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IMPACT OF REPRESENTATIONAL SYSTEMS ON COLOR SELECTIONS FOR GRAPHIC USER INTERFACES

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DISCLAIMER

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ABSTRACT

This paper is based on a study involving representational systems and color preference on graphic user interfaces (GUI). The study is an extension of a general exploratory experiment (GEE) conducted in October of 1993[2], wherein individuals' favored sensory representational systems (visual, auditory and kinesthetic) (FRS) were compared to their GUI comfort parameters. The results of the study show that an individual's FRS is a significant factor in their acceptance of a GUI design, and that further in-depth study of the various display attributes to an individual's FRS is required.

This research is the first in the series of follow-up studies to be conducted regarding specific characteristics of GUI (i. e., fonts, character density, etc.) with respect to an individual's FRS. The study focus on the attribute of color preferences for GUI design.

Keywords

Favored representational system (FRS), representational system (RS), graphic user interface (GUI), color selection, neurological outputs, behavioral indicators, user study.

INTRODUCTION

Software technology has developed to the point that graphic display designers have the capability to design simple and complex graphic user interfaces (GUI) with a wider range of flexibility and creativity. However, the final outcome is not always met with acceptance from the end user. One reason is due to the differences between the favored representational systems of the developer and that of the end user.

A study conducted in 1993 at Argonne National Laboratory showed that an individual's favored representational system impacts their preferences regarding the design of GUI.

"...'favorite representational system' asserts that many individuals tend to value and use one representational system: visual, auditory or kinesthetic, over the others to perform their tests and operations. This kind of preference is often generalized to many different types of tasks, even to those for which the preferred representational system is inappropriate or inadequate"[1]

People are multi-sensory and have the tendency to favor one representational system over the others for processing information, as was seen in the 1993 study. The GEE study depicts a paradigm that kinesthetically oriented individuals' dislike black backgrounds because of negative "feelings" generated in them by the color. This is correlated to visually oriented individuals who find black background displays to be excellent for providing good contrast. The study also found that comfort parameters regarding hue preferences and quantity of colors displayed on the screen differed between representational systems. The ramification is that color preference affects how users relate to GUI which is, in turn, controlled by the FRS. It is therefore hypothesized from this study that color on a display can determine user "friendliness" dependent upon representational system preference.

EXPERIMENT

Phase I

A program was developed for Phase I of the GUI study that displays a sample box which automatically cycles through 128 colors. This is used to seek the subjects' color preference. Since a background color used during this selection process may seriously impact on the subjects' election of color preference, this test has been constructed to operate on three different background colors: black, light blue, and a color to be selected by the subject prior to testing. Subject's identification, background color, sample box color, and user color *acceptance, rejection and undetermined* will then be recorded. The test will be repeated three times for each background color to determine

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consistency in the subjects selections. Subjects' FRS are to be observed and recorded consistent with their neurological outputs (i.e., eye movements) and behavioral indicators (i.e., tone shifts in voice, breathing patterns, gestures, etc.) and their FRS is then to be compared with their color selections. The subjects' selections are to be recorded as indicated above from soft buttons on the screen.

Phase II

Phase II of the GUI study requires subjects to select colors for trending operations. The study uses a program to display trending output on a user selected background. The display contains three trending lines, associated text, and a palette from which the subject can select colors for the line and text. Each subject will be asked to select the colors they perceive are suited for them in viewing trending functions. Subject's identification, background color, and color selections for each line and text will be recorded. The results will be compared with subjects' FRS.

DATA ANALYSIS

The GEE study performed by the first author concerning continua of color, hue, saturation ratios, brightness and darkness, and contrast, indicated that visually oriented subjects prefer colors that are dark and delineate high contrast; whereas auditories favor hues that are more primary and "easy to see;" and kinesthetics favor less saturated colors that "feel" comfortable. The data from the present study will be used to validate the results of the original study and associate specific colors to an individual's FRS.

Data analysis will be completed by late February of 1996. Statistical analysis of the quantitative data collected by the computer will be integrated with the FRS qualitative data.

CONCLUSION

By effectively applying the models built as a result of this study, designers will be able to develop color GUI that appeal to a wide audience. This broader acceptance of displays can translate into marketing success for commercial companies or decreased implementation time for internally used software. At the very least, designers must be aware that their own representational system preferences can cause a bias in the creation of displays that may not appeal to end users. Redesign can be avoided and developmental time reduced by taking into account the comfort parameters of the representational systems during the conceptual design phase of the GUI..

The final outcome of the studies is the development of a general model for designers of the user comfort parameters.

FUTURE WORK and APPLICATIONS

Future work involves follow-up studies of representational systems and other components of GUI. These include, but not limited to, function representation (i.e., line thickness), table formats, use of animation, and text display (e.g., font size, character density, etc.).

Results will be applied to the design and development of displays for applications such as; (a) the movement and storage of low level radioactive waste, (b) the human-driver interface for an intelligence transportation system, (c) the human-computer interface for the Sodium Process Facility at Argonne National Laboratory, and (d) perceptual modeling for virtual environments.

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