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Image Visual Color Design Transmission Based on Artificial Intelligence Statistics

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Abstract One of the earliest and profound groups of people who studied color in painting is painters, which is because painters need to use different colors in the creation of their works. Their profound understanding of color is conducive to the creation of works. Many painters rely on their own experience in color design in their works, with a strong sense of sensibility. In order to make color design more rational, this article use artificial intelligence statistics to study image visual color design. Through experiments, it can be found that compared with computer aided analysis, this article used artificial intelligence statistics to improve user satisfaction with color design in different fields. The satisfaction rate with the use of artificial intelligence statistical technology was above 91%, while the satisfaction rate with the use of computer-aided technology was below 89%. At the same time, using artificial intelligence statistical technology can also improve the value of various types of color information in images, which can better assist in the transmission of different color information and improve the effect of image color display.

Index Terms Color Design Transmission, Image Vision, Artificial Intelligence Statistics, Color Saturation

I. Introduction

Color plays a very important role in understanding the representation of objective objects, and it is one of the important tools for image visual communication. This article uses rich colors to create artistic characters, which can enhance the appeal of art and become a bait for designing eye-catching designs. Color has the scientific function of carrying information and appeal to emotion, and it is one of the bridges to spread abstract information. With the continuous development of technology, more and more image processing algorithms and software are constantly enriching and changing people's lives. The issue of transitioning from color images to grayscale images is a necessary image processing step for many practical applications, and its effectiveness directly affects the effectiveness of subsequent processing. It can be said that artificial intelligence statistical technology has created a novel design method, providing people with a rich and intuitive visual scene. Visual effects that were previously difficult to achieve manually can now be expressed using artificial intelligence technology, bringing a series of changes and benefits to color design. For color design, image vision based on artificial intelligence is a fast and efficient new tool and means, which can transform the color display process from qualitative to quantitative, and the accuracy and efficiency of operation is far superior to human vision. In addition, artificial intelligence has the advantage of handling a large amount of information, which also provides assistance for the transformation and accumulation of color design ideas.

As one of the main expressions of visual forms, color has always been a controversial topic in the art and design circles. From different artistic fields such as painting and sculpture to design fields such as architecture, graphic arts, and movies, everyone has always been paying attention to them. Color research involves many disciplines, and many experts have also conducted research and achieved a series of results. Kuo, Lungwen believed that color was the main visual way to express the quality and emotions of a webpage. Through the experimental analysis of different psychological perception of different colors, he can explore the most suitable web color for browsing. He selected five images for dynamic image web testing to determine the impact of shapes on users' psychological responses to web browsing, and designed the most popular dynamic image composition style [1]. Zhang, Xinxin combined grey theory with Kansei engineering, and based on the brand image of product color, he excavated the macro and micro factors in the decision-making process of product color design. The results showed that the constructed method can be used to guide product color design, comprehensively and quickly meet user emotional needs, and improve the correlation between product color design elements and brand image [2]. Li, Chongyi proposed a weakly supervised color transmission method to correct color distortion. The proposed method reduced the requirements for underwater images and allowed underwater images to be captured at

unknown locations. Through taking underwater images in different scenes, he found that the proposed method produced satisfactory visual effects, even better than the most advanced methods [3]. In order to better express the multicultural images of cultural creative product color design, He, Jintao proposed a correlation analysis method that couples color beauty and visual beauty. Based on the least squares regression analysis method, he studied the mapping relationship between color beauty and visual beauty, used the mapping relationship to obtain key parameters that affect the dynamic changes of color images, and proposed a product color design and evaluation method based on cultural image constraints [4]. Most scholars have conducted various studies on color design, but few scholars have considered the application of artificial intelligence statistical image vision to the design studied in this article.

Other researchers have different perspectives on the research of color design transmission. Ye, Ziang conducted extraction tests on the actual features of image color and shape, further optimizing existing methods in the field of computer vision. This can improve the intelligence of image data mining technology, and combine correlation feedback technology with traditional image data mining technology, greatly improving the accuracy of image feature extraction [5]. Guo, Shihui believed that colorization of indoor scenes had a broad demand in areas such as personalized architectural design. Existing works either require manual coloring of individual objects, or must conform to fixed color patterns that are automatically learned from existing knowledge. This seriously ignores user preferences, so he proposed a representative view selection method based on visual attention [6]. Xue Lei proposed a new method for product shape design and color design based on grey relational analysis and fuzzy theory. Through grey correlation analysis, he effectively analyzed various morphological and color elements that affect the product image, respectively identifying the morphological and color elements that have the most impact on achieving the ideal product image, in order to facilitate the optimization of morphological and color design in the product design process [7]. Experts and scholars have conducted research on color design, so there is a theoretical basis for selecting them for research in this article.

The use of color is one of the most important visual carriers in image visual design, playing a unique role in the expression and output of information. By applying the rich characteristics of color and the basic principles of color application, good results can be achieved in image visual transmission. The use of eye-catching colors can provide better guidance and achieve public awareness of the design brand. This can humanize color design, enhance the sensory stimulation of color design works, enhance people's purchasing desire, and thus achieve the economic value of the product. This article uses artificial intelligence statistical technology to improve the accuracy of detecting different color saturation, enhance the quality of images, and allow better transmission of color information in image design.

II. Methods Related to Image Visual Color Design

II. A. Artificial Intelligence

Artificial intelligence is the basic theory and methodology for simulating human intelligence using computer hardware and software [8], [9]. Artificial intelligence can be said to be the ultimate goal in the field of computer development. The purpose of the initial invention of computers was to help humans quickly complete simple but cumbersome computing tasks. However, with the continuous emergence and improvement of computer performance and related theories, people's expectations of computers have become increasingly high [10], [11]. As computers have been able to perform more and more intelligent tasks similar to human thinking, it has become one of the latest disciplines. Now, the development of artificial intelligence is more intelligent. The development of artificial intelligence is the product of tool evolution and updating, and tool evolution is a process of continuous innovation [12]. At the same time, artificial intelligence is closely related to computer science and technology. It is a rapidly developing frontier science that benefits from computer science. Through scientific research, it has been found that artificial intelligence can simulate human intelligence and help computers develop in the direction of the human brain.

II. B. Color Design

The basic concepts and laws of the three elements of color are important factors in the construction of various basic theories in color design [13], [14]. Artificial intelligence technology can be used to provide an intelligent design platform for image visual color design, providing more accurate and convenient tools for color design delivery. The three elements of color are the three most fundamental factors that constitute the relationship between colors. At the same time, they are also the basis for understanding the concept of color. Understanding the three elements is conducive to color design and transmission.

Chromatic aspect usually refers to the appearance of a color, and each color has a different visual characteristic from other colors. The name that can accurately express a specific color is the biggest feature of color [15].

Brightness refers to the brightness or darkness of a color. Changes in brightness usually vary in levels, ranging from white to black to 9 or 13 levels [16]. Purity, also known as saturation, refers to the clarity of the tonal sensation and the percentage of different color components in a color. The various monochromatic lights in the visible spectrum are the purest colors. The three characteristics of color: hue, purity, and lightness are inseparable, and the relationship is also inseparable. Therefore, when conducting color design, artificial intelligence statistics and computers can be used to quantify these three elements, fine-tuning the various colors needed for design delivery, and achieving a more perfect color concept for designers.

The hue is actually the circumferential angle of a three-dimensional model, where one degree represents the hue of this color [17]. It can be represented by the following mathematical formula:

$$H^{''} = fg^{-1}\frac{(x''-x_n)cos30^{\circ}}{(x'-x_n)-(x''-x_n)sin30^{\circ}} + \mu_i \tag{1}$$

Among them, x' and x'' are the colors with the highest or second highest content among the three primary colors, x' is the red or green light, x'' is the green or blue light, and x_n is the color with the lowest content.

Set the two colors to be mixed as endpoint colors, named R_{start} and R_{end} respectively, and the red component calculation formula for the mixed color R_k is:

$$R_k = R_{start} + (k-1) * \left(\frac{R_{end}-R_{start}}{Num-1}\right) \tag{2}$$

In the formula, $1 \le k \le Num$, when $k = 1$, $R_k = R_{start}$; When $k = Num$, $R_k = R_{end}$.

When the direction of change of the Q component and the hue loop is consistent, the formula for calculating the hue component Q_k of the mixed color is:

$$\begin{cases} Q_k = Q_{start} + (k-1) * \left(\frac{Q_{end}-Q_{start}}{Num-}\right) & Q_{end} \ge Q_{start} \\ Q_k = Q_{start} + (k-1) * \left(\frac{(360-Q_{start})+Q_{end}}{Num-1}\right) & Q_{end} < Q_{start} \end{cases} \tag{3}$$

II. C.Image Vision

In a broad sense, image refers to the human perspective, the objective reflection of human vision on natural landscape, and the important source of human cognition of the world and themselves. A picture is usually a distribution of reflected or transmitted light from an object, while an image is an impression formed in the human brain by images accepted by the human visual system. Many things in people's daily life are embodied in images. In a narrow sense, images emphasize maintaining the original appearance and details of things more than graphics, so images often have a stronger appeal. In the art field, images refer to three-dimensional, realistic shadows or visual objects with complex and rich textures, such as photographs, factual illustrations, and so on. Image is one of the important language forms in image visual design, which has the function of conveying images and expressing information. As one of the important tools for designers, image vision can bring many benefits in the production of image works by using image symbols for in-depth refinement. Designers refine their design creativity from aspects such as graphic production methods and cognitive psychology, which would make the design of each image symbol not disorderly and unfounded. However, due to differences in the content and form of expression, the image symbols designed by designers are also different.

In order to improve the color of an image, it is necessary to smooth the image. According to the color requirements of the red, green, blue, and RGB modes, smooth visual processing of images is performed in the light source component and the reflection component. The specific expression is as follows:

$$\begin{cases} R_F = x_1R + y_1G + z_1 \\ G_F = x_2R + y_2G + z_2 \\ B_F = x_3R + y_3G + z_3 \end{cases} \tag{4}$$

In the formula, the hue value in the standard color card is converted into an RGB value, expressed as R_F, G_F, B_F.

Consider the color space of an image as a component, and rate the visual comfort conveyed by the design when the image color is asymmetrical. The specific expression is shown below.

$$R_i = \frac{\sum_{i=1}^{M}(A_i-\overline{A})(B_i-\overline{B})}{\sqrt{\sum_{i=1}^{M}(A_i-\overline{A})^2}\sqrt{\sum_{i=1}^{M}(B_i-\overline{B})^2}} \tag{5}$$

Among them, A_i represents the specific score of visual communication comfort when the image color is asymmetric.

By adjusting the reflection component of the image, thereby improving the local contrast of the image, and completing color enhancement of the image without distortion, the calculation formula is as follows:

$$H_{x,y} = m_{x,a}R_k + m_{x,b}G_k + m_{x,t}B_k, (k = 1,2,\cdots,K) \tag{6}$$

K is the number of elements in the set $H_{x,y}$.

Gradient edge detection is performed on a color image using the following formula:

$$Hf_t(x_i, y_i) = \sqrt{(R_x - R_y)^2 + (G_x - G_y)^2 + (B_x - B_y)^2} \tag{7}$$

$Hf_t(x_i, y_i)$ represents the gradient of the pair of edge points of pixel x_i and pixel y_i, and R, G, B represent the values of the three RGB components of the corresponding pixel in the RGB color space.

III. Application of Artificial Intelligence Statistics in Image Visual Color Design and Transmission

Vision is one of the important windows for people to understand the world. The objective world mainly forms information through people's visual institutions, thereby causing people's sensory awareness. Any object has external factors that affect its own information transmission, and information transmission requires these external factors in order to perfectly convey the overall concept of things and display the state of matter, life, existence, and motion to people. Otherwise, there is a possibility of deviation. In modern people's lives, color occupies a very important position in people's lives, and it is closely related to people's lives. In all modern design fields such as product design, environmental art design, color design is indispensable. Excellent color design can enhance the artistic appeal of products and stimulate consumer interest. The traditional flow chart of image visual color design based on artificial intelligence statistics is shown in Figure 1.

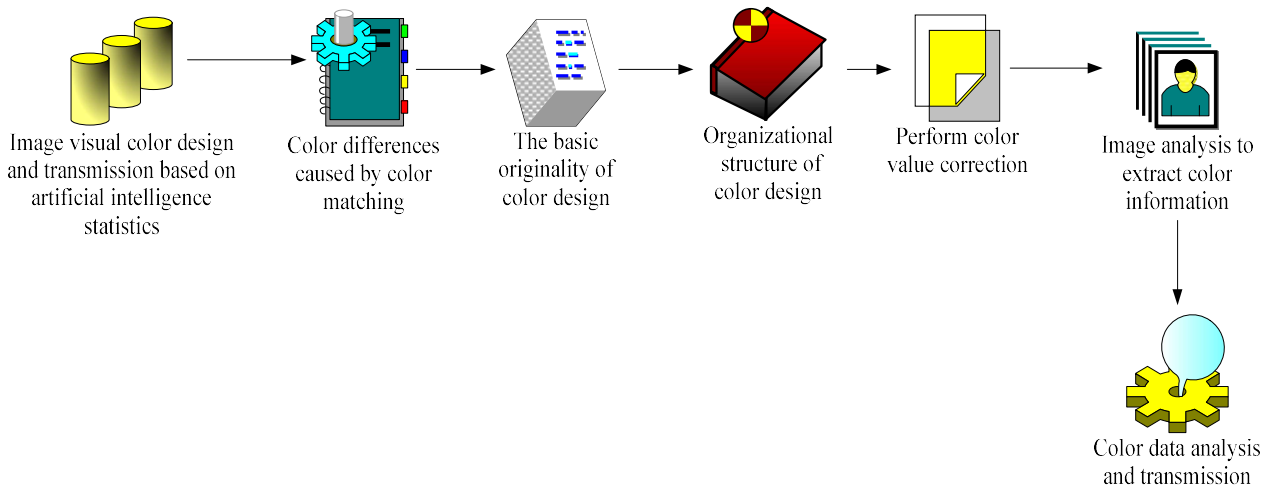


Figure 1: Traditional flow chart of image visual color design based on artificial intelligence statistics

Color is one of the necessary elements for image visual transmission. In image vision, along with graphic text, visual language is used to express the demands of design. Proper color design and matching can bring strong visual impact, attract users' attention, better guide product sales, and bring very good economic benefits to the enterprise. The visual communication effect can be guaranteed by stimulating the senses. Correct color application and matching is the key to product design and expression. Good design requires the application of rich color theories, which can achieve the integration of color transmission and visual transmission.

(1) It can better convey product attributes

Applying artificial intelligence image visual design to color design is conducive to strengthening the internal relationship between product content and attributes. At the same time, many types of goods have specific concepts and specific habitual colors in the minds of consumers. People would judge the specific nature of goods based on these habits. Due to long-term publicity and emotional accumulation, commodity color has become a specific concept and visual signal for people to judge the properties of goods.

(2) It is conducive to achieving overall uniformity in color design, but also partially prominent

The user's visual experience ultimately depends on the overall color design, and then information is transmitted through color design. Using artificial intelligence for image vision can best reflect the overall color characteristics in

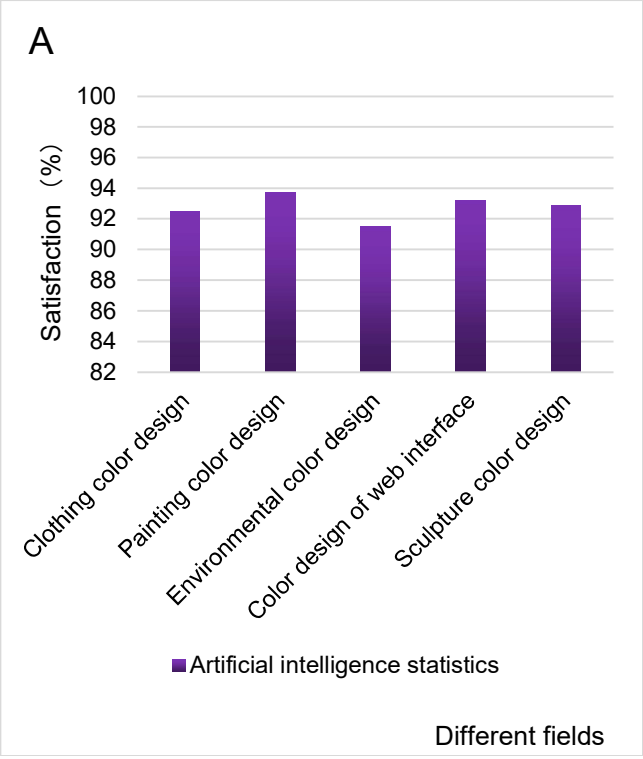
image color design, allowing users to gain a better color design experience. In the process of coordinating overall colors and local colors, it is possible to use artificial intelligence to unify local and overall colors. At the same time, in order to make local colors more prominent in color design, artificial intelligence technology is generally used. This article uses it to better achieve the highlighting of local colors and bring users better color impact. The reason for highlighting the local part is that if only emphasizing the unity of the overall tone during color design, it would affect the vitality and vitality of the entire color design. This requires appropriate adjustments, using artificial intelligence image vision for small area color changes. Through the comparison of the whole and the part, the design screen is made more prominent, better reflecting the main body of the design.

(3) Color and Psychological Association

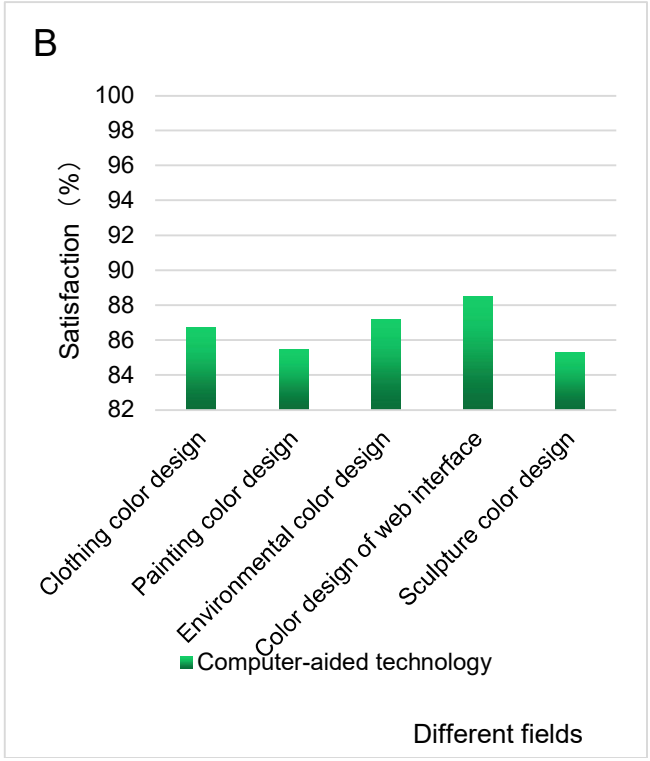
As an objective existence, color exists in all aspects of people's lives. The object representation and internal spiritual connection represented by color in artificial intelligence image visual design are far beyond the level of general art appreciation. Only by skillfully using the symbolic and associative functions of color can designers better design and convey colors. This requires designers to have the ability to organize and refine colors, which is the only way to express the beauty of color in the transmission and design of colors, thereby designing an ideal work. The specific association of colors is the association of specific things through the colors seen. Abstract association refers to the association from visible colors to abstract concepts. The concrete and abstract associations of colors are shown in Table 1.

Table 1: Concrete and abstract associations of colors

Colour	Figurative association	Abstract association
Red	Fire, sun, red skirt	Bright, warning
Orange	Oranges, persimmons, fruit juice	Positive, happy and mature
Green	Forests, lawns, leaves	Life, vitality, vigor
Black	Hair, dark skin, coal	Mystery, fear, abyss
White	Snow and white clouds	Pure and sacred



A: Artificial intelligence statistics



B: Computer aided technology

Figure 2: Comparison of user satisfaction with the application of the two methods in different fields of color design

IV. Experiment of Image Visual Color Design Transfer Based on Artificial Intelligence Statistics

Color design involves a wide range of industries, and many fields involve color design. Using different methods to conduct color design can produce different effects. This article uses artificial intelligence statistical image vision for color design in different fields, in order to better convey color information to users, bring them a better color experience, and improve user satisfaction. Using artificial intelligence statistical technology is beneficial to improving user satisfaction with color design. This article conducts a comparative study with computer-aided technology, focusing on five aspects: clothing color design, painting color design, environmental color design, web interface color design, and sculpture color design. The specific satisfaction comparison results are shown in Figure 2.

As shown in Figure 2, applying artificial intelligence statistical technology to color design in different fields can improve user satisfaction with color design in these fields, which is much higher compared to computer assisted technology for color design. As shown in Figure 2A, the satisfaction rate using artificial intelligence statistical technology is above 91%; As shown in Figure 2B, the satisfaction rate using computer-aided technology is below 89%. Among them, the use of artificial intelligence statistical technology allows users to have the highest satisfaction with painting color design, with 93.75%, which is 8.25% higher than the use of computer-aided technology; The use of artificial intelligence statistical technology allows users to have the lowest satisfaction with environmental color design, only 91.5%, but still 4.3% higher than the use of computer-aided technology. Using computer assisted technology to make users satisfied with the color design of the web interface is the highest, with 88.5%. It is still 4.7% lower than using artificial intelligence statistical technology; The use of computer-aided technology to make users feel the lowest satisfaction with sculpture color design, only 85.3%, which is 7.55% lower than using artificial intelligence statistical technology. The above data indicate that using artificial intelligence statistics can better assist different fields in color design, enable better transmission of color information, and improve user satisfaction.

In order to further image vision to find the color design information transmission, this paper would use artificial intelligence statistical technology to study the brightness, contrast, saturation, hue and information entropy of image color. This article mainly studies a character image. In order to better reflect the advantages of artificial intelligence statistics for the transmission of image color information and improve the quality of colors in images, this article aims to make images better viewed for display design transmission. This article compares it with computer-aided technology, and the specific comparison is shown in Figure 3.

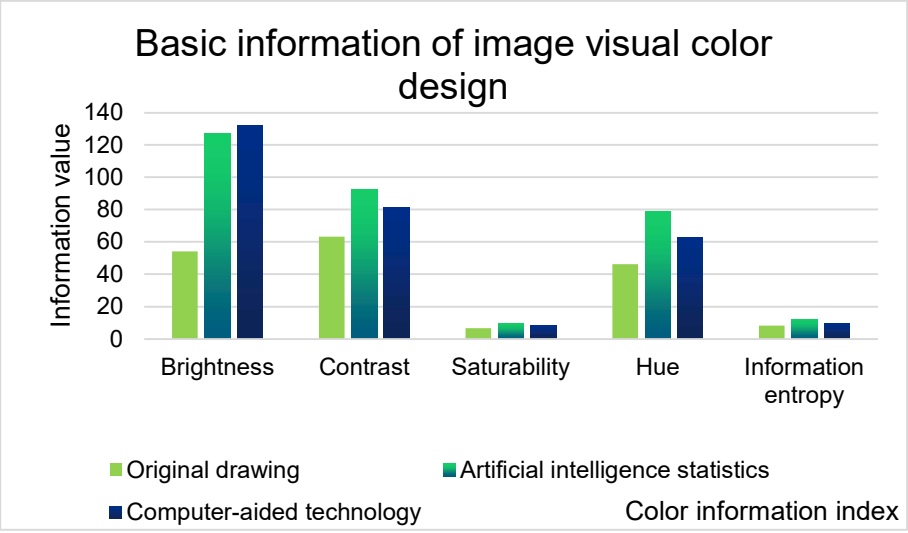
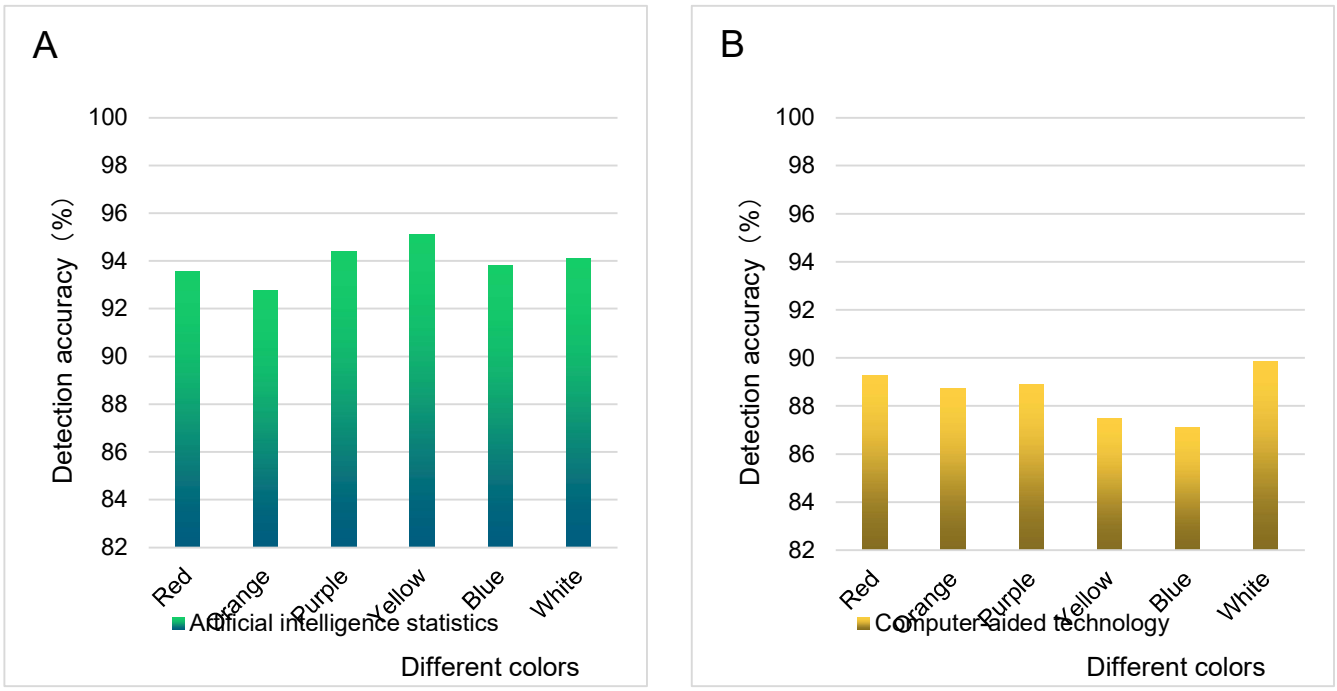


Figure 3: Specific comparison of different methods for improving the basic information of image visual color design

As shown in Figure 3, both techniques improve the color information values in the image compared to the original image. There are still differences in the specific improvement effects. Although using artificial intelligence statistical technology to improve the brightness value is not as high as computer-aided technology, the brightness improvement of an image should be adjusted based on the image color, and the higher the better. Excessive exposure may result in severe image exposure, affecting the clarity of the image. Using artificial intelligence

statistical technology can reasonably enhance the clarity of the original image based on its visual characteristics. Artificial intelligence statistical technology can also better adjust the brightness value, allowing the brightness of the image to reach the optimal state, making the final color presentation of the image superior to the original image. At the same time, for the saturation in the image color information, the larger the value, the better the image color display. Although the image saturation of computer-aided technology has also increased, there are still shortcomings compared to artificial intelligence statistical technology. In summary, artificial intelligence statistical technology can adjust the brightness, contrast, and hue of image colors to make them as close to the original image as possible, enhance the color intensity of the original image, and provide strong color effects for color design transmission.

This article uses artificial intelligence statistics to help image visual color design better transfer, which is conducive to better detection of different color saturation. Improving the accuracy of detecting different color saturation can help designers better understand the saturation of the colors used, which is beneficial for displaying the effectiveness of color design. Especially in product design, accurately grasping the saturation of different colors can help product color design better and better attract consumers' attention. In order to highlight the accuracy of artificial intelligence statistics for detecting different color saturation, this article compares it with computer-aided technology. This article mainly tests colors such as red, orange, purple, yellow, blue, and white. The specific saturation detection accuracy is shown in Figure 4.



A: Artificial intelligence statistics

B: Computer aided technology

Figure 4: Comparison results of different color saturation detection accuracy

As shown in Figure 4, the accuracy of using artificial intelligence statistical technology for detecting image color saturation is much higher than using computer-aided technology for detection. As shown in Figure 4A, the accuracy of using artificial intelligence statistical technology is above 92%, while as shown in Figure 4B, the accuracy of computer-aided technology is below 90%. Among them, using artificial intelligence statistical technology has the highest accuracy in detecting yellow saturation, with 95.12%, which is 7.61% higher than using computer assisted technology; The accuracy of using artificial intelligence statistical technology to detect orange saturation is the lowest, only 92.78%, but it is still 4.04% higher than using computer-aided technology. Using computer aided technology to detect the saturation of white has the highest accuracy, with 89.86%, but it is still 4.23% lower than using artificial intelligence statistical technology; The accuracy of using computer-aided technology to detect blue saturation is the lowest, with 87.12%, which is 6.7% lower than using artificial intelligence statistical technology. By analyzing the above data, it can be found that using artificial intelligence statistical technology can better improve the accuracy of detecting different color saturation in color design, help designers

better use different colors for product color design, and facilitate the transmission of color design information through the product.

V. Conclusions

The conception methods of color design are rich and colorful. In order to better conduct color design, this article would study image visual color design based on artificial intelligence statistics, using artificial intelligence statistical technology to improve the different information values of image colors. This can help images have better visual transmission, allowing users to receive different color information. At the same time, using artificial intelligence statistical technology can also improve the accuracy of detecting different color saturation in color design. It helps designers better use different colors to design products, design more perfect products, and stimulate users' desire for consumption.

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