Changing color attributes of icons to inform the application status

Sung-Wook Ju, Kyeongah Jeong, and Hyeon-Jeong Suk
Dept. of Industrial Design, KAIST
Daejeon, Republic of Korea
sungwook.ju@kaist.ac.kr; kyeongah17@gmail.com; h.j.suk@kaist.ac.kr

***Abstract*— This study explores what relationship is formed between the change in attribute of icon's color and its implicit message. In the user study we employed 5 well known App icons and manipulated the color attributes to result 16 color variations for each of the App icons. As color alterations, the HSV color system was facilitated, and hue, lightness, saturation, and opacity were independently manipulated to result 16 variations. We collected 6 typical messages related to App usage and asked the participants to select any of the 16 color variations that match the given message. The results unfolded three findings: First, when the app is broken, an icon would become dark; Second, when the App is used less, an icon would become translucent; Last, when the App is used a lot, the hue of an icon would be shifted toward red.**

Keywords*— *App icons; color attributes; smartphone;

I. INTRODUCTION

Smartphones have evolved from practical purpose devices into dynamic tools that support their users in a wide variety of tasks [1]. As the role and usage of smartphones become more meaningful, the number of smartphone applications(App) has been steadily increased. However, smartphones have relatively smaller display size compared to other display devices, these app icons are need more versatile method to deliver informative messages to users intuitively. Shin and his colleagues [2] proposed a system that analyzes user's app usage patterns to show the next most probable app that users will use on the home screen. From their research, changing the icon color is less intrusive way to give information, not changing its position and physical shape. Recently, Jang and Suk [3] revealed that decreasing opacity and saturation creates the impression that the Apps are not used for long. In this foregoing, we attempted to explore users' perception about appropriate change of the color attributes of an App icon when a certain message is intended.

II. OBJECTIVE

We aimed at finding whether there is an intuitive engagement between the App status and its color change. We carried out a user study to examine the relationship and to provide the empirical evidence.

III. USER STUDY

Stimuli: color alteration of App icons

For visual examination, we selected 5 App icons which are ranked as the most frequently used services(Table I). For the color alterations, we created variations using HSV controller of Adobe Photoshop to manipulate color attributes independently. Firstly in terms of hue, 5 variations were considered(+90º, +45 º, -45 º, -90 º, +180 º); Secondly in terms of saturation, 3 levels were considered(-100: grayscale; -66, -33); Thirdly in terms of lightness, 4 levels were considered(+70: almost white; +35; -35; -70: almost black); Lastly in terms of opacity, 3 levels were considered(75%; 50%; 25%). Including the original design, in total 16 variations were created for each of the 5 App icons. The 16 variations were arrayed in random order and were shown to participants on Samsung Galaxy S3(Fig. 1).

TABLE I. THE LIST OF 5 APPLICATIONS

Facebook	KakaoTalk	YouTube	Naver	Daum
				
SNS	Chat	Video Streaming	Search Engine	Portal

Stimuli: Messages about App status

In Jang and Suk's study [3], participants were asked to guess the messages while viewing the color alterations of the frequently used App icons. We adopted the survey results of the previous study and categorized them into 6 messages, such as 'Need to update', 'Update complete', 'This app is used a lot', 'This app is used less', 'Broken', and 'New notice'. Hence, each of the 5 App icons was tested with the 6 messages, and regarding to the message the participants were asked to select the most suitable color alteration among the 16 variations. Also, in prior to the selection, the participants agreed or disagreed with any color alterations to get notified about the status change of an App icon.

Subject

A total of 30 college students including 15 males and 15 females were recruited. The average age was 23.67 years with a standard deviation of 1.25 years.

Fig. 1. (Left)An example shown to participants for test; (Right) Experimental apparatus

IV. Result and Data Analysis

With regard to the necessity of the color alteration of App icons, the participants agreed the most when the message is 'Broken(87.86 %)', followed by 'Need to update(78.34 %)'. In Table II, the most frequently selected color alterations of Facebook and KakaoTalk icons are presented. For example, to notify that the Facebook needs to get updated, the hue shift was the most frequently chosen but less than 40 % of the participants agreed with this alteration. In case of KakaoTalk, to inform the same message, the increase of lightness was preferred, therefore there found no consistent tendency in color alteration with regard to 'Need to update'. On the other hand, to inform the a rare usage of an App, the translucent icon was advocated across the 5 App icons. In this way, the test results were analyzed across the 5 App icons in order to reveal the overruling tendencies.

First, most of participants selected the opacity 25% variation as 'This app is used less'; Second, lightness -70% and saturation -100% were selected as 'Broken'. Last, the hue shift toward red effectively indicates 'This app is used a lot', probably because the hue shift toward red is typically associated to overheated or burned image. However, this tendency was not found in case of YouTube and Daum icons, since they already contain red hue in the original icon design.

V. Conclusion

In this study, we investigated alterations of color attributes of App icons in order to implicitly announce the status change of the App. We focused on 6 types of messages and demonstrated color variations by manipulating each of the 4 color attributes including hue, saturation, lightness, and opacity. We tested with 5 App icons and examined whether there are perceptual linkages between status information and color alterations. Based on the empirical findings, we conclude the three findings. Firstly, the deceasing opacity is appropriate to inform 'This app is used less'; Secondly, very low lightness and saturation is associated to 'Broken'; Lastly, hue changing toward red is suitable to inform a status 'This app is used a lot'. In a future study, the empirical study should employ more diverse App icons to verify the three findings. Ultimately, we expect to share the empirical results with design practitioners.

References

[1] M. Böhmer, B. Hecht, J. Schöning, J. Kruger, and G. Bauer, "Falling asleep with Angry Birds, Facebook and Kindle: a large scale study on mobile application usage," *in Proc. of the MobileHCI '11*, Stockholm, Sweden, Aug. 2011, pp. 47-56.

[2] C. Shin, J. H. Hong, and A. K. Dey. "Understanding and prediction of mobile application usage for smart phones," *In Proc. Of the UbiComp '12*. ACM Press.

[3] J. Jang and H. J. Suk. "Informative effect through changing the color attributes of smartphone application icons," *in Proc. IEEE International Conference on Consumer Electronics*. Las Vegas. Jan. 2014. pp. 341-342

TABLE II. NEED FOR CHANGE AND THE TOP 3 SELECTED CHANGES PER STATUS(E.G. FACEBOOK & KAKAO TALK CASES)

Status	*Need for change (%)*		Selected Changes					
			1st		*2nd*		*3rd*	
Need to update	78.34	81.82	Hue +90º	Lightness +70%	Lightness +70%	Saturation -100%	Hue-45º	Hue+45º
Update complete	27.25	31.82	Default	**Default**	Hue -90º	Hue +45º	Hue-45º	Hue+90º
This app is used a lot	49.25	54.55	**Hue +90º**	**Hue -45º**	Hue -45º	Hue -90º	Lightness -70%	Default
This app is used less	62.20	50	**Opacity 25%**	Opacity 25%	Opacity 50%	Saturation -100%	Saturation -100%	Opacity 50%
Broken	87.86	81.82	**Lightness -70%**	**Lightness -70%**	Saturation -100%	Saturation -100%	Lightness -35%	Lightness +70%
New notice	60.44	54.55	Hue +90º	Hue -45º	Hue -45º	Hue -90 º	Default	Hue +45º

Shaded cells: Chosen by more than 40% participants