Research on Interactive Information Visualization Design in Web Pages

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Abstract. With the popularity of computers and mobile devices, the network has been widely used as a platform to break the time and space constraints and has more forms of expression. Different from the traditional static information visualization in the plane at one time, the interactive information visualization in web pages has become a new trend of development of conveying abstract information, with the method of more clear visual interface and interactive way between human and information. This paper analyzed the characteristics of interactive information visualization in web pages, and studied its manifestations and multi-level experience. Finally, it put forward the application of the design of interactive information visualization in web pages, and summed up the development trend and influence in the future.

Introduction

Information visualization is an interdisciplinary field of design, which aims to study the visual presentation of large-scale non-numerical information resources, and to help people understand and analyze the data by using the technology and methods of graphic images. As a closely related branch of information design, information visualization not only embodies the main features of design information, but also has a unique and advanced way of expressing yourself. Its main role is to help users extract valuable information and the relationship between each other from the abstract data and events.

The Characteristics of Interactive Information

Visualization in Web Pages

The Efficiency of Information Transmission. The Internet from the information age has accelerated the timeliness of information dissemination. By the power of the Internet, users around the world can use the web interface as a platform to watch the same information and have communication based on the same topic. With the development of combination of design and technology, users can find the interesting information visualization combining graphics, text, music, animation and so on, and more willing to share them with others immediately.

Figure 1. Visualization of hacker attacks.

The Interaction between Human and Information. The interaction of information visualization reflects that the users and the visual interface get information with many kinds of senses such as vision, hearing, touch and so on, while participating in the mode of information transfer. It represents
that the way of information expression with a long history has a new adaption trend in the modern user interface design, and manipulates the interface to make the information visualization more human and emotional. A good interactivity between human and information cannot be separated from human’s active thinking and further feedback. During this process, users, information and the web interface have formed a relationship network with a virtuous cycle, which greatly enhances the effectiveness of communication transmission.

Expression Forms of Interactive Information Visualization in Web Pages

**Ideographic and Metaphorical Graphics.** The reason why metaphorical graphics are easier to be accepted by the people than texts is: Easy to identify. The recognition to graphics are based on the common senses and experiences from daily life to people, so they can understand the meaning of graphics without particular courses and trainings and have a good understanding of the relationship between information or events conveyed by the overall information visualization. Easy to remember. Studies have shown that the graphics is easier to remember than long text data. It can be more intuitive by the abstraction and metaphor design of graphic symbols. If expressed properly, a graph could be understood rapidly by people without the need of too much explanation and long process of thinking.

**Colors that Trigger Imagination.** Colors can foil the theme atmosphere of the entire information visualization, which can show the special theme of information. With the development of internet technology, colors in web sites tend to become diversified, which without doubt has brought more forms of expression and imagination. The imagination caused by colors can promote the user's imagination development of the visual contents and mobilize the user's desire to explore, and thus deeply understanding the emotional and abstract concepts which designers want to convey.

**Accurate Text Content.** In the interactive information visualization, the text is not only a concise information to explain and illustrate, but also become a part of the graphic combination. Texts can be expressed by the change of size and color to show the importance level of information.

**Voices that Increase the Interestingness of Information**

The "visible" of information visualization is not just related to vision, besides graphics and colors, hearing and other forms of perception can be used to describe the data. The scientific research shows that people can understand the content and concept of information more quickly under the visual and auditory interaction.

**The Interaction that Enhances User Experience**

User experience in interactive information visualization refers to the user’s personal psychological feelings in the process of interaction with information visualization interface. A good interactive information visualization not only has attractive information content and a clear visual graphical interface, but also has a simple and smooth operation, which can provide users with a sense of self-control.

Figure 2. Visualization of Submarine Cable Map.  
Figure 3. Visualization of Cake Ingredients.
Multi-level Experience of Interactive Information Visualization in Web Pages

Multi-sensory Experience of Interactive Information Visualization

**Visual Experience.** Virtual space—The information visualization breaks through the limitation of the two-dimensional form, and shows a 3D virtual scene with visualization, so that the user seems to enter a real environment and experience the immersive feeling. True form —The image of the real object is used in the interactive information visualization in web pages, through the high-definition screen display, it can stimulate the user's visual perception, and also can cause changes of other sensories.

**Auditory Experience.** Sounds in the information visualization can enrich and supplement the visual graphic interface depending on different sounds, which can create a pleasant, soothing, mysterious and radical atmosphere to assist the contents of information visualization, and provide users with some guidelines about the information.

Behavior Experience of Interactive Information Visualization in Web Pages

**Usability in the Behavioral Experience.** In order to make users obtain a pleasant behavior experience in the process of interaction, we need to analyze the user's psychological characteristics, behavior habits, cultural differences and so on. A well-designed information visualization must pass the usability test at first to verify whether it can accurately convey information and increase the coherence and understandability of information data.

**Fluency in the Process of Experience.** On the basis of accurate transmission of information, the fluency of the communication between people and information is an important factor to enhance the user's behavior experience. Interactive process can change the user's view of the traditional information, and arise the user's strong sense of exploration and initiative, so as to mobilize the user to further operation behavior.

Emotional Experience of Interactive Information Visualization in Web Pages

**Affect the User's Emotions.** Web interface design of the emotional interaction is through the web interface, to stimulate the user's inner feelings created by the experience. When the visual interface to meet their visual and psychological needs and expectations, which will make the whole process of information acquisition and transfer is more smooth and easy to use. Beautiful details will affect the user's mood and affect the subtle changes, which further affect the user's operating behavior.

**Mobilize the User's Thinking.** Interactive information visualization in web pages can enable users to produce a self-thinking and information feedback of thinking activities based on the data knowledge they show and the relationship between them. Users obtain the understanding of the contents during the interactive progress, and get some influence from inner heart, leading to a further reflection and summary, which comes from the impact that information visualization brings on the user’s thinking activities.

Design and Application of Interactive Information Visualization in Web Pages

Design Method of Interactive Information Visualization in Web Pages

**Simplified the Visual Elements.** Cognitive study shows that human beings can only remember four to five kinds of visual elements in interface at the same time. Therefore, in the case of not affecting the whole information visualization and legibility, we should try to make visual elements simplified and systematic. In information visualization, information content should have an appropriate visual element to express its meaning, no matter what form of visual elements, it should
have a certain link and symbol with information. It could be reasonable for a good interactive information visualization to have at least two layers of visual information for a rating presentation. Visual hierarchies help deal with complex and abundant information, and is also helpful to enhance the corresponding relationship between information. How clear the contrast between graphics and the background is determines the degree of the recognition of the information. Therefore, under the circumstance of not going against the information contents, we should widen the contrast between graphics and the background as far as possible.

**Enhance the Color Collocation.** There no doubt for the importance of color choice to information visualization. Colors can not only distinguish the relationship between various events and data to help users remember information, but also show the emotional attributes and atmosphere which abstract information has. The survey data shows that when choosing the colors for information visualization in web pages, an appropriate increase in the kinds of colors and brightness contrast can make colors easier to distinguish and identify. In the interface design of information visualization in web pages, the combination of colors plays a role of strengthening the classification and coordination of information. In order to make the color combination beautiful and comfortable, we can use warm colors of a high purity in visual foreground, and cool colors of a lower purity for the background. In the interactive information visualization in web pages, the symbolism and regionalism of colors have an important position. Colors have different symbolic meanings in different cultures. When using colors to indicate the information, we should understand the popular meaning of this color. For example, red represents passion or emergency, blue can be relieve and calm down also can represent high technology, green is mostly used to reflect safety, environmental protection and so on.

**Add Appropriate Sounds.** In order to improve the understanding and experience of interactive information visualization in web pages, it will effectively reduce the information load by combining the user's auditory and visual channels. According to the size, density, high or low relationship of the visual graphics, they can be related to "high frequency", "low frequency", "slow" "fast" and so on of sounds respectively. Under the common function of the graphical interface and sounds, information visualization will be easier to learn, and provide more subjective satisfaction.

Select the corresponding sound for different themes of visualization. When providing the user with a good audio-visual experience, we can also enhance the efficiency of information transmission.

**Improve the Fluency of Interaction.** The interaction between the user and the computer has become the core of the modern information visualization. To ensure a smooth interactive process is the key to attract users to study and explore constantly. In the process of information visual interactive design, it should be based on the purpose of information design to select the most representative content, and allow the user with some request to carry out a deeper-level research. In order to ensure the fluency of the process of information visualization interaction, we should shorten the waiting time when operating, improve the good experience when receiving information, reduce the pixel size of the pictures or images as far as possible. Users read web pages with the visual route similar to the letter "F" type, so it is very important for the graphic layout in web pages, and it will affect the efficiency and speed for the user in the process of interaction. For users, they may be at a loss when entering a
visual interface at first. Therefore, providing corresponding friendly tips can help users get familiar with the operation quickly and obtain information and fun from the interaction fluently.

Design Trends of Interactive Information Visualization

**The Humanization of Information Communication.** With the internet technology and interactive concept deeply rooted in people’s heart, information visualization will pay more attention to imaging, emotion, as well as bi-directionality between people and information interaction. People can get access to data and information through the interface, and the computer will also receive people’s feedback and emotions constantly. The interaction of information visualization will show up more in people's daily life, forming a kind of intimacy similar to the communication between people.

**The Unlimitedness of Information Transfer.** Information visualization in the future will be accepted and used by more people, even it can build a series of visual contrast data related to themselves which can be read often. At the same time, the rise of virtual technology will also promote the development of information visualization.

**Commercialization of Information Applications.** Interactive forms of interactive information visualization has expanded more and more disciplines and application areas, such as the operation of the network business. The research on information visualization not only accords with the requirement of information transfer in the modern times, but also consistent with the development law of the design itself. Science and technology make data collection and presentation become more and more simple. We will also continue to be overwhelmed by more information data.

Conclusion

In this paper, through the study of the interactive information visualization design in the web interface, the information visualization design of many foreign real cases is analyzed in this paper. In visual interface design based, interactivity and user experience for innovation, in-depth mining of the similarities and differences between interactive information visualization and traditional static information visualization charts. In order to make the information visualization can play to convey the maximum information and interact with people effectively and conveniently, for the future web interactive information visualization design to provide some guidance for the design and method, the main results of this paper are as follows:

From the interactive information visualization has the new feature point as the starting point, the analysis on the development of the Internet based dynamic, timeliness and interactivity of visual form, emphasizing information visualization is a set function and beauty in one of the product.

The page interactive information visualization deconstruction of three elements: visual graphical interface, sound and interactive operation, namely the use of graphics, color, text, add sound, video, interactive and so on a number of ways in which the expression of abstract information content and relationship.

According to the theory of emotional design of Norman, will be interactive information visualization design to the user brings experience divided into three levels: for visualization in the visual, auditory and tactile sensory to users attract in the visceral level of experience; in the behavior
level design, user experience from the ease of use of visual information content of the information itself, the readability and operation; in levels of reflection, highlight the interactive information visualization can stimulate the user's emotional identity and subsequent thinking process.

In large number of data analysis and widely based on the argument and design of Web interactive information visualization of proposed combined with theoretical and practical principles and methods, the prominent emphasis is still to convey information, and user experience of the sense of pleasure.

References