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Summary of the Influence of Image Subject Ratio on Design Evaluation

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Abstract

With the rapid development of the information age, images and animations have become the mainstream way of product display at present. At the same time, the development of image processing and technology makes the rapid processing of images become a reality. Through image processing, the proportion of the image subject to the whole image is calculated, and the image sample and its proportion are obtained. A more accurate psychological model of users' needs is obtained by using the joint experiment of eye movement and EEG, and the influence of image subject ratio on users' information transmission is determined. The purpose of this study is to provide reference and suggestions for product design publicity pictures, and to help designers design products that meet users' emotional demands from a user-centered perspective.

Keywords

Proportion of Image Subject; Image Processing; Eye Movement; EEG; Information Transmission.

1. Introduction

The formation of images is not the reproduction of physical meaning, but the biological response of people's visual organs, which arouses the audience to produce a psychological effect between black and white and color of image form, real objects and visual graphics. This visual manipulation technique, which uses physical kinetic energy to achieve psychological efficacy through physiological functions, completes people's response to the desire to copy the real world and meets people's psychological needs for real images [1].

The gradual development and continuous reform and improvement of images have satisfied people's desire to observe the world visually. People express the spiritual world of nothing, invisibility and colorlessness in a limited image space by using the techniques of material, tangible and colorful. At the same time, in the limited image space, with the techniques of nothing, invisibility and colorlessness, the real world with things, shapes and colors is expressed.

As an indispensable part of image production, picture composition plays a major role in image production [2]. It can give full play to the application of color matching and light and shadow design, and enhance the depth and sense of space of the image.

2. Determine the Factors of Image Composition

2.1. Picture Composition

The name composition comes from a course in western painting, which is called composition [3]. With the development of society, composition has become a term of plastic arts. Its meaning is to combine the requirements of theme and subject, and connect the images you want to express, thus forming a complete and coordinated picture.

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The five elements of a picture: subject, companion, foreground, background, and blank space, are to arrange the elements of various pictures reasonably in order to achieve a harmonious effect.

The subject is the main object in the picture. Among the five elements, the subject is the most important and needs to be highlighted. The prominent subject is mainly divided into two types: direct and indirect. Accompanying body is the secondary performance object in the picture, which is closely related to the main body, but only plays a foil role. The foreground is generally located in front of the subject in the picture, closer to the lens. The background is generally located behind the main body in the picture, far away from the lens. Finally, the blank space is to leave the meaningless parts in the picture. Appropriate blank space can make the picture more concise, the subject more prominent and the audience's imagination more space.

2.2. Image Segmentation

Through the analysis of landscape image composition, we know the content and knowledge of image segmentation. Image segmentation refers to dividing an image into multiple regions, so as to extract meaningful objects for advanced computer vision tasks. In the research and application of images, people are often only interested in some parts of the image, which are generally called targets. In order to identify and analyze the target, it is necessary to separate and extract the relevant areas, and further use the target on this basis, such as feature extraction. Image segmentation refers to the technology and process of dividing an image into regions with different characteristics and extracting interested objects. The characteristics can be gray scale, color, texture, etc. The target can correspond to a single area or multiple areas. Image segmentation is the basic prerequisite for image recognition and understanding.

By obtaining the gray values of three RGB channels of each pixel, etc. Through the processed images such as grayscale images, they are imported into the image segmentation processing program, that is, the proportion of the required color area size in the picture to the whole picture size is calculated.

2.3. Research Process

The obtained image data needs to be processed firstly. In the aspect of composition, the subject is determined in a certain composition, for example, the product subject is determined as the intersection of diagonal composition to eliminate composition interference. Unify the overall size and pixel size of the image, remove other contents except the main body, only keep the main body of the image, and treat the background as a single color. The main body of the image is processed in grayscale, and the main body and other parts except the main body are made into two colors through the processed images such as grayscale images, which are imported into the image segmentation processing program, that is, the proportion of the required color area size in the picture to the whole picture size is calculated.

3. Experimental Treatment

Through the processed images, the viewer is experimented, and the subconscious thoughts of the viewer can be mined through eye tracking and EEG experiments, and the experimental data can be obtained, and the internal needs and thoughts of the viewer can be obtained by analyzing the experimental data. Through the joint experiment of eye movement and EEG, the experimental results can be more credible, and the psychological needs of users can be more reliably tapped.

Researchers such as Yang Mingqing, Li Lin, JASON ZHANG, Chen Ling, Wu Zhunguo [4] put forward a method to build a perceptual image prediction model from a more objective eye-brain physiological cognitive perspective in order to more accurately predict the perceptual

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image when users interact with products and help designers design products that meet users' emotional demands from a user-centered perspective.

Semantic difference analysis has the advantages of simple, fast and intuitive operation, but because it is based on subjective evaluation, the results are easily influenced by individual cognitive differences, and this method depends on the willingness and ability of users to describe the feelings caused by products [5]. In addition, due to the complexity of cognitive processing, this method can not accurately obtain users' image cognitive feedback and tacit knowledge [6]. Because the visual system is closely related to many advanced brain functions, Therefore, the combination of EEG and EEG topographic map technology can more effectively explore the unconscious processing mechanism of users' perceptual cognition and more accurately mine the tacit knowledge in unconscious cognition [7]. Accurate prediction of perceptual images is helpful to the classification of directional perceptual design materials and the improvement of controllability of perceptual images. The study combines EEG and EEG topographic map technology as the key means to evaluate image cognition. Establishing a more accurate product perceptual image prediction model is a further study of perceptual image. This model can solve the problem that designers lack the support of user data in the process of conceiving product form, thus avoiding the need for designers to rely on subjective decision-making to choose the final scheme.

Indian researchers Dhruv Mehra 'a, B, Ashutosh Tiwari 'b, C, Deepak Joshi 'b, C, * [8] and others have studied the temporal relationship between eye movements recorded by EEG and EOG, and the EEG signals from the occipital lobe of the brain are processed to understand the relative appearance of EOG and EEG signals during the transition period. Referring to EOG detection, dipole sources in occipital lobe region are estimated from independent components, and then clustered by K-means algorithm. The dynamics of dipoles in pillow clusters in different frequency bands reveal significant desynchronization in β and low γ frequency bands, followed by resynchronization. This transition behavior is consistent with the instantaneous characteristics in EOG signal that suggest that the eyes may saccade rapidly. Through the joint experiment of EEG and eye movement, this paper studies the neural correlation, which shows that the instantaneous characteristics of EEG and eye movement are consistent and show correlation when doing the same work.

At the same time, the combined application of EEG and eye movement can also help the later decision-making, evaluation and prediction.

4. Experimental Verification and Evaluation

4.1. Experimental Verification

Tang Bangbei, Guo Gang, Wang Kai [9] and others verified the experimental results of the joint experiment of EEG and eye movement, established a multi-dimensional comprehensive evaluation model of user experience in automobile industry design combining psychological and physiological evaluation indicators, and checked the model. The experimental results show that the subjective indicators of user experience, eye movement and EEG indicators can be mutually verified in the selection process of automobile industry design scheme, which makes the evaluation results more objective.

4.2. Image Evaluation

In the evaluation of images, Lin Zhao, Shang Meimei, Gao Fei [10] and others have studied the photo quality evaluation (PQA) in order to calculate and accurately evaluate the image quality from the aesthetic point of view. A new end-to-end learning framework for image synthesis representation is proposed. In particular, we build a completely connected graph based on depth feature in convolutional neural network (CNN). Learn the data set through deep learning,

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and evaluate and judge the image. Among various aesthetic attributes, image composition is considered to be the most important one. Image composition describes the global layout of an image about an area or an object. Some well-known composition rules include trisection, golden section and diagonal rule [11]. Researchers have made various efforts to calculate image composition representation. By constructing a fully connected graph based on depth features to represent the image composition, and learning it in an end-to-end way to evaluate the photo quality.

5. Conclusion

Through reading the literature, we know that there is something to be studied in the evaluation of image subject. In the whole evaluation process of image subject, the image is pre-processed by image processing and image segmentation algorithm, and a reasonable experimental image is obtained. Then, the potential evaluation data of user psychology on image subject is mined by eye movement and EEG experiments, and the experimental results are obtained by analyzing the data. The experimental results are verified by multi-dimensional comprehensive evaluation model, and the research results are obtained. It is helpful for designers in the subsequent design process.

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