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Cultural differences on attention and perceived usability: Investigating color combinations of animated graphics

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Abstract

This experimental study investigates the effects of animated graphic colors on attention and perceived usability of users from two cultural groups, American and Thai. The experiment employs a three-way split-plot design with one between-subjects factor and two repeated-measures factors. The between-subjects factor contains two cultural groups, American and Thai. The two repeated-measures variables are a banner background color factor with six levels and a banner font color factor with two levels. Participants search for target words from text on Web pages that contain three animated banner graphics. The findings lead to the conclusion that users across cultures tend to ignore animated banner graphics when they look for specific information on highly informative Web pages. This study also suggests influences of culture on overall performance, overall retention, and overall self-reports on usability, regardless of differences in banner color combinations. Moreover, cultural differences on the self-report of attention drawing are also revealed in each banner color usage, except yellow banners with white text. This study does not aim at exploring superiority of participants between cultures. Rather, it attempts to explore some possible cultural differences in interacting with a computer interface that could facilitate cognition and perception of users from different cultural groups.

Keywords: Culture; Animated graphic; Color; Banner; Attention; Usability; Visual search

1. Introduction

Developing a successful computer interface requires careful consideration of language translation and the implications of culturally sensitive elements. A number of studies (e.g., Tractinsky, 1997; Dong and Salvendy, 1999) show that taking cultural diversity into account in a design process, particularly in interface design, is essential. Still, cultural studies in HCI are limited.

As cultural backgrounds could influence learned responses to color (Eiseman, 2000), color preferences might be considered culturally dependent. Interface designers need to understand color appreciation and color responses of people in different cultures and regions. Effective usage of color can create several benefits, and these benefits must be given to all people throughout the world.

In terms of interface design, other than color, motion is also an important attribute of objects that can most distract visual attention (Constantine and Lockwood, 1999). Therefore, understanding how a user processes information on a Web interface that contains not only text but also animated graphics (e.g., banner advertisings) is particularly important to a Web usability engineer in designing usable Web pages. Moreover, Web users often perform more than one online activity simultaneously (e.g., information seeking, online chatting). Nevertheless, it is widely known that human beings have limited attention and limited short-term memory. As such, the effectiveness in human information processing is lessened when performing concurrent tasks.

This study explores the effects of combinations of text and background colors of Web animated graphics on

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attention and perceived usability in seeking information on Web pages containing animated banner graphics between American and Thai participants. This empirical study potentially contributes to a necessity of understanding cognitive processing of people across cultures when interacting with computer interfaces.

The study addresses the following questions:

1. Are there differences in performance, retention, and self-reports of usability when users perform target-word searching on different Web pages containing animated banner graphics with different combinations of text and background colors?
2. Does culture affect performance, retention, and self-reports of usability when users perform target-word searching on different Web pages containing animated banner graphics with different combinations of text and background colors?

2. Related work

Theoretical work of this study can be divided into two major sections, cultural issues in interface design and visual attention. Cultural issues in interface design are discussed in terms of the concept of culture, culture and color preferences, and culture and human information processing. Visual attention particularly points out the effects of animated graphics and colors on visual attention.

2.1. Cultural issues in interface design

Generally, culture differs not only in languages, symbols, images, colors, and formats of date and time, but also emotions, personalities, perception, cognition, and thinking styles. In other words, culture functions as the basis of people's behaviors, thoughts, and feelings (Komin, 1991). Therefore, general guidelines of cross-cultural interface design (Fernandes, 1995) and general models of cultural differences (e.g., the Onion model by Hofstede, 1991) exist and can be adapted for interface design purposes, thereby improving in user performance and satisfaction.

Currently, many HCI researchers are focusing on culture as a potentially important factor that can affect user performance and satisfaction toward an interface. However, cultural studies in HCI are insubstantial. In addition, recommendations of interface design for international users are mainly based on collective knowledge, personal experiences, and few case studies (Marcus, 1993; Russo and Boor, 1993; Belge, 1995; Fernandes, 1995; Kano, 1995; Nakakoji, 1996; Marcus et al., 1999; Schaffer and Sorflaten, 1999). Tractinsky (2000) states that theory building and testing is essential to facilitate researchers in cross-cultural HCI to explore their studies systematically. Hence, empirical investigations on the impacts of cultural factors on interface design are absolutely vital.

2.1.1. The concept of culture

Culture is an abstract, complex, and problematic term (Barber and Badre, 1998). It has been defined in various ways. Hofstede (1991) defines culture as "software of the mind," i.e., "the collective programming of the mind which distinguishes the members of one group or category of people from another." Segall et al. (1999) assert, "Any experience a person has is influenced by that person's previous experiences. To the extent that previous experiences are determined by the accident of birth at a particular time in a particular place, it becomes probable that the 'same' event will be different events, even in very fundamental ways, to members of different cultural groups." Culture might include behavioral products, values, languages, ways of life of ancestors, art, music, shared preferences, rules, norms, attitudes, and beliefs (Segall et al., 1999). Cultural elements are transmitted, shaped, shared, and taught among people in each particular culture, thereby differentiating a culture from one another (Segall et al., 1999).

2.1.2. Culture and color preferences

Fernandes (1995) provides nine general principles in designing interfaces for international users. One guideline is to present information with culturally appropriate aesthetics such as colors. As cultural backgrounds can influence learned responses to colors (Eiseman, 2000), color preferences are probably considered culturally dependent. By rating separately or by comparing between each pair of colors on a subjective scale, several factors influencing human preferences of unique colors or color combinations have been investigated such as age, gender, emotion, personality, and nationality (Kreitler and Kreitler, 1972).

Kreitler and Kreitler (1972) emphasize that an investigation on color preferences of people from different cultural backgrounds is important to arts because aesthetic experience, which is culturally dependent, is greatly concerned in Arts. However, evidence of color preferences from culture to culture varies (e.g., Silver, 1988; Birren, 1992), therefore, more studies are needed to explore these variation preferences.

Several efforts in determining cultural factors in color preferences still continue. Particularly, a trend in studying color in interface design across cultures is crucial. For instance, Vanka, as cited in Kemnitzer and Dorsa (1999), develops "ColorTool" as a general guideline and a tool for assisting interface designers to choose appropriate colors for different cultures. Peterson and Cullen (2000) provide worldwide examples of color design in global graphics. In another study, Barber and Badre (1998) attempt to embed cultural factors into usability in the context of Web design.

2.1.3. Culture and human information processing

In cross-cultural psychology, Segall et al. (1999) state that the purpose of cross-cultural cognitive psychology is to understand human cognitive processes which are influenced by cultural factors. These processes include