

# Effective Application of Dynamic Visual Elements in Web Design

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**Abstract.** Through the study of the category and composition of graphic elements in web design, this paper discusses the psychological response, information guidance and auxiliary communication role of graphic elements in the network space. This paper introduces a method of representation of visual elements in dynamic scenes based on attention sequence. A method of constructing observation vector based on multiple visual elements is proposed. Secondly, the text graphics and music graphics of information graphics in web interface design are designed. Aiming at the information graph and interaction design in the network environment, the concept of information graph is put forward. And the emotion expression of the information graph is designed in detail. The network interface proposed in this paper has achieved good effect in visual expression and obtained a high degree of user satisfaction through an example.

**Keywords:** Dynamic Visual Elements; Web Design; Visual Communication; Information Transmission; Attention Sequence.

## 1. Introduction

With the continuous growth, the web page has gradually become a new performance and application place. At the same time, the huge amount of information resources on the Internet, the convenience of graphic interaction, the speed of communication and high efficiency, all of which put forward new challenges for the performance and application of visual elements in page design. The emergence, development and maturity of emerging technologies such as Java language, HTML5 and virtual reality modeling language provide the corresponding technical basis for the page to become more vivid and interesting [1]. In addition, text, pictures, graphics and colors are an important part of the visual elements of page design, and their combination and utilization will affect the final presentation effect of the page layout, but also affect the web user's first impression of browsing, the self-promotion of the website and the specific effects of operation purpose and goal performance. In the current web interface, the most important information is the information conveyed by the interface, and the main interface elements and interface design in the interface must follow the interface law. The traditional cognitive psychology based visual communication design method of page interface has less emotional communication and interaction with users, resulting in low user satisfaction. Image beautification technology is a personalized way of visual communication, which can enhance the emotionality and interactivity of web page visual communication design and improve user satisfaction [2]. The visual attention system is to imitate the selective attention of the human eye, and imitate the alternating working mechanism of its pre-attention and attention. Through some simple operations on the edge of the field of view, the next focus and the scene of the lower center pit are determined, so as to generate a series of center pit images. This paper presents a new graphical processing scheme. Then, an image feature set composed of attention is proposed to describe the image feature set. This method improves the visual expression and design effectiveness of the website.

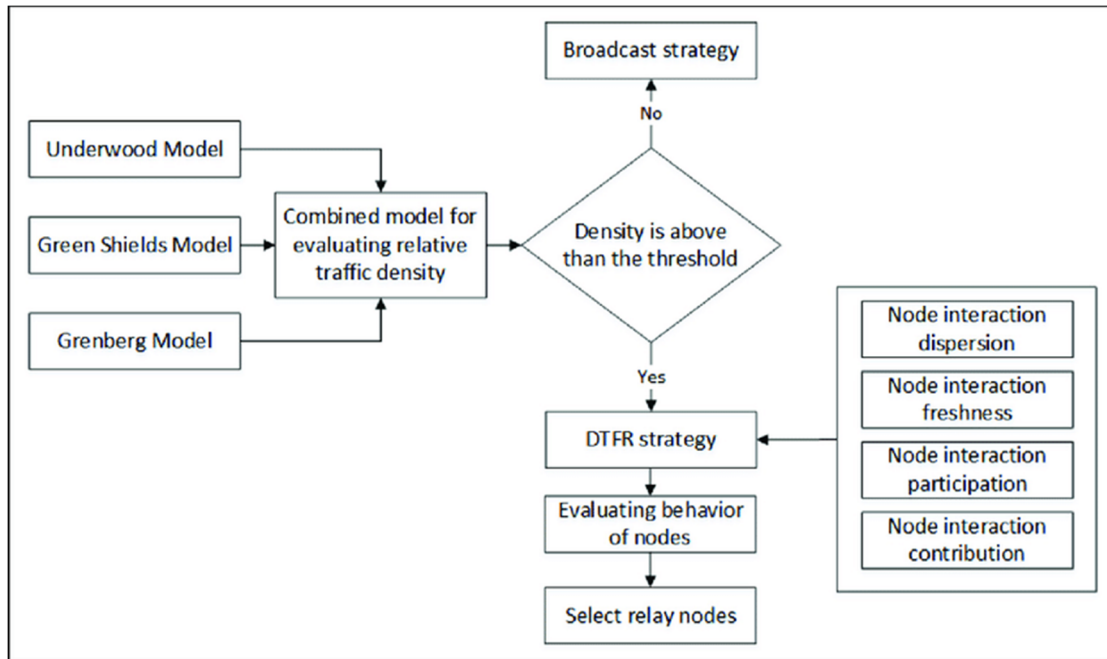
## 2. Analysis of Visual Elements of Website Beautification

### 2.1. Message Passing Modes in the System

In the process of web interface visual communication design, its information transmission mode is: the designer converts the information into visual language, then encodes it into a graphical web



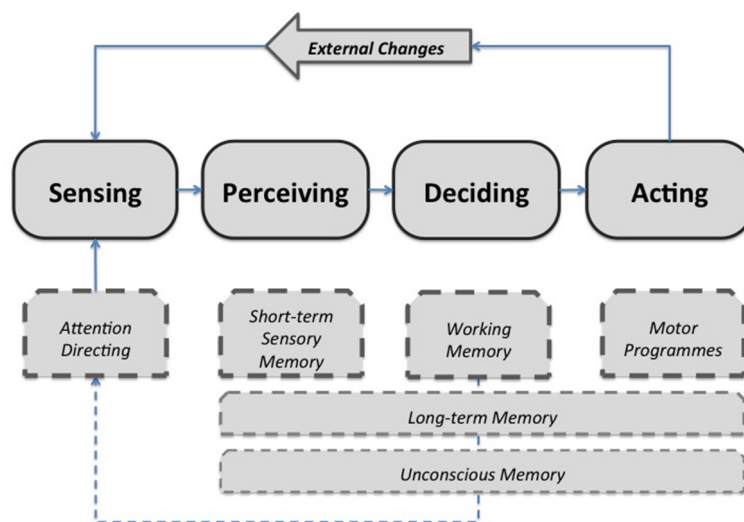
interface, and then the user decodes and converts it to obtain the valuable information needed [3]. The specific process is shown in Figure 1 (image cited in A data dissemination mechanism based on evaluating behavior for vehicular delay-tolerant networks).



**Fig 1.** Information transmission mode in network interaction

The process can be accurately described through the diagram, so as to realize the transmission and reception of information. The interaction between designers and website interfaces can be regarded as of transforming . The page can be seen as the process of transforming [4]. These thought of as "coding" processes, which can be used to express the visual communication of the website in a direct way.

## 2.2. Design of Message Acceptance Mode



**Fig 2.** Human information processing system

When the image content on the page attracts attention, people will understand the image content according to their own needs. And in a rational way to interpret the picture content, so as to transform the picture content into knowledge. Figure 2 shows the human information operating system

including sensory organs, central nervous system and mobile organs [5]. The central nervous system controls the sensory organs, collects external information, processes the information through the central nervous system, and finally realizes the identification, memory and analysis of the information, and transmits the relevant processing commands. In the process of visual communication, the focus attention is to visually interpret the visual information in the Web interface, which leads to the psychological behavior related to the Web interface. According to physiological reasons, the eye flow is regular, showing the characteristics of visual flow. In the high-quality web interface visual communication design, it should ensure that the visual flow is clear and intuitive, and image beautification technology can play this effect to the extreme, the visual becomes more concise and beautiful, thereby increasing the interest of users. At the same time, through the use of image beautification technology, users can enhance the "decoding" speed of network content and the understanding of network content.

### 3. Dynamic Visual Element Information Graphics and Interactive Design

#### 3.1. Tips and Feedback

Prompt and feedback are the output results of the interface, which is composed of interface elements, sound and vibration, and is the process of information interaction between the user and the page. Page Prompts and feedback on the page include information, warnings, and acknowledgements. The user works with the presentation elements within the interface to obtain visual results and gather information tips from areas such as charts and links [6]. In the prompt and feedback, the chart can bring help and perception to the user, so as to ensure that the user can efficiently collect the feedback information and carry out follow-up actions. Proper use of the diagram ensures that users can respond quickly to their actions. When the user enters the information, the right side will generate the relevant feedback message. If the information is entered incorrectly, a Red Cross icon will appear to explain the error and warn. Graphics are used in the design of page interaction.

#### 3.2. Emotional Design of Image-based WEB Interface

Therefore, when using image beautification technology for page design, users' feelings and emotional feelings generated by interaction with the page should be combined to design users, so as users can obtain pleasant emotions [7]. The use of pictorial way users interact shows a certain emotionality. The visual communication formed can improve the product. when the Taobao page search is not found, an emoji can be used to ensure the emotional exchange between the product and the user, so that the user will have a feeling of being understood. In this way, users' feelings of loss caused by not being able to search for what they can find can be alleviated, thus improving users' satisfaction with Taobao pages.

### 4. Image Acquisition Algorithm of Dynamic Visual Elements

#### 4.1. Algorithm Design

Visual attention is a continuous cycle of attention. In the process of pre-attention to visual attention, the image is firstly fuzzy clustered, and then some alternate boundaries are obtained by boundary detection. And rectangular area to circle, the range of this rectangle is called the field of view image [8]. The mathematical morphology is based on the morphological elements of morphology to analyze the image. Assume that  $A$  represents the input grayscale image, and the structural element is represented by  $f$ . Then there is grayscale morphological expansion operator

$$F1 = (A \oplus f) - A \quad (1)$$

Grayscale morphology corrosion operator

$$F2 = A - (A \ominus f) \quad (2)$$

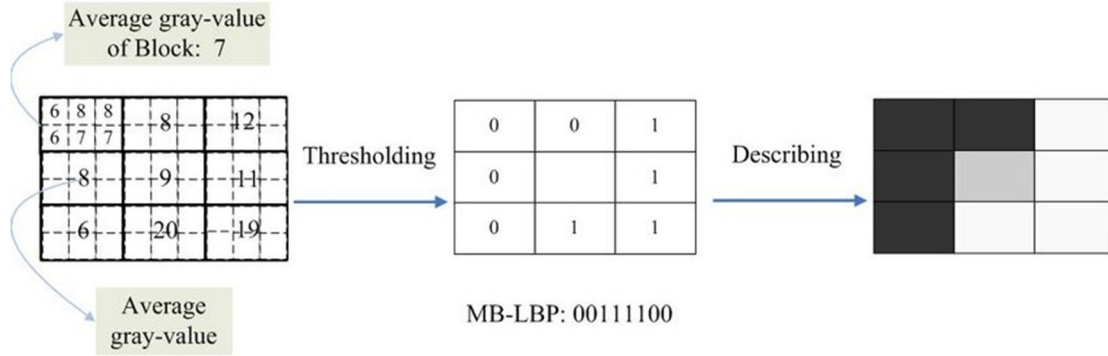
Single scale morphological gradient operator

$$Grad(h) = (A \oplus f) - (A \ominus f) = F1 + F2 \quad (3)$$

Where:  $A \oplus f$  means that  $f$  is used to expand  $A$ , and  $A \ominus f$  means that  $f$  is used to corrode  $A$ . The performance is determined by the element  $f$ . If  $f$  is large, there will be a serious interaction between the edges, which will cause the maximum value of the gradient to be inconsistent with the edge. However, when  $f$  is too small, the gradient operator outputs a small result on the slope edge. Let  $C_i$  be a set of size  $(2i+1)(2i+1)$ :

$$\nabla h = NF = \frac{1}{n} \sum_{i=0}^n [(A \oplus C_i) - (A \ominus C_i)] \ominus C_{i-1}, 0 \leq i \leq n \quad (4)$$

The rectangular region obtained after edge detection is represented in the original image as shown in Figure 3.



**Fig 3.** Representation of the rectangular area in the original image

The image of the rectangular region in Figure 3 is regarded as the field of view image  $U_v^t$  at moment  $t$ , and the central region of this region is taken as the fovea image region  $U_h^t$  of the retina, so that the optical axis of the camera is directed to the fovea region. The camera motion corresponds to the saccadic motion of the human eye, and thus the foveal image set  $U_h = (U_h^1, \dots, U_h^t, \dots)$  is produced.

#### 4.2. Pay Attention to the Formation of Sequences

After selecting the visual elements, the foveal image is processed with attention. Suppose that there are  $N$  total of different visual elements,  $H$  represents the filter bank of the visual element, and  $\phi_n$  represents the set of values of the  $n$  visual element. Suppose that the mathematical model of the filter function in the visual element is

$$H = \{h_{c\lambda} \mid c = 1, \dots, C; \lambda = t\lambda_0, t = 1, \dots, T\} \quad (5)$$

$$R_n^t(i, j) = h_{c\lambda}(i, j) \otimes U_h^t(i, j), n = 1, \dots, N \quad (6)$$

$H$  is composed of Cartesian and non-Cartesian filters.  $U_h^t(i, j)$  represents the pixel value of the foveal image to be processed at time  $t$ .  $(i, j)$  represents the position of pixel  $U$ . The  $R_n^t$  table is the response of the image pixel after passing the filter at that moment. And the constraints that  $n$  and  $N$  have to satisfy are

$$\begin{cases} n = (c-1)T + t \\ N = (C-1)T \end{cases}$$

When the filter is a Cartesian filter, the last response takes

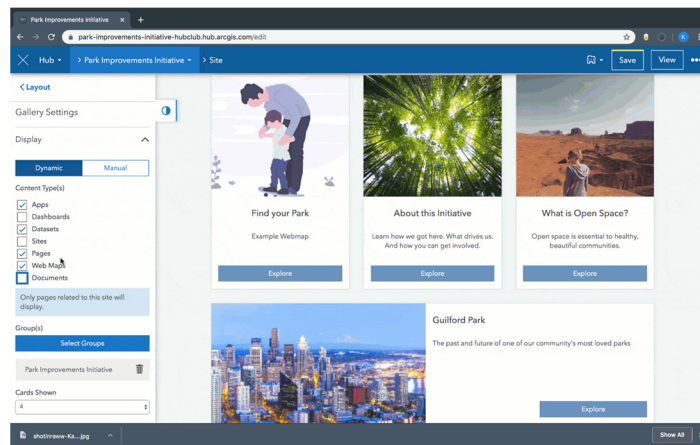
$$f_n = \text{var}(R_n^t) \quad (7)$$

When the filter is a non-Cartesian filter, the last response takes

$$f_n = \max(R_n^t)^2 \quad (8)$$

The resulting  $N$  visual element value  $[f_1, \dots, f_N]$  forms a vector called the observation vector at time  $t$ :  $\sigma^t = [f_1(U_h^t), \dots, f_N(U_h^t)]$ .

The response of these filters is investigated experimentally. The images produced by the camera's first four sweeps as it sweeps over these objects are shown in Figure 4 (image cited in Create a gallery of content using ArcGIS Hub).



**Fig 4.** First 4 saccades

## 5. System Simulation

**Table 1.** Evaluation results of this method

| group number | Intuitive feeling | Ease of use | Emotional atmosphere | Degree of interest |
|--------------|-------------------|-------------|----------------------|--------------------|
| 1            | 96.20             | 94.64       | 96.17                | 97.03              |
| 2            | 99.23             | 95.99       | 96.96                | 93.83              |
| 3            | 98.08             | 95.17       | 99.00                | 96.32              |
| 4            | 99.15             | 93.00       | 97.58                | 97.06              |
| 5            | 95.68             | 96.42       | 99.15                | 96.31              |
| 6            | 97.76             | 95.02       | 96.27                | 94.63              |
| 7            | 99.24             | 92.25       | 98.09                | 98.19              |
| 8            | 98.42             | 96.90       | 97.23                | 97.57              |
| 9            | 97.16             | 96.30       | 96.38                | 98.00              |
| 10           | 96.58             | 94.50       | 97.35                | 96.81              |
| Mean value   | 97.75             | 95.02       | 97.42                | 96.57              |

The social networking website constructed using this method has also been able to operate in practice. Website designers should increase the recognition and credibility of the website through the design of the website interface, while also attracting users' attention through better visual communication effects. In this way, you can better utilize image beautification technology to attract more reading volume and create emotional connections between them and the page. Use decorative techniques with

images to create a positive atmosphere on your webpage. Allowing users to always be in this atmosphere while browsing the webpage, thereby stimulating their enthusiasm for promoting other groups, increasing the click through rate of the webpage, and improving the economic efficiency of the website. The research method mainly involves conducting a questionnaire survey on users. The methods described in the article and traditional methods were applied to online shopping sites respectively, and user interest tests on online shopping sites were conducted.

**Table 2.** Evaluation results of traditional design methods

| group number | Intuitive feeling | Ease of use | Emotional atmosphere | Degree of interest |
|--------------|-------------------|-------------|----------------------|--------------------|
| 1            | 85.79             | 81.52       | 72.25                | 83.71              |
| 2            | 88.72             | 86.90       | 75.58                | 81.73              |
| 3            | 83.99             | 86.17       | 80.02                | 82.45              |
| 4            | 92.88             | 83.50       | 83.68                | 68.00              |
| 5            | 86.20             | 83.00       | 77.27                | 71.70              |
| 6            | 89.02             | 82.10       | 75.67                | 76.55              |
| 7            | 80.75             | 83.71       | 82.14                | 78.79              |
| 8            | 82.35             | 85.84       | 76.33                | 83.41              |
| 9            | 83.80             | 84.44       | 73.01                | 85.77              |
| 10           | 86.27             | 83.00       | 78.63                | 82.79              |
| Mean value   | 85.98             | 84.02       | 77.46                | 79.49              |

## 6. Conclusion

The dynamic visual image beautification technology is adopted to realize the visual design. An attention sequence is formed by a set of associated features in time and space, and each observation point contains all the filter functions in this set of features. In page interface design, image beautification technology is used to design image elements, so the beautification page and enhance the user's interest. And can guide them to browse the page, thus obtaining valuable information.

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