

**Urban Color Assessment Based on Spatial Perceive: A Case Study on Changzhou
Xinbei District****Jiangbo Wang^a, Aiping Gou^{b*}**^a*Nanjing Technology University, CHINA*^b*Shanghai Institute of Technology, CHINA***aipinggou@hotmail.com***ABSTRACT**

Present urban color assessment research and practice mostly concentrated on picture collection or laboratory evaluation. However, considering the complexity of façade color in real urban environment, spatial perceiving is essential for urban color assessment. In the project of Changzhou Xinbei District Urban Color Plan in 2016, accompanied with the AHP-MATLAB analysis, the research group performed the spatial perceiving assessment from the aspects of color characters, color combinations, relationship between color and mass, color and form, and color and spatial location. Though charts and data exhibited a comparable good evaluation result, still a lot of deficiency were found such as color monotonous, lacking of vitality, lacking of continuous or rhythm in the axes color façade, lacking of character in the node area, etc. Then, a considerable suggestion on color and spatial elements adjustment were put forward for the reference in the next step of urban color plan.

KEYWORDS: Color assessment, Spatial Perceive, AHP-MATLAB**INTRODUCTION**

Over the past 20 years, with the accelerated process of urbanization in China and the ever-changing urban landscape, urban construction color disorder phenomenon is more and more prominent. At the same time, the general public on the city color environment quality requirements are getting higher and higher. Therefore, how to effectively guide and control the city color has become an important task facing urban planning management. In the existing relevant research and practice, the use of qualitative way to sum up the urban color problem. The advantage of this approach is fast; and the disadvantage lies in the subjective, out of the city space. This topic tries to establish a quantitative evaluation method system so as to find the problems in the process of urban color construction and provide important reference for future color planning and transformation.

EVALUATION METHOD CONSTRUCTION

This paper uses the Analytic Hierarchy Process to evaluate the color of urban architecture. The target layer is urban building color quality. The criteria layer includes: color three attributes, color combinations, color and building volume, color and architectural form and color and building space.

Determining the judgment matrix is the most important part of calculating the weight, and the judgment matrix has two main steps. One is to compare the importance of the division level, and the other is more important. According to the above judgment matrix, we can use MATLAB software to calculate the weight.

Table 1. Hierarchy of architectural color evaluation

Target layer	Criteria layer	Index layer
		Hue (0.0755)
	Color attribute (0.0753)	Lightness (0.2290)

Saturation (0.6955)	
Urban building color quality	Color combinations (0.4715)
	Holistic (0.500)
	A sense of composition (0.500)
	building height (0.6144)
	Building width (0.1172)
Color and building volume (0.2362)	Building depth (0.2684)
	Building roof form (0.0484)
Color and architectural form (0.1740)	Building facade form (0.6229)
	Architectural details (0.1684)
	Color and material properties (0.0679)
	Color and material texture (0.0924)
Color and architectural space (0.0430)	The hierarchical characteristics of the spatial position (0.1667)
	The relationship with the surrounding buildings (0.8333)

In this paper, we use the linear weighted synthesis method to determine the formula of comprehensive evaluation. The evaluation formula is: $U = \sum (W_i * f_i)$. Where U is the final score for the architectural color, f_i is the score for each element, and W_i is the weight of f_i .

At the same time, consistency testing is required. Formula: $CI = (\lambda_{\max} - n) / (n - 1)$, where n is the matrix order of judgment matrix and λ_{\max} is the largest eigenvalue of the matrix. After inspection, $CR = 0.0658 < 0.10$, we can see that the judgment matrix satisfies the consistency test.

EMPIRICAL EVALUATION

In August 2016, the research group on the city of Changzhou City, the new city of urban color in-depth study. The northern city is divided into 19 units to the difference between the wall colors for the basis of the evaluation of the construction of color work.

In the color composition, the main color is white, gray, red; auxiliary color: yellow, blue, and green. The distribution of each color in the space is the overall dispersion, local concentration. In the overall level, the color distribution in the city is very scattered; in some areas, individual areas have a certain degree of color tendencies. Specifically, the white lines are mainly distributed in some urban areas and rural settlements. Gray is distributed in the city government surrounding the Olympic body, industrial area.

In the tone of the tone, the lack of the main colors are lack at the city and the planning unit level. Many adjacent neighbors' building color are very different, and the order is lack. Color fragmentation phenomenon is very obvious. Therefore, this leads to the formation of a certain form of urban color space structure.



Figure 1: The color distribution of the walls in the North New City

North New Town architectural color evaluation using a five-level evaluation. Evaluation results are: the overall better, not balanced, still need to optimize the upgrade. In the five grades of the evaluation results, the most is better, followed by, and then is poor, then is good, the last is poor. The best area is concentrated in the southeast of the new town. Better plots are distributed throughout the city. The general plots are distributed in the industrial area. The poor plots are distributed in the north of the city. The poor and worst plots are located in the north of the city.

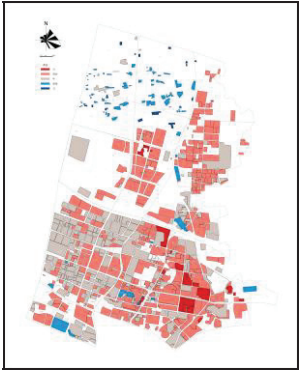


Figure 2: Current Situation of Architectural Color Evaluation Grade Distribution

The city's main colors are not formed. From the city point of view, architectural colors of the northern city, include white and gray and other neutral color, red, yellow, and some blue and a small amount of green. However, there is no color in the number and area to occupy a dominant position, failed to form a color image with some distinctive features. From the functional block point of view, the major functional blocks have not yet formed a certain tone atmosphere. Only in the western and northern industrial areas, a certain degree of color has a certain proportion, but did not account for the majority. From the planning unit point of view, only the individual units have a more obvious tone tendencies, and most of the unit's tone tendencies are not obvious.

Urban color space structure is not obvious. From the spatial distribution point of view, the color in the space cross-distribution, fragmentation is very obvious. From the structural point of view, a certain color layout has not yet formed.

The important lot of color characteristics are not prominent. Axis area: the continuous interface of the architectural color of the lack of unified planning, lack of color continuity, but also the lack of rhythm and guidance. Node area: color is scattered, and building space sense of order has not been strengthened.

Spatial characteristics. The majority of the planning unit of the color tone has not yet formed, and only the individual units have a more obvious color tendencies.

At the same time, although the color of some areas has a certain vitality, but it is still far from the formation of very clear color image features at the whole. Most of the planning unit of the urban color space structure has not yet formed, only the color of individual units show a more obvious block characteristics. The architectural color does not match the urban spatial structure. Most of the planning elements of the color evaluation results are generally and better, because the construction of the northern city is generally newer. At the same time, the number of particularly good samples is not much, but also need to further enhance the overall quality. From the color of the single building, the new building facade in the form of more innovative, and the effect is generally better. However, in the architectural design stage, professional color design is generally lacking.

Sorting. The color quality of the different planning units is classified according to the number and proportion of the good grades of the color plots. North New Town has a total of 18 planning units.



Figure 3: A file diagram

A file has five units, accounting for 27% . In the A file, the better plots accounted for more than half, almost no worse. The better color is different in each unit including white, gray, red and yellow .

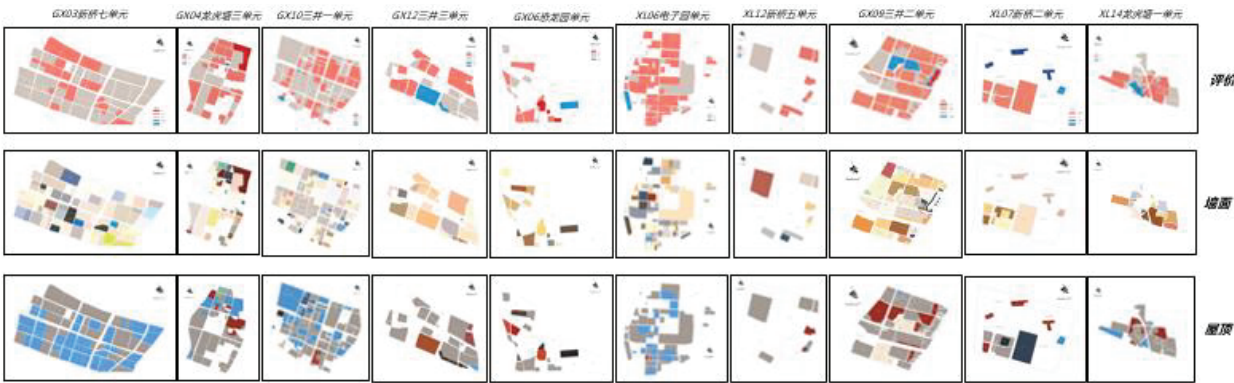


Figure 4: Bfile diagram

B file has 10 units, accounting for 56% . In the B file, the general proportion i s high, and good is very little. Some good cases and poor cases are in white, gray, red and yellow.

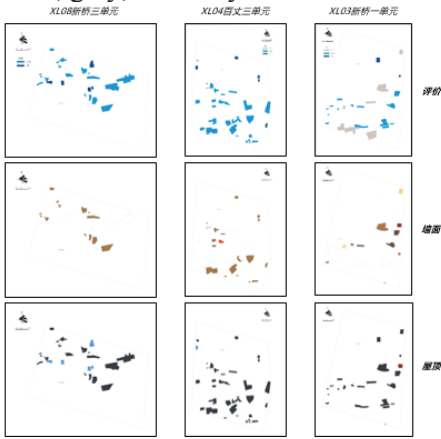


Figure 5: Cfile diagram

C file has 3 units, accounting for 17%. In the C file, the poor plots accounted for the majority, there is no better plots. These plots are concentrated in rural settlements in the northern part of the city, with farmers' houses and small factories. Farmer's cement is gray, dark and old, because of long time and water stains.

DISCUSSION

A lot of color problems are not the cause of the color itself, mainly due to the cause of the building itself. Such as the huge volume of buildings, the walls are worn, facade style, building interface continuity, the location of the building ancillary facilities disorderly disorder, and so on.

On the one hand, the role of color in bridging space problems is limited when it comes to elements such as building materials and mass. On the other hand, in some negative space need to enhance the vitality, the color can play a very positive effect.

Any color will appear good and poor situation, and we cannot think that a certain color is not good. The color attribute itself is not wrong, and the key is how people use it.

CONCLUSION

Evaluation results show that the construction of the northern city is generally relatively new, and the overall color of the city's color environment is better.

Color is an important component of urban characteristics, the characteristics of the source of the source of the source cannot be confined to the history of the traditional color context, the current spirit of the times and future social needs are its important source.