Applying Classic Art-style Colors to Product Color Planning

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Abstract: The developments of Eastern and Western art-styles are too numerous to mention. They had all the artistic movement that developed drawing, painting, music, sculpture and so on. With regard to design, the art-styles mostly show up in visual arts; on the contrary, they seldom show up on products. The image of products is mostly made up of its appearance, color, and texture, etc. Generally speaking, color plays an important factor in visual image of products. This study selects the most typical art-styles that have the better color presenting in the world such as Neoplasticism, Pop Art, Amis and Ukiyo-e. The four art-styles of this study are set as the color elements of products and use the triangular fuzzy numbers to establish a color-combination design algorithm from art-style colors. By utilizing genetic algorithms, the ideal color-combination with art-style images is obtained and used on product color design. The developed algorithm is written down as a color design consultation interface system in program. The designer can select his/her favorite art-styles and set their weights to search for the best color combinations with the interface system. The purposes of this study is shown as the followings: (1) Explore the representation of the most typical art-styles of Neoplasticism, Pop Art, Amis and Ukiyo-e colors in this study, (2) Based on the art styles and the corresponding weights set by the designer, the algorithm for color design with artistic styles is established, and (3) It can provide an assist for designers in searching for the near-optimal color combination of products rapidly by using computer-aided design.

Key words: Color Planning, art style, fuzzy

1. Introduction

People have come into contact with the type of all-embracing color, whether they are daily necessaries, vehicles or industrial products, between people and color the relationships have been reached inseparably in life. In the current of high consumption the kinds of product are very variety increasingly, a prosperous design promotes the design industry in recent years, and the appearances of many products are much different from the old style. Customers also enhance their requirements to highlight their individual characteristics by product form regarding product style.

Design styles of product are very various, and the appearance design is the most outstanding factor about making out product difference. Luo [1] indicated that color had also been extensively used in the field of industrial design or product design. Although there are many factors in product design such as texture, style, forms and function, color was one of the most important for attracting customers. Colors play an important role for

customers in making decisions on what they like and dislike, and they evoked various emotional feelings [2]. The result of the analysis showed that product color was more influential than product form on product image of mobile phone [3]. Priester [4] indicated that if color was used suitably, that could make the design more exquisite, on the contrary, the excessive color will make the products transmitted the complicated message making people puzzled. The market survey revealed that there were 90% of the consumers that they were careful consideration while purchasing the goods, only 10% of the consumers purchased goods because of impulse for the moment, and among that consumer with planned purchase goods, 60% were influenced by color [5]. Moreover, Holtzschue [6] also indicated that the third rate products with the excellent color had abundant sales volumes usually, but if an excellent product had not well color design, it will not have abundant sales volumes. Synthesizes the above reason, we may know that the product color is an important factor about the visual sensation for dominating the product image, and the color has the enormous importance and the influence in product design.

The developments of Eastern and Western art -styles are too numerous to mention such as New York Pop Art and Japanese Ukiyo-e that are influential art-styles. In addition, many creative styles, design thinking and design form of designers are influenced by all kinds of art-style. “Red Blue Chair” was designed by the master designer Gerrit Rietveld that took the spirit of art in design. Gerrit Rietveld skillfully used the colors of Neoplasticism to chair design that mode the chair design more art spirits. Therefore, based on the reason that both color and artistic are able to make people and product more perfect, this study will make the best use of artistic style of color, so that designers can use this into the product design effectively.

In recent years the computer technology has made great progresses that shorten design development indirectly and easy to use. Therefore, this study will use computer-aided design to the color plan, the study expects to intercept the art-style colors, and through triangular fuzzy numbers establish the evaluation algorithms of a product color matching, and applies computer-assisted to build the consultation system on art-style color planning. The study aims to establish product color in order to provide for designer the suggestions of product color planning.

2. Implementation Procedures

2.1 Select productions of the art-styles

This study will select the most typical art-styles that have the better color presenting in the world such as “Neoplasticism”, “Pop Art”, “Amis” and “Ukiyo-e”, and then will select the well-known arts from the four art-

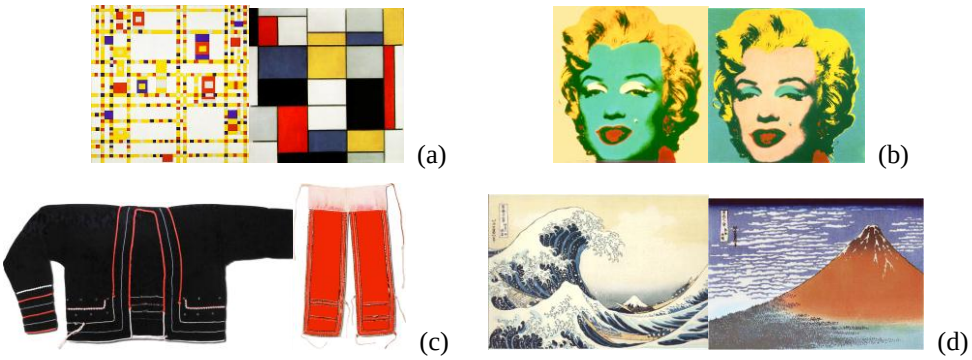


Figure. 1 Four art-styles: (a) Neoplasticism, (b) Pop Art, (c) Amis and (d) Ukiyo-e

styles. Because this study can not obtain the actual arts from the four art-styles, and therefore the resource of arts will gain form the full-color pictures of related literatures, the art pictures as shown as Figure 1.

2.2 Confirm color simples

This study selects that have better color presenting from “Neoplasticism”, “Pop Art”, “Amis” and “Ukiyo-e” and intercepts the representative colors as the color samples of the algorithms. Every area of the arts is compared with standard color patches and analyzed the area by using Adobe Photoshop CS3. The measurement for the parameters of color samples is that sets the most similar color piece as like the picture of literatures in computer and simulates colors by defining the color parameters of L*, a* and b*. The obtained representative color samples are shown as Table 1.

Table 1. Representative color samples of the four art-styles

Art-style	Representative color					
Neoplas-ticism	N.(1)	N.(2)	N.(3)	N.(4)	N.(5)	N.(6)
Pop art	N.(1)	N.(2)	N.(3)	N.(4)	N.(5)	N.(6)
	N.(7)	N.(8)				
Amis	N.(1)	N.(2)	N.(3)	N.(4)	N.(5)	N.(6)
	N.(7)	N.(8)				
Ukiyo-e	N.(1)	N.(2)	N.(3)	N.(4)	N.(5)	N.(6)
	N.(7)	N.(8)	N.(9)	N.(10)	N.(11)	N.(12)
	N.(13)					

3. Product Color Design Case Studies

3.1 Construct color-combination interface system

In order to search the expected color-combination rapidly and accurately by the program interface, the single-color evaluation algorithms and the multi-color evaluation algorithms are used and written in the VB program. The developed color design interface is shown in Figure 2, and thus the designer can accesses the home page and enters the consultation system on art-style color planning.

Then he / she can select the desired color image of single or multi art-style from Neoplasticism", "Pop Art", "Amis" and "Ukiyo-e", and that are shown as Figure 3. Designers can drag the bar to set the linguistics and weight values of his / her desire after selected the art-style. The linguistic variables are divided into five degrees as very high, high. Medium, low and very low, and the weight values is from 0% to 100%. After selecting the desired linguistics and weight values of art-style, the designer presses the next key and the main color of optimum forecast will be shown at the other windows page. This program interface provides ten main colors of optimum forecast for selecting by designer, and shows their L*a*b* and RGB parameters of the main color, that are shown as Figure 4. After selecting the ideal main color, the designer presses the GO button in order to gain the second color and third color, and then it will be shown at the other windows pages. From the calculation of the fuzzy genetic algorithms, this program interface provides colors of optimum forecast for selecting by designer, and shows the relative color parameters. The iteration trend of GA-evaluation evolution for one color-searching case is shown as Figure 5. It shows the fitness value converges approximately at the 150th generation and the near-optimal colors meeting to the required art-style images are obtained.

Figure. 2 The home page of the program interface

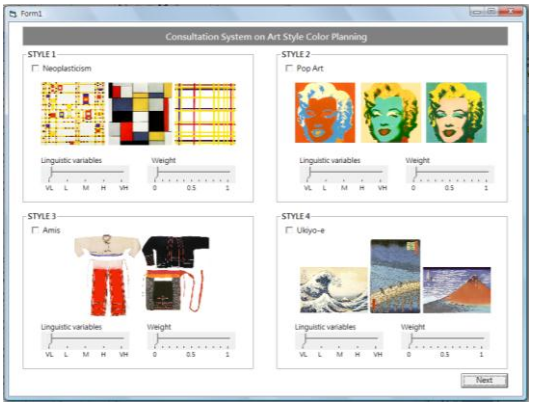


Figure. 3 The consultation system on art-style color planning

Figure. 4 The page of main colors

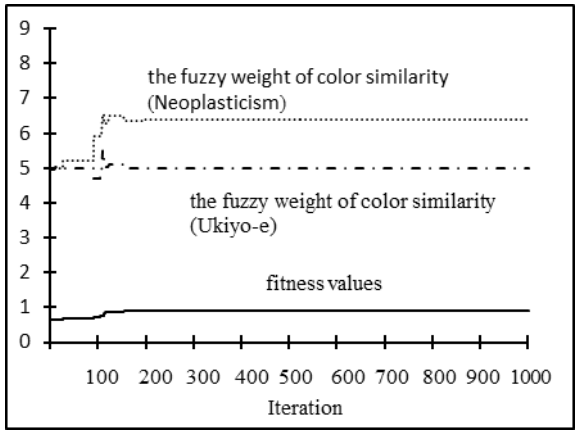


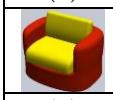
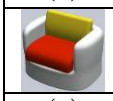
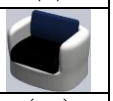
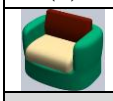
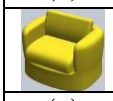
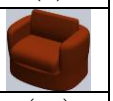
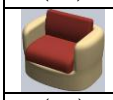
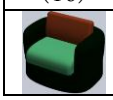
Figure. 5 GA-evaluation evolution for one color-searching case

3.2 Color design on sofa

Designer can select the desired art-styles, linguistics and weight values from the program interface by this study, so that he / she can search the required main color, the second color and the third color. Sofa-color design is taken as the objective product case to demonstrate the effectiveness of this research.

The author randomly sets the linguistics and weight values in the single-color, two-color, triple-color in different art-style or double art-styles. Each different setting generates different color-design solutions. Table 2 shows the corresponding color-design results calculated from the interface program. These forty-eight color combinations on sofa are shown to fifty subjects (17 males and 33 females) of design-related college to investigate the image consistency with the corresponding original linguistics image settings. The questionnaire results show the average deviation of the single-color combination is 0.164. The average single-color deviations are Neoplasticsm / 0.206, Pop art / 0.192, Amis / 0.201, and Ukiyo-e / 0.257, respectively. The average deviation of the double-color combination is 0.126, better than the triple-color combination (0.236). The average deviation of Neoplasticism and Ukiyo-e at the same time in the double art-style color combination is 0.108, and that are the ideal art-style combination.

Table 2. The generated color combinations of sofa

Single Art-style				
A. Single-color combination				
(1)	(2)	(3)	(4)	(5)
				
(6)	(7)	(8)	(9)	(10)
				
B. Double-color combination				
(1)	(2)	(3)	(4)	(5)
				
(6)	(7)	(8)	(9)	(10)
				
C. Triple-color combination				
(1)	(2)	(3)	(4)	(5)
				
(6)	(7)	(8)	(9)	(10)
				
Double art-styles				
(1)	(2)	(3)	(4)	(5)
				
(6)	(7)	(8)	(9)	(10)
				
(11)	(12)	(13)	(14)	(15)
				
(16)	(17)	(18)		
				

4. Conclusions

This study aims to take the color image of art-style into the product color combination, which can make design show the art sense by color. Through the literature, this study selected Neoplasticism, Pop Art, Amis and Ukiyo-e as the resource of samples, and applied the color similarity, triangular fuzzy numbers and genetic algorithms to construct a color consultation system on art-style color planning, so that designer can obtain the desired art-style color and apply to product color planning by the consultation system.

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