

The Influence of Visual Balance of Interface Elements Layout on the Attractiveness of APP Guide Pages

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ABSTRACT

Guide page design is an important part in APP design. A good guide page can attract users' interest and attention in a short time and effectively transmit information. Therefore, attractiveness is a key factor in evaluating design of APP guide pages. In the actual design activities, most of the interface elements in guide pages are arranged in the form of high balance. In order to explore the relationship between attractiveness of APP guide pages and this arrangement, this study collected samples of 40 guide page design and the corresponding user access data from zcool.com (a well-known Chinese design social website). Interface aesthetic evaluation method is applied to calculate the value of the three indicators (balance, equilibrium and symmetry) associated with visual balance, SPSS analysis results show that visual balance has an important potential impact on improving the attraction of APP guide page.

Keywords: Visual balance, Interface aesthetics, APP guide pages

INTRODUCTION

With the popularity of smart phones, a large number of apps appear in people's life. Whether an app can successfully attract users' attention in a large number of apps is an important prerequisite to determine the success of this app (Xing et al., 2021). In the design of app interface, guide pages plays a crucial role in improving its attractiveness. The guide page, which usually appears when starting to use the app, is short in duration and contains images and concise text information. The aim of guide pages is to introduce the basic functions and features of the product to the user, which determines the user's first impression of the entire app.

The content of the guide page is usually fixed: an illustration or other image, a set of key words, and a short explanatory sentence. The arrangement of these elements affects users' aesthetic experience of APP guide pages to a certain extent. Since guide pages only appears for a few seconds during the use of the APP, it is necessary to effectively attract users' attention. Therefore, the aesthetic measurement of the interface layout plays a key role in the design of guide pages. Ngo et al. proposed a calculation method to measure interface aesthetic and proved its practical value (Ngo et al., 2003). Lai et al. confirmed a high correlation between visual balance and aesthetic experience in image layout (Lai et al., 2010). Zhou et al. constructed an

interactive interface aesthetic evaluation method and verified its effectiveness through experiments (Zhou et al., 2013). Wang et al. demonstrated the effect of visual aesthetic factors on users' emotions through experiments (Wang et al., 2020). This study applies the interface aesthetic evaluation method to evaluate the aesthetic of the interface elements layout of APP guide page cases on Zcool.com, and proves the key role of balance and equilibrium among visual aesthetic facets in improving the attractiveness of APP guide pages.

BASIC CONCEPT

According to previous studies, The facets to measure the aesthetic of interface layout mainly includes Balance, Equilibrium, Symmetry, Sequence, Cohesion, Unity, Proportion, Simplicity, Density, Regularity, Economy, Homogeneity, Rhythm, etc (Zhou et al., 2014). The measurement of interface balance aesthetic is mainly reflected in Balance, Equilibrium and Symmetry (Tsi et al., 2013). Balance refers to the visual weight of interface elements distributed on the left-right and on the top-bottom. The corresponding visual weight of an element is positively correlated with its size; Equilibrium is related to the coincidence degree between the overall visual center of each element in the interface and the center of the interface. A higher coincidence degree can increase the visual stability of the interface; Symmetry reflects the similarity and repeatability of elements in the interface according to horizontal central axis, vertical central axis and geometric center point of the interface. The higher the similarity and repeatability, the higher the aesthetic experience of symmetry of the interface layout (Moshagen and Thielsch, 2010).

Balance

Balance is a measure of visual weight, which depends on the integrated value of the visual distribution of elements in the APP interface. For any one dimension, the visual weight balance of the distribution of elements is determined by the size of the area of the elements on either side of the axis and the distance from the axis (Schmidt, 2009). The equation of balance is expressed as follows:

$$Ba = \frac{\left| \frac{w_L - w_R}{\max(|w_L|, |w_R|)} \right| + \left| \frac{w_T - w_B}{\max(|w_T|, |w_B|)} \right|}{2} \in [0, 1]$$

$$w_j = \sum_i^{n_j} a_{ij} d_{ij} \quad j = L, R, T, B$$

a_{ij} is the area of element i in j ;

d_{ij} is the distance between the central lines of element i and the interface;

n_j is the number of elements in j ;

L is the left side of the interface;

R is the right side of the interface;

T is the top side of the interface;

B is the Bottom side of the interface.

Equilibrium

Equilibrium depends on the degree of coordination between the center of the distribution of elements and the center of the entire interface. In APP interface, if the center of the entire interface and the center of the distribution of elements has a high degree of coincidence, or is relatively close, then the interface has a high degree of equilibrium. Its formula is as follows:

$$\text{Eq} = 1 - \frac{\left| \frac{2 \sum_i^n a_i (x_i - x_c)}{nb_{\text{frame}} \sum_i^n a_i} \right| + \left| \frac{2 \sum_i^n a_i (y_i - y_c)}{nh_{\text{frame}} \sum_i^n a_i} \right|}{2} \in [0, 1]$$

(x_i, y_i) is the coordinate of element i ;

(x_c, y_c) is the coordinate of the interface;

b_{frame} and h_{frame} are the width and height of the interface;

n is the total number of elements.

Symmetry

Similarity refers to the similarity degree of distribution of elements in APP interface on both sides of the coordinate axis, or the symmetry degree of elements on both sides of the coordinate axis. The measurement and calculation of similarity depends on the size and distance comparison of elements distributed on both sides of the coordinate axis (Ben-Bassat, 2006), and the calculation method is as follows:

$$S_y = 1 - \frac{|S_{yV}| + |S_{yH}| + |S_{yR}|}{3} \in [0, 1]$$

$$S_{yV} = \frac{|X'_{UL} - X'_{UR}| + |X'_{LL} - X'_{LR}| + |Y'_{UL} - Y'_{UR}| + |Y'_{LL} - Y'_{LR}| + |H'_{UL} - H'_{UR}| + |H'_{LL} - H'_{LR}| + |B'_{UL} - B'_{UR}| + |B'_{LL} - B'_{LR}| + |\theta'_{UL} - \theta'_{UR}| + |\theta'_{LL} - \theta'_{LR}| + |R'_{UL} - R'_{UR}| + |R'_{LL} - R'_{LR}|}{12}$$

$$S_{yH} = \frac{|X'_{UL} - X'_{LL}| + |X'_{UR} - X'_{LR}| + |Y'_{UL} - Y'_{LL}| + |Y'_{UR} - Y'_{LR}| + |H'_{UL} - H'_{LL}| + |H'_{UR} - H'_{LR}| + |B'_{UL} - B'_{LL}| + |B'_{UR} - B'_{LR}| + |\theta'_{UL} - \theta'_{LL}| + |\theta'_{UR} - \theta'_{LR}| + |R'_{UL} - R'_{LL}| + |R'_{UR} - R'_{LR}|}{12}$$

$$S_{yR} = \frac{|X'_{UL} - X'_{LR}| + |X'_{UR} - X'_{LL}| + |Y'_{UL} - Y'_{LR}| + |Y'_{UR} - Y'_{LL}| + |H'_{UL} - H'_{LR}| + |H'_{UR} - H'_{LL}| + |B'_{UL} - B'_{LR}| + |B'_{UR} - B'_{LL}| + |\theta'_{UL} - \theta'_{LR}| + |\theta'_{UR} - \theta'_{LL}| + |R'_{UL} - R'_{LR}| + |R'_{UR} - R'_{LL}|}{12}$$

$$X_j = \sum_i^{n_j} |x_{ij} - x_c| \quad j = \text{UL, UR, LL, LR}$$

$$Y_j = \sum_i^{n_j} |y_{ij} - y_c| \quad j = \text{UL, UR, LL, LR}$$

$$H_j = \sum_i^{n_j} h_{ij} \quad j = \text{UL, UR, LL, LR}$$

$$B_j = \sum_i^{n_j} b_{ij} \quad j = \text{UL, UR, LL, LR}$$

$$\theta_j = \sum_i^{n_j} \left| \frac{y_{ij} - y_c}{x_{ij} - x_c} \right| \quad j = \text{UL, UR, LL, LR}$$

$$R_j = \sum_i^{n_j} \sqrt{(x_{ij} - x_c)^2 + (y_{ij} - y_c)^2} \quad j = \text{UL, UR, LL, LR}$$

UL is the upper-left area of the interface;

UR is the upper-right area of the interface;

LL is the lower-left area of the interface;

LR is the lower-right area of the interface;

(x_{ii}, y_{ii}) is the coordinate of element i in j ;

(x_c, y_c) is the coordinate of the interface;

b_{ii} and h_{ii} are the width and height of the element i in j ;

n_j is the total number of elements in j ;

$X'_i, Y'_i, H'_i, B'_i, \theta'_i, R'_i$ are respectively the normalized values of $X_i, Y_i, H_i, B_i, \theta_i, R_i$.

METHODOLOGY

In this study, 40 guide page design cases and the corresponding popularity and recommendation numbers were collected from zcool.com. zcool is a Chinese website that provides a platform for designers to share and communicate their works. The popularity of a work is determined by the number of times the work is clicked and viewed, which reflects the attraction degree of the work to website users among many other works. The number of recommendations refers to the number of people who choose to recommend a work after browsing it, which is similar to the number of “likes”. It reflects the degree of liking of website users for the work. In the top 80 works according to the default sort of the website, 40 works were randomly selected as samples, and their corresponding popularity and recommendation number were recorded. Samples and corresponding data were collected on March 25, 2022.

The obtained guide page samples are then processed. Through experiments, Ngo et al. found that the content of interface elements are not affecting users' overall aesthetic perception (Ngo et al., 2003); Tsai et al. 's study demonstrated that when the text elements are involved in the experiment, the two methods of calculating the background area of the whole text and the sum of the background area of each character are equally feasible and effective (Tsai et al., 2013). Therefore, in this study, image elements in guide page samples are transformed into rectangles according to their boundaries, and continuous text elements are also transformed into rectangles according to their overall boundaries through Photoshop. As shown in Table 1.

The width and height of the interface and the width, height and coordinates of elements in the interface are measured in pixels in Photoshop.

Table 1. Part of the results of balance values of samples collected.

Facets	Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	...
Balance	0.72898	0.74742	0.74477	0.73373	0.77103	...
Equilibrium	0.98535	0.98511	0.97972	0.98933	0.99022	...
Symmetry	0.66710	0.66776	0.66841	0.66882	0.66761	...

CONCLUSION

According to the aesthetic evaluation method of interface layout, this study evaluates the collected 40 guide page samples based on Matlab, and obtains the aesthetic value of each sample in 3 facets. Part of the results are as follows:

After obtaining the aesthetic evaluation results of 40 groups of sample data, the data was imported into SPSS for regression analysis. Among them, the prediction variables are balance, equilibrium and symmetry, and the regression analysis is carried out on the two dependent variables of popularity and recommendation respectively.

R-Squared Value and Significance

By comparing the analysis results of two different dependent variables, the adjusted R-square value of the three balance measurements for the popularity is 0.783, while for the recommendation degree is 0.170. Generally, if the value of R square is greater than 0.7, it means that the prediction variables can describe the dependent variable accurately. Therefore, the aesthetic evaluation indexes related to the balance degree has a high correlation with the popularity of APP guide page, while the correlation with the recommendation degree is not obvious.

In addition, for the dependent variable of popularity, the significance of balance and equilibrium indexes are 0.000 and 0.010 respectively, both of which are less than 0.05, indicating that these two indexes have a significant impact on popularity. The significance of symmetry index is 0.585, so the influence of symmetry index on popularity is not obvious.

Durbin-Watson Value and VIF Value

For the dependent variable popularity, the Durbin-Watson value of the three prediction variables is 1.844, which is close to 2, proves that the autocorrelation among the three variables of balance, equilibrium and symmetry is within the acceptable range. The VIF values of the three prediction variables of balance, equilibrium and symmetry are 3.206, 3.358 and 1.116, respectively. VIF values below 5 indicate that the data of the three prediction variables don't have strong collinearity.

Discussion

According to the results of regression analysis, balance, equilibrium and symmetry, which reflect the visual balance measurement, largely determine the popularity of the APP guide page, that is, the degree to which users are attracted by the first impression in a short period of time; However, for another

dimension of user attractiveness, recommendation, there is no great correlation, because recommendation reflects the decision made by users after observing all aspects of interface design details for a long time. At this time, the impact of visual balance on the overall aesthetic becomes relatively minor. To sum up, for APP guide pages whose main purpose is to attract users' attention in a short period of time, a sense of balance in the interface layout is particularly important, which is why the majority of design cases follow this rule.

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