

Research Paper

# Color research of rural tourism destination based on chromatographic analysis: A lowland case study of Hangzhou Meijiawu Village

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## ARTICLE INFORMATION

### Article history:

Received: 03 June, 2017

Received in revised form: 21 August, 2017

Accepted: 31 August, 2017

Publish on: 08 September, 2017

### Keywords:

Rural Color  
Chromatography  
Landscape  
Village

## ABSTRACT

Good color for rural planning not only brings comfortable living environment, creates an impressive image, but also is conducive to the color context of inheritance and to reserve the unique style. At present, there is not much research on rural color planning in rural country, so this paper chose the rural tourism destination, Meijiawu Village, as a case. and it analyzed the color of the village by using qualitative and quantitative methods. On the basis of tourists' perception of Meijiawu colors, this paper proposed several optimization suggestions about the various types of color and material color by extracting the chroma, lightness and saturation information, including the mass-tone attune (building facade, plant color), auxiliary color (the color of roof, doors, windows and other components, facade color), embellishment color (the color of signs, other colors) and 7 class material colors.

## 1. Introduction

Throughout history, most developed countries have been experienced from countryside to withstand the result of the possibility of expanding the city's economic development: rural living environment was deteriorated with the extension of urban construction, the vast majority of local culture and rural inherent natural landscape color are disappearing gradually. The whole color planning which including the facilities and the natural landscape, cultural characteristics, in harmony around the

environment. Spillmann (1997) through the color scheme of Kirchsteigfeld argues that the homogeneity and heterogeneity of color are good for formation and change of the urban space.

To maintain a sustainable development of rural settlements, we must protect the balance between built-up area, the natural, local community, history, traditions and local culture. Color as one of the properties of the district, can express the city's political, economic, cultural, ecological and other mine areas directly or indirectly. In 2014 the 12th International Investment Forum for

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*Note:* Discussion on this paper is open until April 2018.

Learning, Italy has established relevant management platform architecture color protection. Ji (2015) combines multi-criteria spatial analysis and computer-aided photographic processing based on a visual view. According to the villagers about Ipam traditional stories of keywords, Li(2014)extracts relevant imagery and symbolism of color to ensure rural color and its characteristics in massive color planning of government.

1), south of Mei Ling tunnel, along depth Mei Ling Road on both sides more than a decade, in the south ‘Bamboo-lined path at Yunqi’ , which is one of the new ten views of West Lake, only 1.5 km away. There are ‘Ten Maywood’ , he said. It is a village with a history of six hundred years, more than 500 existing rural residence, 1274 of agricultural resident population people, 502 of residents.

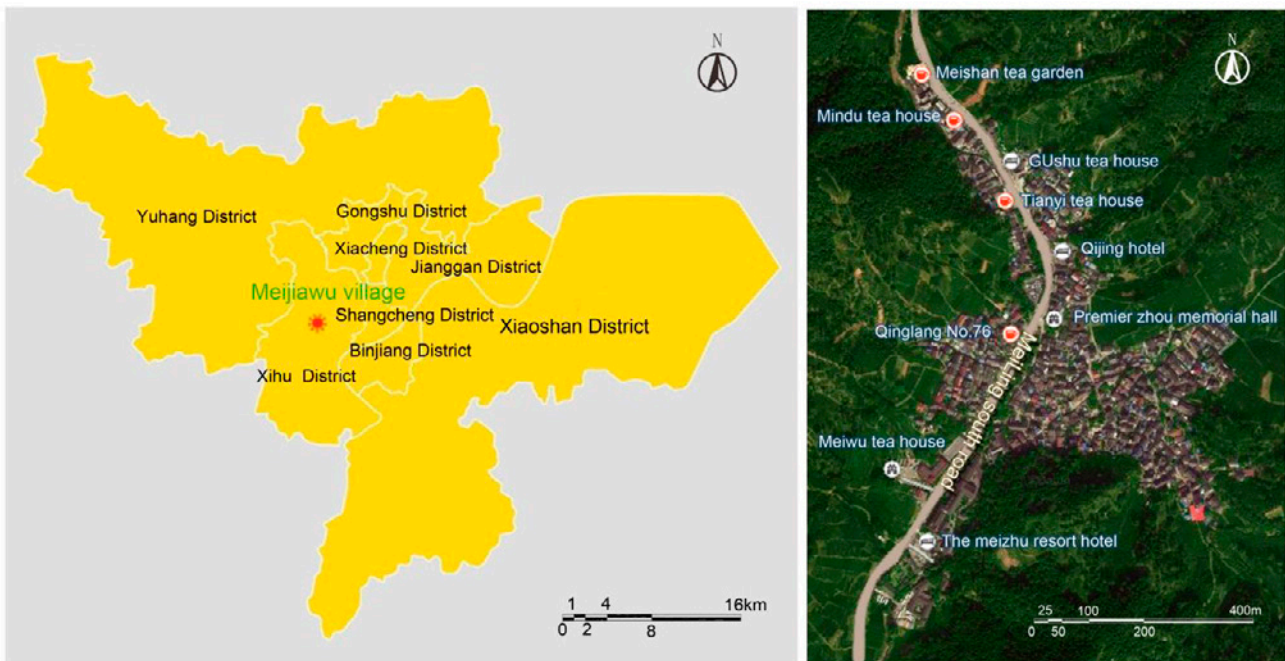


Fig. 1. The location of Meijiawu and the village site plan.

planning method.

Although urbanization is the trend of the development, there are differences between the rural and urban structures in the nature, the development of the rural color need much more to consider the specific environmental factors, and cannot be unified into urban color planning, which will make rural color loss caused by fault of color context. Jin and Yi (2012) argued that putting the harmony natural landscape in the important position, giving the freedom to the residents of color options, then the color of the building will present a consistent change with change of the time, and the rural color planning will be sustainable. In this study, for example, we crafted from the present conditions of Meijiawu color and made relevant recommendations on rural color planning according to tourists’ color perception.

## 2. Overview of Meijiawu

Meijiawu , a tea-culture village, located in the western hinterland of the Hangzhou West Lake Scenic Area (Fig.

In order to discover the relationship of colors and rural landscape in Zhejiang area, a new methodology is highlighted as the followings.

(1) Using qualitative and quantitative methods of chromatography.

(2) The qualitative color classification consists of the mass-tone attune (building facade, plant color), the auxiliary color (the color of roof, doors, windows and other components), embellishment color (the color of signs and other ornament colors).

(3) The quantitative color extraction consists of chroma, lightness and saturation.

## 3. Rural Color Research in Meijiawu Village

We can objectively record color information by digital tools, and the color of the specific physical information can be transferred back into color symbol available for interpretation analysis. Therefore, this research takes the way of taking pictures to record the color information of rural tourism destination, then extracts Meijiawu

chromatography by photoshop and records them, including RGB, lightness (L) and saturation (S). Because the light has a large impact on the color, we try to extract chromatography in a sunny day at 10:00 am ~ 3:00 pm, and take photos time and time again at the same site to reflect the color information of rural tourism destination as authentic as possible.

A methodology of the chromatographic analysis is formulated as Fig. 2, combining the qualitative and quantitative measurements into the case of Meijiawu Village in Zhejiang Province, China.

### 3.1 Overall Color of Meijiawu

The layout of Meijiawu village is 'T' shaped and it is divided into two parts by MeiLing road, the longitudinal axis of the building (direction) generally perpendicular to the main street, east to the south and southwest. Tourists and business gathering area mainly concentrated in the axis of the Meiling road for the two sides, so we divided the first row of buildings on both sides of the MeiLing road into the spindle resign, the rest are divided into other areas. The first impression on Meijiawu are the white walls and black tiles. Most of the building facade are white, grey paint, the wooden doors and windows are dun and vermillion, the tiles are black, coupled with strong culture atmosphere of the tea, there are developed traditional architectural style with unique local flavor in Hangzhou. But in further observation, the spindle region is also interspersed with all kinds of light colored brick and a large area of blue-green glass window

recovery of 228 questionnaires, there are 50.9% visitors visit Meijiawu more than 3 times, only 21.1% are the first arrivals. Therefore, the visitors of Meijiawu have a more comprehensive and specific perception.

Survey results show that 15.8% of visitors think Meijiawu's rural color is diversity, conforms to the rural regional characteristics and meets the demand. 43.9% of visitors think rural color is ordinary, in line with rural regional characteristics, basically meet the demand of the villagers and tourists; 21.1% of visitors think rural color is single and similar, not conforms to the rural regional characteristics, it is also cannot meet the demand of the villagers and tourists; 19.3% think the color is mixed and disorderly, not only can't conform to the rural regional characteristics, but also can't meet the demand. In a word, about 40% of visitors are not satisfied on Meijiawu's rural color.

### 3.2 All Kinds of Colors Analysis

According to the characteristics of photos crafted from Meijiawu, we divide the picture elements into plant, building facades, the windows and doors ,and other components, roofs, roads facade, signs and other 7 classes. The building facade, plant colors are mass-tone attune; the colors of roofs, the windows and doors and other components, roads facade are auxiliary color; the signs and other colors are embellishment colors (as Table 1 and Table 2.

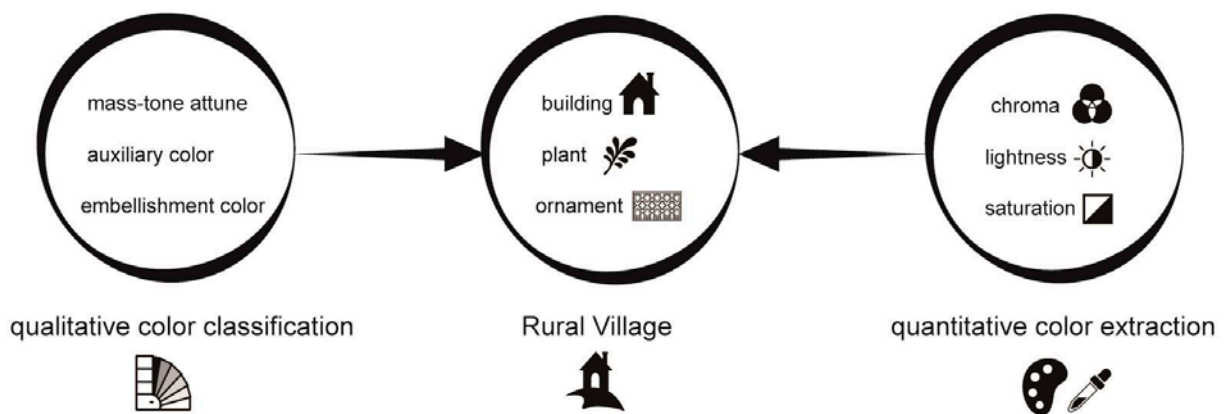


Fig. 2. Methodology of the chromatographic analysis combining the qualitative and quantitative measurements.

components; On other areas, the traditional architectural style faded dramatically and the overall traditional architectural style features of Meijiawu is reduced in a large extent. The study gave out 250 questionnaires for tourists on Meijiawu rural color and recycled 228 effective questionnaires . The effective rate was 91.2%. In the

#### 3.2.1 Mass-tone attune

The spindle building area mainly in the form of 'one household one courtyard' in Meijiawu, white walls and

**Table 1.** The chromatography of all kind of colors.

Classification	Item	Area	Color Dot									
			1	2	3	4	5	6	7	8	9	10
Mass-tone attune	Building facade	Spindle										
		Other										
	Plants	Spindle										
		Other										
Auxiliary color	Roof	Spindle										
		Other										
	Components	Spindle										
		Other										
Embellishment color	Roads facade	Spindle										
		Other										
	Signs	Spindle										
		Other										
Others	Spindle											
		Other										

**Table 2.** The proportion distribution of lightness-saturation.

Classification	Item	Area	Spindle region				Other areas			
			S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	total	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	total
Mass-tone attune	Building facade	L <sub>1</sub>	26.6%	-	-	26.6%	29.5%	-	-	29.5%
		L <sub>2</sub>	63.9%	0.9%	-	64.8%	49.8%	-	-	49.8%
		L <sub>3</sub>	7.9%	0.7%	-	8.6%	20.7%	-	-	20.7%
		total	98.4%	1.6%	-	100%	100%	-	-	100%
Auxiliary color	Plants	L <sub>1</sub>	65.7%	4.7%	-	70.4%	67.5%	-	-	67.5%
		L <sub>2</sub>	27.1%	0.8%	-	27.9%	17.1%	12.3%	0.8%	30.2%
		L <sub>3</sub>	0.2%	1.3%	0.2%	1.7%	0.6%	0.6%	1.7%	2.3%
		total	93%	6.8%	0.2%	100%	84.6%	12.9%	2.5%	100%
Embellishment color	Roof	L <sub>1</sub>	65.8%	-	-	65.8%	60.6%	-	-	60.6%
		L <sub>2</sub>	27.1%	-	-	27.1%	37.8%	-	-	37.8%
		L <sub>3</sub>	7.1%	-	-	7.1%	0.8%	-	0.8%	1.6%
		total	100%	-	-	100%	99.2%	-	0.8%	100%
Mass-tone attune	Components	L <sub>1</sub>	18.8%	46.6%	-	65.4%	69.8%	2.6%	-	72.4%
		L <sub>2</sub>	25.7%	0.2%	-	25.9%	22.4%	-	-	22.4%
		L <sub>3</sub>	8.7%	-	-	8.7%	5.2%	-	-	5.2%
		total	53.2%	46.7%	-	100%	97.4%	2.6%	-	100%
Embellishment color	Roads facade	L <sub>1</sub>	36.6%	-	-	36.6%	37.4%	-	-	37.4%
		L <sub>2</sub>	54%	1.6%	-	55.6%	52.4%	0.5%	-	52.9%
		L <sub>3</sub>	7.3%	-	0.5%	7.8%	-	9.7%	-	9.7%
		total	97.9%	1.6%	0.5%	100%	89.8%	10.2%	-	100%
Embellishment color	Signs	L <sub>1</sub>	49%	8.3%	1.1%	58.4%	57.1%	15.6%	-	72.7%
		L <sub>2</sub>	35.4%	4%	-	39.4%	23.4%	-	-	23.4%
		L <sub>3</sub>	2.2%	-	-	2.2%	2.6%	-	-	3.9%
		total	86.6%	12.3%	1.1%	100%	83.1%	15.6%	-	100%
Mass-tone attune	Others	L <sub>1</sub>	35.2%	-	-	35.2%	27.1%	40.8%	-	67.9%
		L <sub>2</sub>	22.8%	32.7%	-	55.5%	17.4%	10.1%	-	27.5%
		L <sub>3</sub>	6.5%	2.8%	-	9.3%	3.2%	-	1.4%	4.6%
		total	64.5%	35.5%	-	100%	47.7%	50.9%	1.4%	100%

black tiles, part of the buildings with light colored tile veneer. While buildings of the other areas mainly colored with light tile veneer which are too dense, private and distribution desultorily, the white walls and black tiles decreased significantly. We can conclude from the **Table 2**.

The building facade colors mainly in medium lightness and low saturation, but proportion in the spindle region is significantly higher than other areas;(2)In terms of saturation, Meijiawu building facade colors are mainly low saturation, without high saturation ,and there is no medium saturation in the other areas;(3)In terms of lightness, building facade colors are medium lightness, the proportion of the colors of low lightness is less in the spindle region and other areas, but high lightness in the other areas is significantly higher than the spindle region.

The color of plant on spindle region is mainly composed of Meiling south road on sides, residential courtyard, river bank of Meiling brook. From the **Table 1**, the mainly chromatography of plant colors in spindle region and other areas (1,2,3 class) is insignificant, but there are significant differences in the proportion of smaller parts (7 - 10 classes). From the **Table 2** we can conclude that : (1) The saturation and lightness ratio of plants colors in spindle region and other areas are similar; (2) The plant colors are mainly composed of low lightness and low saturation, and it has poor color; (3) The medium lightness, high lightness (12.9%, 2.5%) in the other areas are obviously higher than the proportion of the spindle region (6.8%, 0.2%).

### 3.2.2 Auxiliary color

From the chromatography of **Table 1**, the main chromatography of roof colors in spindle region and other areas are no color and little gray and reddish ocher. From the **Table 2** we can conclude that : (1)The colors of roof are mainly composed of low lightness and low saturation, and it has poor color rendering; (2)The high lightness (12.9%, 7.1%) in the spindle region is obviously higher than the proportion of the other areas (1.6%); (3)There are some excellent color renderings in the other areas, but the spindle region is low saturation entirely.

The doors and windows and other components is mainly wooden structure in the spindle region, but wood and metal materials are mainly in the other areas. From the chromatography on the **Table 1**, the main chromatography of the doors and windows and other components colors in spindle region and other areas (1,2,3 class) show that the no color with different lightness, while the proportion of 7 to 10 class show significant different colors, the spindle region are griege, green and ember; the other areas are manifested in grey

blue and tawny. From the Table.2, we get the conclusion about the doors and windows and other components colors:(1)The color are mainly medium lightness and medium saturation in the spindle region, but other areas are mainly for low lightness and low saturation; (2)In terms of lightness, the colors proportion in all kinds of lightness is small; (3)In terms of saturation, although the colors in spindle region and other areas without high saturation, the most are low saturation, the proportion of medium saturation in the spindle region ( 46.7%) is obviously higher than the other regions (2.6%).

In the spindle region of Meijiawu, Meiling Road is the only main road, the road is wide and there are no central green belts as the separator; However, the roads in other areas are mainly branching road which are uneven in width, breaking and more unsystematic. From the chromatography on the Table. 1, the colors of road facade show the no color, but the lightness of chromatography in spindle region and other areas show obvious differences. From the Table.2, we get the conclusion about the colors of the road facade: (1) The colors mainly in medium lightness and low saturation, and the proportion of different lightness differs little; (2) In the saturation, although the spindle region and other areas are mainly low saturation, but the medium saturation in the other areas (10.2%) is obviously higher than the spindle region (1.6%), then the spindle region with 0.5% high saturation while other areas do not.

### 3.2.3 Embellishment color

The spindle region of Meijiawu is the main gathering area of visitors, but also a gathering place of Tea House, so all kinds of signs are an important way to attract tourists; On the other areas, there are just two or three tea houses, and the signs are relatively less. From the chromatography of signs colors on the Table. 1, there are little differences between the spindle region and other areas, the mass-tone attune is no color and complementary with green, beige and blue. From the Table.2 we can conclude that: (1) The signs' colors are mainly composed of low lightness and low saturation, and it has poor color rendering; (2)In terms of lightness, the signs' colors are mainly low lightness, but the medium lightness in the spindle region is obviously higher than the other areas; (3)In the saturation, the signs' colors are mainly low saturation, but the spindle region with 1.1% high saturation while other areas do not.

From the chromatography on the **Table 1**, the difference between the other colors of the spindle region and other areas mainly display on the proportion of different chromatographic. From the **Table 2** we can conclude that : (1)The other colors of the spindle region

are mainly composed of low lightness and low saturation, but the difference between the medium lightness and medium saturation is small, the spindle region is mainly composed of low lightness and medium saturation; (2) In terms of lightness, the spindle region is mainly medium lightness, but the other areas is mainly low lightness; (3) In the saturation, the spindle region mainly is low saturation, but the other areas is mainly medium saturation and with 1.1% high saturation.

3.2.4 Summary

In terms of the hue, the spindle region and other areas are mainly no color and complementary with a small amount of red, yellow, blue, and green of low saturation. According to the chromatography of spindle region and other areas, the colors of the building and road facade are mainly medium lightness low saturation;

The colors of the plants, roof, signs are mainly low lightness low saturation, and the ratio between the spindle region and other areas are little differences. The colors of doors and windows and other components of the spindle region are mainly low lightness medium saturation, but the other areas are mainly low lightness low saturation, the other colors are opposite. No matter with the chromatography or lightness-saturation, even if the spindle region and other areas in tourists gathering degree and commercial function has big differences, but the colors of which is unobtrusively different. From the distribution ratio for all kind of saturation and lightness, the major proportion of them are about 50% and the majority of which are more than 50%, indicating the attribute of the chromatography in Meijiawu are more concentrated.

Table 3. The proportion distribution of tourists' color perception.

	Building facade	Plant	Road	Roof	Component	Sign	Others
The color is various with rich characteristics	19.3%	19.3%	7%	8.8%	5.3%	3.5%	1.8%
The color is simple but can reflect the rural characteristics	59.6%	63.2%	24.6%	38.6%	38.6%	22.8%	10.5%
The color is single and similar, without any characteristics	17.5%	15.8%	42.1%	19.3%	40.4%	24.6%	17.5%
the color is mixed and disorderly that cause color pollution	0	0	8.8%	3.5%	7%	33.3%	52.6%
No sense	3.5%	1.8%	17.5%	29.8%	8.8%	15.8%	17.5%

Table 3 is the proportion distribution of tourists' color perception, about the mass-tone attune (the colors of building facade and plants), more than 50% of the visitors think that the color is simple but can reflect the rural characteristics; For auxiliary color, 42.1% of the visitors think the colors of road facade is single and similar, without any characteristics; 38.6% of visitors think roof colors are simple but can reflect rural characteristics; 40.4% of visitors think the colors of doors and windows and other components also single and similar, without any characteristics. About the embellishment color, the mainly tourists think the color is mixed and disorderly that cause color pollution. Take signs' colors for example, 22.8% of visitors think it is simple but can reflect rural characteristics, 24.6% of visitors think it is single and similar, without any characteristics; For the roof colors, 38.6% of visitors think it is simple but can reflect rural characteristics, the ratio between the perception is not very obvious, but the content is different completely. So

we need to keep the intrinsic mass-tone attune and optimize all aspects of the rural color in Meijiawu.

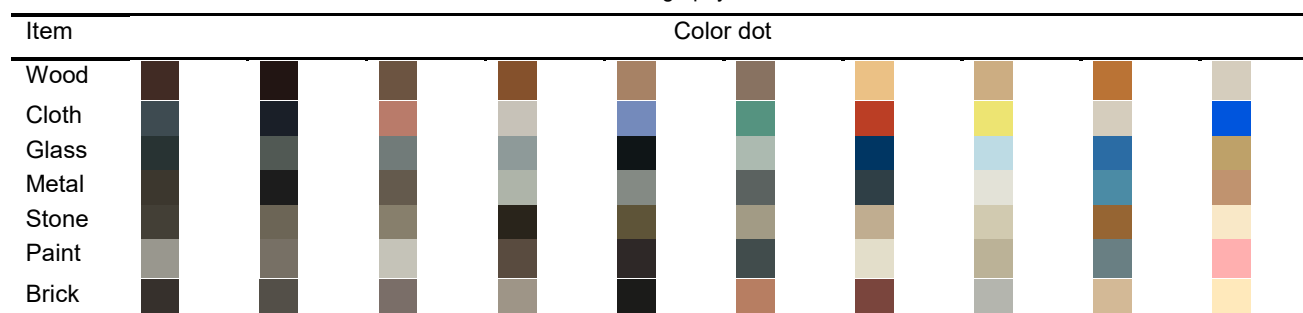
3.3 The Materials' Color Analysis

In the study area, we divide the material into seven classes: the wood, cloth, glass, metal, stone, paint and brick, there are obvious differences in their color preferences and usage. Table 4 shows the total chromatogram of the materials. In terms of the hue, each material is mainly no color in the Meijiawu. Table 5 is the ratio of the lightness-saturation of the materials. In addition to the stone and paint, the other materials are mainly low saturation and low brightness, and the proportion is about 50%. The stone and paint are mainly medium lightness and low saturation, the stone of which accounted for 49.3%, and the proportion of low brightness and low saturation of the stone is 45.3%. The attribute of all materials tend to low lightness and low saturation.

**Table 6** is the perception of materials according to tourists, most of the visitors think the colors of wood and

paint are simple but can reflect rural characteristics, the colors of glass and cloth are mixed and disorderly, cause

**Table 4.** The chromatography of the materials.



**Table 5.** The proportion distribution of lightness-saturation of the materials.

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	total	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	total	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	total
	<b>wood</b>				<b>cloth</b>				<b>glass</b>			
L <sub>1</sub>	61.5%	7.9%	-	86.7%	49.4%	-	-	49.4%	40.7%	1.4%	-	42.1%
L <sub>2</sub>	24.6%	3.3%	-	10.6%	22.3%	4%	7.4%	33.7%	52.1%	1%	-	53.1%
L <sub>3</sub>	0.7%	2%	-	2.7%	13.9%	-	3%	16.9%	3.8%	1%	-	4.8%
total	86.8%	13.2%	-		85.6%	4%	10.4%	100%	96.6%	3.4%	-	
	<b>metal</b>				<b>stone</b>				<b>paint</b>			
L <sub>1</sub>	51.8%	-	-	51.8%	45.3%	-	-	45.3%	23.5%	-	-	23.5%
L <sub>2</sub>	33.8%	-	-	33.8%	49.3%	0.4%	-	49.7%	52.7%	-	-	52.7%
L <sub>3</sub>	14.4%	-	-	14.4%	4.6%	0.4%	-	5%	23.4%	-	0.4%	23.8%
total	100%	-	-	100%	99.2%	0.8%	-	100%	99.6%	-	0.4%	
	<b>brick</b>											
L <sub>1</sub>	63.4%	-	-	63.4%								
L <sub>2</sub>	32.6%	-	-	36.2%								
L <sub>3</sub>	2.5%	1.1%	0.4%	4%								
total	98.5%	1.1%	0.4%	100%								

color pollution, the colors of metal, stone and brick are single and similar, without any characteristics. Although the color properties of the materials are similar, the tourist perception of color is completely different. For the color of each materials, the visitors think it is abundant and distinctive, but the approval ratings of the cloth, metal and glass are the lowest.

#### 4. Discussion on color design

The climate of Meijiawu is warm moistly, four seasons clearly, illumination is adequate and rainfall is abundantly, belongs to the obviously medium light region where the color appeared different lightness of black, white and gray that has a rich sense of space. The color of building facade is medium lightness while the plants are low lightness, so there are no obvious differences between the low saturation of large area plants and surrounded building facade, it's easy to form a chaotic atmosphere and a sense of dull and depressing. In the dilapidated condition, the doors and windows and other components

lost their original color and texture; The plants are drab and without changing. It is losing their characteristics under the high greening rate and tea culture atmosphere. The road is an effective landscape corridor, but losing its important position in the color because it is single and without any characteristics. In Meijiawu, the most prominent colors are the colors of signs' and others which are various, high-frequency that cover up the original rural color characteristics.

Whether optimization rural color can increase the visited-rates of Meijiawu, 38.6% of visitors will come more frequently, 36.8% of visitors will come more than three times, 21.1% of visitors say that they will come again more than once or twice, and only 3.5% of visitors say that they will not come back. The data shows that color optimization will improve the visited-rates to some extent and promote the development of rural tourism.

##### 4.1 All kind of color optimization recommendations

**Table 1** and **Table 2** explain a total chromatography of Meijiawu rural color that based on the quantitative

analysis, we summarized that they can reflect the rural overall color and landscape. Combined with the characteristics of Meijiawu rural color, we studied how to

use the materials and matched colors without losing the sense of identity and layering.

**Table 6.** The proportion distribution of tourists' color perception.

Color description	Material						
	wood	cloth	glass	metal	stone	paint	brick
The color is various with abundant characteristics	19.3%	5.3%	5.3%	5.3%	8.8%	12.3%	17.5%
The color is simple but can reflect the rural characteristics	54.4%	24.6%	15.8%	5.3%	29.8%	59.6%	24.6%
The color is single and similar, without any characteristics	22.8%	1.8%	21.1%	45.6%	38.6%	8.8%	45.6%
the color is mixed and disorderly that cause color pollution	3.5%	45.6%	40.4%	0	1.8%	5.3%	0
No sense	0	22.8%	17.5%	43.9%	21.1%	14%	12.3%

#### 4.1.1 Mass-tone attune

The color of building facade should keep a low saturation, the original medium lightness should optimize to high, medium and low, which have a slow transition, the recommended chromatography are shown in **Table 7**. The classic 'Hui' style architecture in the spindle region is the key area to reflect Meijiawu rural color. For its facade color, the criterion is to repair the original color, the key is to improve the lightness of the facade and keep the cleanliness of it. In other areas the building facade is mainly established in the brick veneer, we should optimize the color of some building facade with higher saturation, the suggestion is given priority to take low saturation of lively color such as pale yellow. The whole area can use a amount of cinerous, the vintage facade and 'Hui' style architecture in the spindle region echo each other and contrast with the building in the other areas. The building facade has a slow transition between the spindle region and other areas and the rhythm is more clear. Under the background of low lightness of castle peak, the overall environment appears more bright and clear.

Based on the original low saturation low lightness, the plant colors increase some colors of medium saturation low lightness and medium saturation medium lightness. In order to highlight the layering of color and seasonal of plant, recommend chromatography are shown in **Table 8**. In terms of variety and color, the plants in the spindle region are single, so we recommend that increase coleus plant, flower, ornamental and plants can reflect the seasonal on the both sides of the Meiling road, which can play a role of ornament and highlight the layering in the

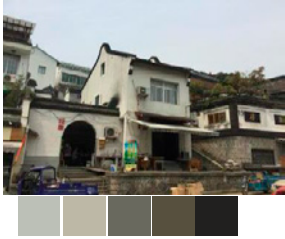

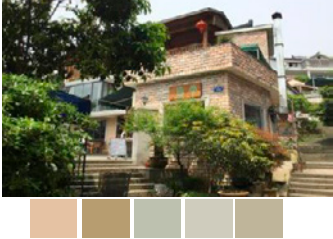




vertical plane. The courtyard plants are too little and too limited which compared to a few potted flowers, so we recommend that increase the plant coverage and plant native vine and flowers with vertical greening to increase the rustic charm of courtyard. The plants on the other areas roads are sparse and more monotonous with lower coverage which are compared with the spindle region, so we can plant coleus plants on the both sides of the road to highlight the layering in the horizontal plane. As the whole plants color, we can highlight the use of red. The green can relieve visual fatigue and red is complementary color of green, so the comparison of red and green can play a role of relaxing and balance.

#### 4.1.2 Auxiliary color







**Table 9** is recommended chromatography of Meijiawu auxiliary color. Meijiawu slope roofs are mainly black and red, so we recommend that the roofs in the spindle region mainly use black to develop a distinct characteristic of white walls and black tiles, and the roofs in the other areas mainly use red. The red tile is a major feature of rural construction, not only embodies the characteristics of rural color but also not conflict with architectural style in the other areas. The color of doors and windows and other components are low lightness medium saturation in the spindle region, while the other areas are low lightness and low saturation, so we recommend that the lightness-saturation of the doors and windows and other components are lower than the building facade to form a sharp contrast. Because of the use of colored canopy that saturation in the spindle region is medium, it need to reduce the use of colored



**Table 7.** The recommended chromatography of building façade.

Typical color combination of rural landscape		
 <p>(1) color restoration</p>	 <p>(2) color facade optimization</p>	 <p>(3) color retention</p>
 <p>The grey building facades of high lightness make the environment clear.</p> <p>(4) The rendering with higher lightness</p>	 <p>Black ,white and ash create a rich sense of space.</p> <p>(5) The rendering of white match cinerous</p>	 <p>Pale yellow paint and lumber primary colors create an elegant atmosphere.</p> <p>(6) The color optimization rendering of part building facade</p>
<p>The recommended chromatography of building facade:</p> 		

**Table 8.** The recommended chromatography of plants.

Typical color combination of rural landscape		
 <p>Green highlights the layering in the vertical plane.</p> <p>(1) The rendering of plant color in the spindle region roads (a)</p>	 <p>Green and coleus plant highlight the layering in the vertical plane.</p> <p>(2) The rendering of plant color in the spindle region roads (b)</p>	 <p>Rich color make the courtyard more bright and natural.</p> <p>(3) The rendering of plant color in the courtyard (a)</p>
 <p>The courtyard color create more vitality.</p> <p>(4) The rendering of plant color in the courtyard (b)</p>	 <p>Green and coleus plant highlight the horizontal linear plane.</p> <p>(5) The rendering of plant color in the other area roads (a)</p>	 <p>Green and coleus plant highlight the horizontal curve plane.</p> <p>(6) The rendering of plant color in the other area roads (b)</p>










The recommended chromatography of plants:



canopy and repair the original color of wooden doors and windows. In the other areas, they need reduce the use of colored glass to avoid showing mixed and disorderly color. The color of road facade is medium lightness and low saturation which is same with the building facade, so it is no contrast on the plane-facade space. So we recommend that reducing the lightness of road facade and using the color of low lightness. The mousy stone

can be applied to the road echo classical ‘Hui’ style architecture in the spindle region, quietly elegant and simple. Colorful plants increase vitality between the building and road, the whole area is full of classic feeling and not losing vitality. The roads within the village lead to the loss of regional soil colors, so we recommend that reduce the harden road in addition to the main driveway to highlight the rural soil colors.

**Table 9.** The recommended chromatography of auxiliary color.

Typical color combination of rural landscape		
 <p>Cinereus roof is tasteful</p> <p>(1) The rendering of roof color (a)</p>	 <p>Cinereus roof is tasteful</p> <p>(2) The rendering of roof color (b)</p>	 <p>Red roof is full of rural feeling</p> <p>(3) The rendering of roof color (c)</p>
 <p>The dark metal doors and Windows are clam</p> <p>(4) The rendering of component color (a)</p>	 <p>The light metal doors and Windows are bright</p> <p>(5) The rendering of component color (b)</p>	 <p>Red-brown wooden doors and windows are quaint</p> <p>(6) The rendering of component color (c)</p>
 <p>Beige stone is plain and elegant</p> <p>(7) The rendering of road facade color a</p>	 <p>Dark gray and white contrast in three-dimensional space</p> <p>(8) The rendering of road facade color b</p>	<p>The recommended chromatography of auxiliary color :</p> 

4.1.3 Embellishment color








The most excellent color rendering is the color of signs and others which are important parts of commercial color. These colors need to harmonize the use and reduce them to avoid covering the characteristics of

original rural color. The area of embellishment color should not be too large and it's better to use the adjacent color without obvious jumping and reduce the using of blue of high lightness, the fonts and background colors could use contrasting colors to highlight. Embellishment color should be positive for the mass-tone attune rather

than destructive. Therefore, we recommend that the embellishment color could use light colored of medium lightness medium saturation. The color of signs suggests that using light green with pale yellow to highlight is a good choose. The green represents the local tea culture, while the yellow is a representative of the wooden, thus

the green matches the yellow is not abrupt and reflects the 'rural' and 'tea- culture' of Meijiawu. Embellishment color recommended chromatography is shown in Table 10.

**Table 10.** The recommended chromatography of embellishment color.

Typical color combination of rural landscape					
					
Yellow sign is elegant (1) The rendering of sign color (a)	Vintage sign is quaint (2) The rendering of sign color (b)	Green sign is fresh (3) The rendering of sign color (c)			
					
Pale yellow wooden sign is nature (4) The rendering of sign color (d)	Symbol pale yellow wooden (5) The rendering of sign color (e)	Light blue is so abrupt (6) Embellishment color Optimization			
The recommended chromatography of embellishment color :					
					

**4.2 Materials color optimization recommendations**

According to the conclusion of the materials' color analysis, although the color properties of the materials are similar, the tourists' perception of color is completely different. For the color of each material, visitors think that it is rich and distinctive, while the approval ratings of the cloth, metal and glass are the lowest. So we can learn that the tourists' perception of materials' color mainly comes from the texture and hue of material, and has nothing to do with the color lightness-saturation.

According to the tourists, to a great extent the choice of the material can reflect rural color: wood, stone, brick, coating, cloth, glass, metal. The wood and stone are the first choice, and no tourist will choose the metal. For the perception of materials' color, most of the visitors think that the colors of wood and paint are simple but can reflect rural characteristics, the colors of glass and cloth are mixed and disorderly, they will cause color pollution, the colors of metal, stone and brick are single and similar, without any characteristics. Although most of tourists think that the color of stone and brick are single and similar, there are 30% to 40% of visitors think they are simple but can reflect rural characteristics. So we should change the lightness of stone and brick mainly, the different lightness under the influence of light will present different layering. The metal can't reflect rural color to a

great extent, and the color of it is single and similar without any characteristics. So the color of metal tries to use no color with different lightness, or combines with other materials which can weaken the reflection.

**4.3 Meijiawu color management recommendations**

Many cities have completed the urban color planning in China, but it's difficult to implement truly, especially at the village level. The building facade color in the rural is generally determined by the householder without restraint. Meijiawu rural color management can be performed in two ways: on the one hand, the construction sector concerned about the restrictions and supervision of rural colors; on the other hand, appealing to the residents taking part in the color protection and restoration. At present, although the beautiful rural construction has acquired great importance, rural color are not under the attention of the authorities, so they are a state of pollution and loss. After in-depth investigation of all aspects, the rural construction sectors should develop a rural chromatography on the basis of public willingness, and carry out strictly during the rural construction. Meanwhile, color faced various problems such as fading, falling, pollution, etc., only by taking effort together can color maintain the authenticity.

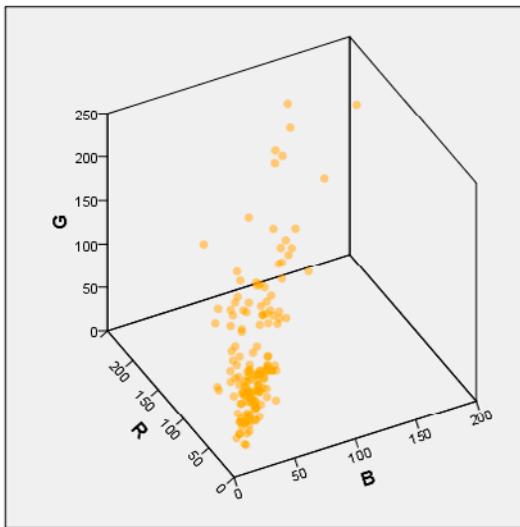


Fig. 3.1. RGB scatter distribution of wood .

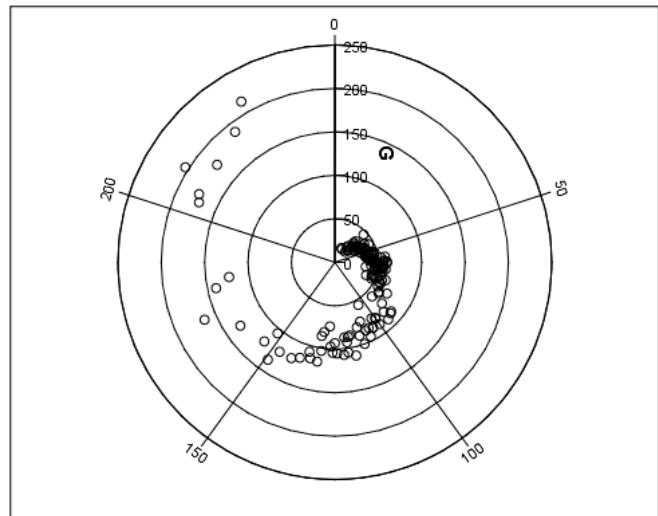


Fig. 3.2. R-G scatter distribution of wood.

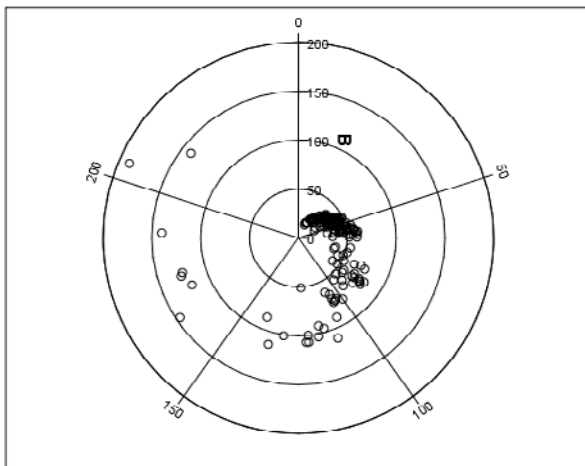


Fig. 3.3. G-B scatter distribution of wood.

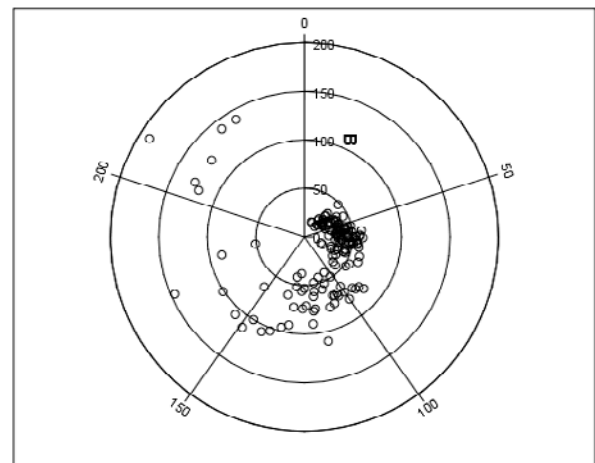


Fig. 3.4. R-B scatter distribution of wood.

## 5. Discussion on material colors

By drawing a variety of material RGB scatter diagram for clustering analysis, a more intuitive discussion on all kinds of material performance is crafted with colour tendency. The materials in the research can be divided into the wood, fabric, glass, metal, stone, paint, brick seven classes, these tendencies and use obvious difference in color. (as **Figs. 3** and **4**).

The spot distributions of wood and fabric show a chromatic difference of material texture. The wood spots converge in a small range, where the chroma values of RGB are smaller and linear. The fabric spots scatter in a wide range, where the chroma values of RGB are medium and nonlinear.

## 6. Conclusion

Rural color management can be crafted from two aspects: one is the construction authorities for coloring restriction and supervision, on the other hand is residents for protection and restoration of their house and yard colour. The construction authorities direct color planning from all aspects of rural in-depth investigation, on the basis of public willingness to develop rural chromatography, and strictly regulate the country in the the same time in the process of rural development, color faces fade, fall off, pollution and other problems, and these problems are needed to controlled for keeping the color original, which villagers maintain fundamentally. process of construction in the use of all kinds of color. At

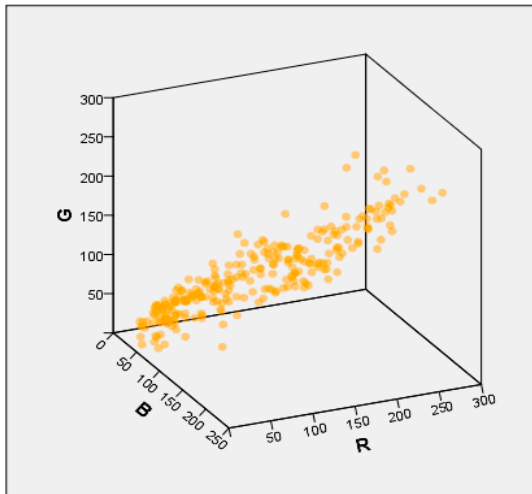


Fig. 4.1. RGB scatter distribution of fabric.

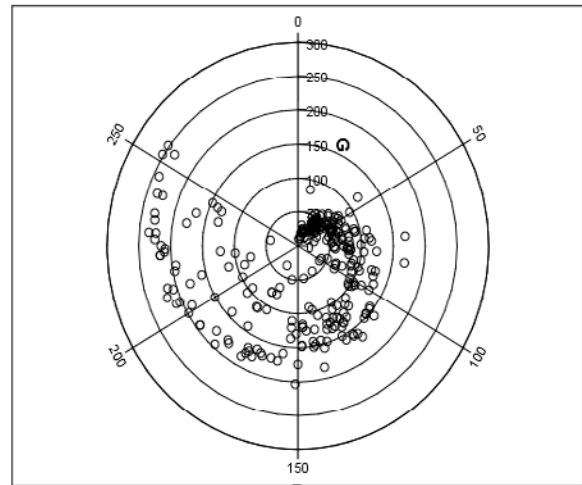


Fig. 4.2. R-G scatter distribution of fabric.

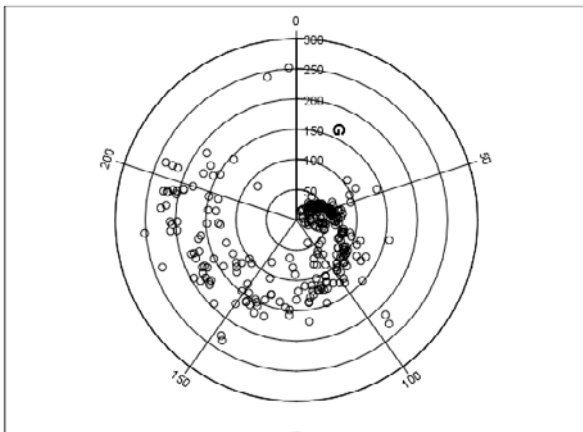


Fig. 4.3. G-B scatter distribution of fabric.

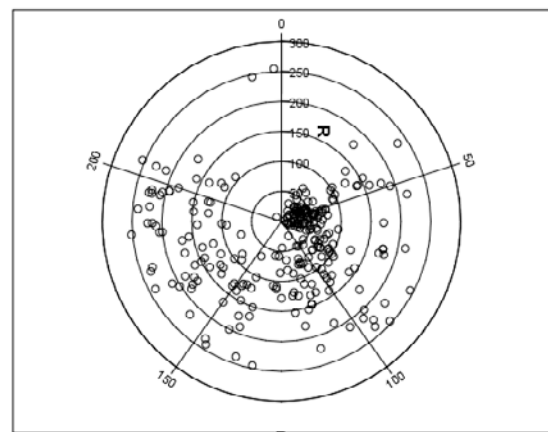


Fig. 4.4. R-B scatter distribution of fabric.

Rural color is different from the urban color, it needs specific treatment at the micro level of specific cases and summarizes specific research methods on the basis of the theory of urban color. In this study, we preliminarily introduced a theoretical and digitized method and provided a relatively simplified research tools for rural color planning under the ideas which are quantitative-based and supplemented by qualitative. In this study, we firstly involved into a lot of parts and grasping the relevant theoretical knowledge just on the surface, and there are many factors affect the colors such as temperature, area, the residence time in different places. Meerwein, Rodeck (1998) think that culture, habit, fashion, style are important, and Kaya and Crosby (2006) think that the color perception depends on individual and emotion. Because of the lack of experience and other

research omissions inevitably, many problems need to explore in the future.

As to the application for future design in local landscape and rural villages, some research argues that introducing a sustainable rating system is a feasible and workable approach to renewal for the traditional areas. Wang (2015) proposes related criteria from the two rating systems and applies them to the design in a case project. The subsequent results verify the necessity and practicality of this color approach.

Therefore, the next study is planned to build up a quantitative framework and methodology on color design. The recovery method of classical architecture includes the ways of environment, design, landscape and building design.

## Acknowledgements

This research is supported by National Natural Science Fund of China (51408545), the Humanities and Social Science Fund of the Education Ministry of China (15YJCZH102), and the Class Innovation Program of ZJGSU (1040XJ2915074).

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