Research on Minimalism in Interface Design Based on Gestalt Psychology

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Abstract. Gestalt psychology is an significant theory in design psychology, which has important influence on interface design. It mainly studies the application method of gestalt principles in interface design, and analyzes the interface design of Apple and Huawei based on gestalt psychology principles. These principles help designers grasp the principles of human visual perception, which can unify and coordinate the information structure, so as to facilitate users to understand and meet their reading needs. And it can also improve user experience. At the same time, the relationship between the principles of gestalt psychology and simplified visual elements is revealed. Moreover, the advantages of minimalist interface design based on gestalt are proposed.

Keywords: Gestalt psychology · APP interface design · Minimalism

1 Introduction

With the increasingly fierce market competition on the Internet, interface design is the medium of information transmission and interaction between users. It can meet the visual and psychological needs of users. It doesn't just pay attention to the functionality of the interface as before. The interaction design of man-machine interface is directly related to the success and failure of the product design. Gestalt psychology is the science of human beings that can quickly capture the psychology of its users. Applying it to interface design can meet users' psychological needs and reduce their cognitive burden. Minimalism promotes desired results by reducing unnecessary aspects. Using minimalism requires a deep understanding of the scientific principles of design and the laws of visual perception. Gestalt psychology can help with minimalist interface design. Based on gestalt psychology principles, this paper analyzes the elements of two famous web page interface design of Apple and Huawei. It summarizes the advantages of using minimalist approach to interface design, so that users can concentrate the interface content more.

2 Literature Review

2.1 Gestalt Psychology

Gestalt psychology is one of the main schools of psychology. Representative figures such as Kohler and Koffka advocated taking direct experience and behavioral environment

as the research object. The observed events should be retained the original appearance, while empirical phenomena should be complete [1]. Roy R. Behrens believed that the working principle of the human brain is holistic, that is, "the whole is different from the sum of its parts" [2]. Human vision has a tendency to integrate and simplify the processing of graphics [3]. Wang Yang believed that there are four main principles in the application of Gestalt psychology in interface design: the first law is proximity principle, that is, the distance between objects will affect whether people's perception is a whole; the second law is closure principle, that is, human brain treats several incomplete elements as a whole; the third law is continuity principle, that is, people regard elements arranged in a straight line or curve as a complete whole; the fourth law is simplicity principle, that is, people regard simple and regular elements as a whole [4]. In addition, Gestalt psychology shows the integrity, concretization, organization and constancy of visual perception information, as well as how visual elements affect perception and attention [5]. Its main characteristics are emphasizing the integrity. It has tonality. At the same time, the wholeness of the object through visual organization [6].

In short, Gestalt psychology expands the framework of visual perception. It shows that if the human visual system can be optimized to perceive structure, it can better understand things or events. Also, it interacts with semiotics and symmetry related theories.

2.2 Interface Design

User Interface is referred to as UI. It is the medium of interaction and information exchange between the system and users. It can realize the transformation between the internal form of information and the form acceptable to human beings [7]. User Interface Design is abbreviated as "UID". In a narrow sense, User Interface Design refers to the beautification of User Interface, which is the art of visual communication and visual display, including mobile game Interface, mobile application Interface, web button, etc. [8]. Broadly speaking, it mainly refers to the overall design of software human-computer interaction, operation logic and beautiful interface. It is not only the subordinate relationship between "user and interface", but also the interactive relationship between "user and interface" [9]. Its purpose is to enable users to operate the contact surface or hardware more conveniently and effectively, so as to achieve mutual interaction and fulfill user needs. For example, the interface after computer startup includes weather, setting, calendar, calculator, etc. There is also the interface of self-service registration machine in hospital including appointment, payment and recharge, etc.

First of all, the interface design can present the positioning, audience and characteristics. It also can directly affect the satisfaction and applicability of users. The basic principles of interface design include visual consistency law, visual simplicity law, color principle and contrast law, user angle law and operation flexibility law [10]. That is, interface design should meet the visual, functional and comfort requirements between users and APP, so as to maximize the value of interface design. Secondly, it is necessary to achieve the high representative interface design quality of mobile applications in order to pay its value role.

In a word, the interface design of mobile media terminals needs to focus on its usability. It not only needs improving the level of artistic aesthetics, but also meeting

the physiological and psychological needs of users, so as to improve the user's sense of pleasure.

2.3 Minimalism

"Minimalism" originated in the 1950s and 1960s, symbolizing a yearning for simple world and the escape from the chaotic world of reality. Minimalism brings us a extremely simple and clean visual feeling. It has no complex colors and tries to have a two-dimensional shape, which is its main feature [11]. Today, with the development of social economy and people's ideology and culture, minimalism has developed from the field of art to fashion, literature, music, architecture, design and decoration. It becomes an important contemporary art school. In essence, minimalist design is the author's pursuit of design quality. It contains rich connotation in simple works. Also, it has rich functionality on the basis of appearance beauty, so that users can enjoy the author's high grade. In complex products, the most essential features are stripped out and polished to restore the essential characteristics of objects. At the same time, it also contains the people-oriented design concept and the spiritual sustenance of modern people in pursuit of simple life [12]. Adolf Luce, a famous minimalist architect, believed that excessive decoration is a waste of resources in architecture, which plays a guiding role for contemporary designers to pay attention to practicality. Sato Keshi, a famous Japanese designer, is also representative of Minimalist design in Japan. He believed that simple and orderly color design elements could better convey strong visual effects. The famous Japanese brand Muji conveys minimalism well. It captures a large number of loyal consumers with appropriate pure materials and simple designs [13].

3 Gestalt Theory Analysis of Interface Design

Gestalt psychology originated from Germany in the early 20th century. It has become one of the main theories of modern western psychology. Its main idea is integrity. Human visual perception system automatically establishes the structure of visual input and perceives things or events from the level of nervous system. People's perception of things is not only based on their direct senses such as shape, color and size, but also includes people's past experience or behavioral environment. All the information gathered together to form people's perception of the thing.

Gestalt psychology is the cornerstone of design elements required in interface design. It is an important factor affecting user experience. In recent years, with the improvement and progress of technology, the interface design style of different media also changes, but its plate, information division, block layout is still inseparable from the theoretical support of gestalt. Relevant designers should conform to the law of cognitive psychology. The visual effect of interface design is extremely important in people's cognitive process. With the help of gestalt psychology experience and behavior research, we can construct aesthetic design more effectively and improve the design level of products and services. In addition, the visual methodology combined with semiotics, topology and other theories can well demonstrate the importance of practical design skills and scientific methods [14].

In interactive interface design, high-quality design works need to maintain the unity of interface style and overall harmony. And these are often inseparable from the theory of gestalt psychology. The messy and chaotic interface is not enough to take Gestalt psychology into account. The following seven principles of gestalt psychology influence interface design, which are proximity law, similarity law, continuity law, closure law, symmetry law, common destiny law and figure-ground law. The following will clearly explain and analyze people's visual perception, system and visual laws. At the same time, it will explain the guiding role of gestalt psychology theory in interface design, providing theoretical reference and support for interface design.

3.1 Proximity Law

Proximity law states that people's visual perception will affect whether we take things as a whole because of the relative distance between things. In other words, things that are close to each other seem to belong to a group, while things that are relatively far apart don't. There are 16 orange squares in the picture (see Fig. 1). Due to the arrangement of the layout, people's visual perception will automatically regard them as a part of four groups composed of 4 squares. When several identical squares are close to each other, the eye automatically perceives them as a combination. The principle of proximity is closely related to the grouping and placement of information content, the arrangement of navigation space or text layout in interface design. Even if there is no explicit partition introduction, users can quickly learn the layout of the interface by placing elements in the same group and expanding the distance from to other groups. If the relevant elements are arranged closely or distantly from the irrelevant elements, the user will understand the wrong design intention, making the operation extremely complex and memory. As for the interface design, there is the homepage of iOS "Music" is divided according to different information modules, but the obvious closed column grid is not used. In order to achieve the required functions, the simplicity of the organizational form is extremely important [15], so as not to cause too cumbersome interface and visual fatigue. Similar to app (such as Netease cloud music and Migu Music), the home page of the interface uses this principle to group the content of the interface through white space to create groups that are relatively close and far away.

3.2 Similarity Law

Similarity law states that people's visual perception will treat similar elements as a whole, whether it is color, shape or size, as a combination. Elements with similar characteristics are considered to be more closely related than elements without similar characteristics [16]. There is a group of eight circles arranged in a square shape. If a square is placed, human eyes will automatically regard the square as an individual. If there are 16 circles of the same size but different colors arranged in a square, the human eye will automatically perceive the blue circle as a combination and the orange one as a combination. If there are too many and complicated differences in the interface, it is difficult for human eyes to grasp key information, resulting in information confusion. As for the interface design, it shows the DiDi home page. On the premise of keeping the same interface style and neat plates, if the color, shape or size of components and icons are distinguished, users

can quickly master the purpose and location of the components and distinguish the importance and significance of their elements.

3.3   Continuity Law

Continuity law means that the human visual perception system will fill in the fuzzy information caused by itself instead of focusing on an incomplete graph. It shows the logo design of IBM. Although the logo is not a complete English letter "IBM", which is composed of discrete blue lines, the human eye will automatically perceive it as a complete form. As for interface design, it can attract people's visual attention by guiding people's visual flow. It shows the interface for adjusting volume and screen brightness for iOS. Users can slide up and down to adjust the desired effect and content by feeling, so as to avoid the visual interference, cost development and user loss caused by the page-turning function. In addition, the main section of Xiaohong Shu's home page interface is pictures plus a line of text, which gives people a visual group. The section that does not appear in the interface will directly guide users to slide up and down to obtain complete content. It skillfully enables users to seek new content and labels and continues smooth visual experience. Moreover, It can have good interaction with the interface and improve user stickiness.

3.4   Closure Law

Closure law means that people's visual perception combines incomplete individuals to form a whole. This kind of visual perception is based on the reaction formed by people according to previous experience and visual intention, and closes the scattered graphs with internal connection into complete graphs. According to the objective stimuli, the human visual system presents relatively stable and integrated graphs in the subject's intuitive activities [17]. There are three incomplete circles in the picture. Human eyes will automatically regard the blank part as a white triangle, and even think that the three circles are only blocked by the white triangle. In addition, there are several unclosed lines in the picture, and people will consciously extend and complement them to make them a triangle. Even the blank area is treated as an object due to the construction of other forms. As for interface design, many icon designs will use this principle to give people a relaxed and free feeling through incomplete graphics. The logo design of Cha baidao. The blank part gives a feeling of "full cup" and adds the element of panda ears, which not only enhances fun, but also makes it simple and clear. In addition, Wechat's facial expression interface will be white space at the bottom. The people's visual system will automatically think that there is content below, so that make the interface clear and meet the visual needs.

3.5   Symmetry Law

Symmetry law states that human visual perception usually focuses on balanced and symmetrical objects. The law simplifies complex shapes. For objects or figures with symmetrical characteristics, they tend to form a whole, so as to reduce the complexity

of the scene [18]. It mainly seeks the form of change on the premise of unification [19]. There are two orange circles. The human eye will automatically think that they are the same size and color. They are a whole and extremely symmetrical, giving people a sense of order. As for the interface design, simplifying the interface can better guide users. It can decompose complex objects through symmetry law, and speed up the acquisition of information. It shows the bottom function bar interface of Meitu xiuxiu. The functions such as skin grinding, thin face and filter are displayed in a symmetrical form, so as to improve the fluency and aesthetics of the visual interface. For the lower filter, there are many functions, resulting in incomplete display of the interface. The human eye will find its symmetry point by sliding left and right until it finds the required options or browses all the options. In addition, too symmetrical design elements are sometimes monotonous and boring. Properly adding some asymmetric style will make it more interesting and readable. For example, in Migu Music's video bell-color interface, the graphic design of making short videos with "+" at the bottom right of the interface is extremely obvious. In the extremely balanced and harmonious interface, there are asymmetric graphics, which are eye-catching and attract the interaction behavior of users.

3.6 Common Destiny Law

Common destiny law states that human visual perception will regard objects moving together as a whole. It is a different principle among the seven principles, but it is similar to other principles at the same time, which affects visual perception. Common destiny law mainly emphasizes dynamics and movement. The direction of motion, speed and time are all important factors affecting the overall visual judgment. There are 16 orange squares of the same size and color. When four of them move to the left and the rest move to the right, eyes will automatically regard the squares moving to the left as one group and those moving to the right as another group. As for interface design, we need to make full use of the positional relationship between elements in order to make it closer and interactive. It shows the interface of iOS system by long pressing the application icon. All icons will shake, which can be deleted and moved.

3.7 Figure-Ground Law

Figure-ground law means that people's visual ability will distinguish the figure from the background. In other words, in a specific scene, when we observe an object, we usually have a visual focus. What is outside the focus is fuzzy, and the human eye will automatically recognize the main element and auxiliary element. The main position is the figure, and the background figure is the background [20]. The subject and background will change with the change of people's visual focus. The two rectangles are large and small. People's visual system will consider the light-colored rectangle as the figure (main body) and the dark-colored rectangle as the ground (background). The greater the difference between the figure and the ground, the shorter the perceived time. There is relativity between the two. As for interface design, it shows the interface of iOS "Find My". The pop-up content and the home page form the relationship between the subject and the background. The pop-up interface belongs to the subject, while the darkened home page interface belongs to the background. The pop-ups window has become a new

attention point to attract users, making the original information subject the background. In the color selection, it tries to use the same color system to reduce the contrast, otherwise it will lead to users' visual fatigue and reduce user experience.

4   Minimalism in Interface Design

4.1   Principle of Negative Space

The principle of negative space is namely "white space" processing. It is one of the most important features of minimalism in app interface design. It helps guide the flow direction of the user's vision. The more negative space there is around a graph, the more attractive the graph will be. As for interface design, its main feature is to use negative space to smooth the visual flow of people, so as to emphasize and focus on the subject. For example, in the welcome page of QQ, the center of the interface is a picture in the shape of a penguin. The rest of the interface is processed with a white background, so the human eye can directly notice this element. In addition, the principle also presents the overall framework or layout of the interface to reflect the sense of space to the design.

4.2   Principle of Balance

The principle of balance means that the use of symmetrical balance and asymmetric balance to achieve a certain balance of visual elements is an important visual interpretation of interface design. For example, color elements with high vividness can focus the users' attention, but over time it will lead to visual fatigue of the human eyes. At this time, some colors with low saturation should be integrated to achieve visual balance. The same is true for text elements. Text sizes are uniform and font types are similar, which will destroy visual balance and require moderate adjustment. For example, the overall color style of the "hungry" interface is light, while the "super food card" of the member center is presented in dark plates, which not only highlights the content, but also meets the visual balance.

4.3   Principle of "Less is More"

The principle of "less is more" means that using fewer elements to produce more effect. It is the dominant principle of minimalism. If the interface design blindly pursues aesthetics or innovation and makes extensive use of various elements, and superimposes or stacks a large number of decorative visual graphics, it will lead to visual fatigue of human eyes. The goal of minimalism is to ensure that the viewer's vision is not disturbed while maintaining the efficiency of obtaining information [21]. For example, there are no redundant decorative icons or graphics on the home page of "Yi Yan" APP. The main features are displayed in the most essential form. A small number of visual elements give people the most intuitive visual feeling, which is clean, comfortable and clear.

4.4 Principle of "Retain Essential Elements"

The principle of "Retain essential elements" states that it eliminates useless and useless elements to avoid the trouble of selection and visual confusion, and achieve "nothing less". Many factors in the interface, such as repetitive content, low demand content and multi-functional content, need to be planned, deleted or combined [22]. For example, the "Discover" and "Select" interfaces of Kuaishou have more video content. Although the former provides users with more choices, it virtually allows users to spend time thinking under the circumstance of similar content, so as to increase the burden on users. The latter has one video content, which gives users a sense of ease to watch by clicking on it. It increases users' impression of the content and enhances users' stickiness.

5   Application of Gestalt Minimalist in Interface Design

In the following case, I mainly studied the interface design of two famous excellent websites – Apple and Huawei. Both websites are designed in a minimalist way based on gestalt psychology model.

5.1 Apple

Apple is represented by Steve Jobs. It integrates the company's organizational structure with a minimalist way of thinking. It follows the simplicity of human-computer interaction process, which makes users feel concise and smooth when browsing. Minimalism skillfully uses the Gestalt relationship between shape and graphics on the home page of Apple website, or guides users to focus on the main content by leaving white space and margins. In addition, the framework of the entire interface is represented by the latest advertising slogan or product name, which conforms to the principle of "less is more". The rest of the self pages are mainly designed according to the principles of similarity, proximity and continuity in Gestalt psychology, so that users can simplify their thinking and understand in the form of unit groups (see Fig. 1). According to the gestalt principle, the situation of Apple website is summarized (see Table 1).

5.2 Huawei

Huawei is represented by Ren Zhengfei with the core concepts of focus, innovation, stability and harmony. It pays attention to turning complexity into simplicity, lightness and convenience. Its website design is based on concise full-page images. It uses large white space and simple user relationships. It is able to consciously use the principles of gestalt psychology to delve into minimalism and remove unnecessary details. New product footers, main menus, and associated selection sections are grouped and perceived according to similarity and proximity laws. The application of the continuity law can be clearly seen in some pictures, which can well guide users to click the relevant link to understand the specific content (see Fig. 2). Based on the application of gestalt principles in interface design, the design of Huawei website is summarized (see Table 2).

Fig. 1. Apple website homepage

Table 1. Gestalt Principle in Interface Design of Apple Website

Gestalt principle	Header	Body	Footer
Proximity law	✓	✓	✓
Similarity law	✓	✓	✓
Continuity law	×	✓	✓
Closure law	×	×	×
Symmetry law	×	×	×
Common destiny law	×	×	×
Figure-ground law	×	×	×

Fig. 2. Analysis of the huawei website home page

Table 2. Application Research of Gestalt Principles in Huawei Website Interface Design

Gestalt principle	Header	Body	Footer
Proximity law	√	√	√
Similarity law	√	√	√
Continuity law	×	√	√
Closure law	×	×	×
Symmetry law	√	√	√
Common destiny law	×	×	×
Figure-ground law	×	×	×

6   Advantages of Gestalt-Based Minimalist Interface Design

Based on the investigation of brand websites of Apple and Huawei, this paper finds that the accessibility of websites can be improved when users have certain perception ability and the ability to deal with interactive challenges. Therefore, based on gestalt psychology and minimalist design, interface design can help designers better grasp the visual elements and ensure that users can achieve the purpose of visiting the website (see Table 3).

Table 3. Adaptation relations between Minimalism principles and Gestalt laws

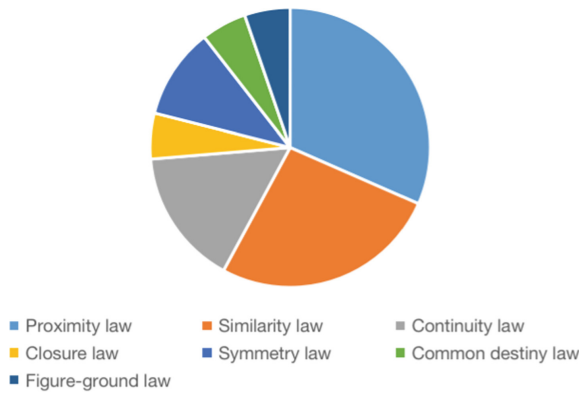| Gestalt laws	Minimalism principle
Proximity law	Principle of "Less is more"
Similarity law	
Continuity law	Principle of "Retain essential elements"
Closure law	Principle of balance
Symmetry law	
Figure-ground law	Principle of negative space

Fig. 3. The usage rate of Gestalt principles in website

Moreover, the principles of similarity, proximity and continuity are most frequently applied in the analyzed web pages, while the principles of figure-ground and common destiny are least applied (see Fig. 3).

According to the above cases, minimalism makes the audience wider in interface design. It can figure out how to make them interact with the interface. Through conscious design and scientific application of visual perception systems, this goal can be achieved in interface design. In modern interactive media, the most important thing is to consciously use gestalt principles to guide user behavior and reactions. The advantages in interface design are as follows:

6.1 Improving User Experience

Each user has different visual habits or visual cognition. The ability to use the network is different. So it is necessary to present a clear and direct sections in interface design so as to directly meet the needs of users. The principles of minimalism based on gestalt psychology can help users understand the structure and layout of an interface by seeing its content and menus as a group. On the other hand, if an interface has unnecessary, overly

decorative, complex elements, and an interface that is too saturated with information, it will lead to users' confusion and even disgust and irritability. It will make the interface design fail to achieve users' goals. Therefore, gestalt psychology includes the principles of proximity, similarity, continuity, closure, symmetry, common destiny and figure-ground, which can help designers to design an appearance structure that enables users to learn more useful information from the interface.

6.2   Enhancing User Attraction

User attraction is an important part of interactive media, which increases the number of user visits due to the convenience of the interface and the effectiveness of functions. Similarly, this is the main direction in which interactive media provides the best service to users. It is one of the main components of the website. It refers to the convenience and profitability of website navigation and the ability of all users to use the website. It is the direction of the website to provide the best service to users. If the interface is filled with too many links, images, and sounds, and the loading time is too long, the functionality of interactive media will be reduced. In contrast, the minimalist interface can easily handle the visual center point. It can reduce visual fatigue and allow users to reach their goals directly with a simple click or swipe. At same time, it can increase user engagement.

6.3   Reducing Cost

Minimalist interface design is characterized by a few decorative elements, a limited number of pages, and fewer code requirements. As a result, you get a reduction in the error rate of your code. Moreover, the cost reduction does not mean emotionless design, nor does it mean the pursuit of form over function. The importance of emotional design is usually reflected in the interface jump, dynamic effect elements and so on.

7   Conclusion

Gestalt psychology can show the principles of visual perception of object graphic structure, so that people can use these principles to sort out in interface design. So, the information to be presented can be expressed in a more prominent and complete way. While gestalt combined with minimalist elements can reduce viewer confusion, a wider range can make the site interact more effectively. Therefore, interface design not only needs excellent artists, but also takes gestalt psychology as the theoretical basis to improve the visual communication effect of the interface, so that users can obtain interface information more conveniently and efficiently. This is what interface designers need to continue to learn and strive to achieve.

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