatively large, with unclear colors and achromatic colors appearing less frequently. The range of auxiliary colors hues is R-RP, the values range from 3 to 9, and the chromas range from 1 to 12. Similarly, the ranges of values and chromas are relatively large, with chromatic colors' tone are not clear and neutral colors appear less frequently (see Figure 3).

As a commemorative garden, Wangcong Temple is dominated by designated symbols and symbolic marks, with text for instructions. From the point of view of a single object, symbols in it mostly use the same hue, high and low chroma contrast, or chromatic and neutral colors contrast, to highlight the text content.

From the perspective of the entire park, in order to maintain the atmosphere of the classical garden, the hue is mainly a warm tone with red and yellow, but the control of value and chroma was ignored during the renovation and maintenance process. The colors are messy. The park’s guide boards have 5 kinds of different values and chromas.
3.1.4. Jinsha Site Museum. In the Jinsha Site Park, the ancient Shu cultural symbol landscape application is dominated by designated symbols and symbolic marks. The range of main colors hues is R-BG with R-Y as the main hues. The values range from 2.5 to 9, and the chromas range from 1 to 11. The range of auxiliary colors hues is R-BP, the values range from 2.5 to 9, and the chromas range from 1 to 7. The three elements of color all have large ranges. The color tone is not clear, and neutral colors appear less frequently (see Figure 4).

From the point of view of a single object, symbols often use adjacent color contrast, and their values and chromas are close. From the perspective of the entire park, the symbols are warm colors with mainly red and yellow. However, because the colors are not often used, the regularity is not obvious.

3.1.5. Tianfu Square. In Tianfu Square, the range of the main colors hues of the ancient Shu cultural symbol landscape application is R (red)-BG (blue-green), the values range from 3.5 to 9, and the chromas range from 1 to 7, mainly in medium and high degrees. The range of auxiliary colors hues is Y-BG, the values range from 4 to 9, and the chromas range from 2 to 6, mainly in medium and high degrees (see Figure 5).

From the perspective of the color collocation of a single object, the main use is the contrast of the colors between adjacent and complementary colors, that is, the yellow and green on the color circle, 90-degree angle from each other. The color vitality is strong, such as the twelve pillars with Shu culture on it on the square and the Jinsha bird sculpture. From the perspective of the overall color application area, it mainly consists of cold colors of G and BG. Warm colors such as red and yellow are not used often, which are consistent with the color of the entire square.
3.2. Results and Discussion

Through field research and arrangement, the overall color application of ancient Shu cultural landscape symbols in 5 sites is obtained, as shown in Figure 6. The main color hues range from R to PB, a total of 8 hues. The auxiliary colors contain the whole 10 hues. The hue range of ancient Shu cultural symbols is large in the process of combining them with the landscape carrier. The current trend of hue application is not clear. But in terms of application frequency, the hues mainly concentrate between R (red) and Y (yellow), with warm colors as the mainstay. The values of the overall color range from 2 to 9, with medium and high value being the main ones. The chromas range from 1 to 11, with medium and high chroma ranging from 1 to 7 being the main ones.

When analyzing each site, it was found that the colors of Sanxingdui National Archaeological Relic Park and Tianfu Square were the clearest and the most regular. There are many plants in the Sanxingdui National Archaeological Relic Park. Taking into account the contrast between the cold and the warm factors of the entire park, the colors used are not single, and the symbols represent warm colors when combined with large-scale carriers such as landscape buildings and scenery walls. In order to be harmony with the background plants that show the hue of green and maintain visual unity, when the ancient Shu cultural symbols are combined with landscape sculptures, facilities and other small-volume carriers, the hues are cold or neutral. As the central square of the city, Tianfu Square has few plants. The entire square is dominated by the contrast of yellow and green. The colors are vivid, so that its symbol application also follows this rule. There are too many neutral color applications in Deyang South Park, the color vitality is not strong, and the color tone is not clear. Wangcong Temple is dominated by warm colors such as red and yellow. It ignored the order of values and chromas of similar scenery. Jinsha Site Park is dominated by warm colors such as red and yellow. It ignored to stay harmonious with the plants' colors. What's more, the symbol application is too few and the regularity is not obvious.
4. Conclusion and Suggestions

In summary, the cultural landscape symbols of ancient Shu culture in the 5 sites are dominated by warm colors with medium and high values and medium and high chromas. However, when being specific to each site, the color application is not clear. The range of the hue of a single object is large, the values and chromas of the symbols in scenic spots are insufficiently controlled, and the color matching is relatively messy. Therefore, in the later promotion and design, related staff should accurately grasp the visual and psychological perception of colors according to the nature of the site and the characteristics of the users, clarify the theme of the site, and choose a color tone that matches it. With the deepening of the theme and tour orientation, orderly changes should be made on the basis of this unified tone, which can enrich the visual effects while evoking associations and accurately conveying the semantics of the place. In addition, related personnel must coordinate the color relationship among the main body of the symbol, the carrier and the environment. First, they must distinguish the primary and secondary, establish the main hues of the design area according to the theme, audience, etc., and then clarify the ranges of values and chromas of the colors according to the characteristics of the site such as climate.

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