



ELSEVIER

Available online at www.sciencedirect.com



Int. J. Human-Computer Studies 58 (2003) 515–545

International Journal of
Human-Computer
Studies

www.elsevier.com/locate/ijhcs

Moticons: detection, distraction and task

Lyn Bartram^{a,*}, Colin Ware^b, Tom Calvert^c

^a *Colligo Networks, Inc., 2nd Floor, 1071 Mainland Street, Vancouver BC, Canada V6B 5P9*

^b *Data Visualization Lab, University of New Hampshire, Durham, NH 03824, USA*

^c *School of Computing Science, Simon Fraser University, Burnaby, BC V5A 1s6, Canada*

Received 1 May 2002; accepted 1 November 2002

Abstract

In this paper, we describe an empirical investigation of the utility of several perceptual properties of motion in information-dense displays applied to notification. Notification relates to awareness and how dynamic information is communicated from the system to the user. Key to a notification technique is how easily the notification is detected and identified. Our initial studies show that icons with simple motions, termed *moticons*, are effective coding techniques for notification and in fact are often better detected and identified than colour and shape codes, especially in the periphery. A subsequent experiment compared the detection and distraction effects of different motion types in several task conditions. Our results reveal how different attributes of motion contribute to detection, identification and distraction and provide initial guidelines on how motion codes can be designed to support awareness in information-rich interfaces while minimizing unwanted side effects of distraction and irritation.

© 2003 Elsevier Science Ltd. All rights reserved.

Keywords: Notification user interfaces; Motion; Animated user interfaces; Attention

1. Introduction

Users typically function in multi-task environments in which information is distributed across windows and applications and is not necessarily exclusive to the

*Corresponding author. Tel.: +1-604-685-7962; fax: +1-604-685-7969.

E-mail addresses: lbartram@colligo.com (L. Bartram), colinw@cisunix.unh.edu (C. Ware), tom@sfu.ca (T. Calvert).

task at hand. For example, a financial analyst may be monitoring stock market quotes while reviewing a client's portfolio and evaluating performance patterns over time. Simultaneously, she may be cued as messages to do with office administration arrive from her colleagues. Alternately, a telecommunications manager may be planning scenarios for equalizing phone traffic across variably loaded channels, while sporadic alarms indicate overloads on current routes. In both cases, these users are being made aware of dynamic information outside the specific scope of the data they are using for their current tasks. In some cases, certain types of dynamic information are contained in a dedicated display which the user must constantly monitor, such as a stock ticker or message flag. These displays are typically located on the periphery of a screen (Czerwinski et al., 2000; Maglio and Campbell, 2000; McCrickard, 2000). In other cases the changing information can be located anywhere in the visual field, such as mode information or element state directly tied to data objects in the displays (Sarter and Woods, 1995; Mitchell and Sundstrom, 1997).

Monitoring dynamic information can be a cognitively strenuous task which requires the user to examine the currently displayed information and decide whether it has changed, so it is preferable to explicitly alert the user to a change by a *signal*. Signals are graphical events which indicate to the user that something has happened in some area in the display. Replacing an "empty mailbox" icon with a "full mailbox" to show e-mail status or animating the transformation of old text into new in a peripheral display (McCrickard, 2000) are examples of signals. Signals are incorporated into peripheral awareness tools (Maglio and Campbell, 2000; McCrickard, 2000), messaging (Parsowith et al., 1998; Cutrell et al., 2000), state changes, system events or alarms (Adams et al., 1995). They can also be used as navigation markers or guides to dynamically emphasize relevant points in a display.

Current information visualization interfaces rely heavily on graphical coding devices (also termed *display dimensions*) such as shape, colour, size, texture, orientation and position (Ware, 2000). These schemes can be very effective in enabling information analysis because they are *mentally economical* (Woods, 1991; Healey et al., 1995): rapidly and efficiently processed by the preattentive visual system rather than attentive effort. However, only a small amount of information can be encoded in each visual dimension. For example, a typical recommendation is that no more than eight colours be used to define information categories (Shneiderman, 1986; Gilmore et al., 1989). For this reason there is a shortage of perceptually efficient codes than can be used in information-rich user interfaces.

One promising way of visually coding information is to use simple motion. Motion has a unique ability to attract attention over a large visual field and offers a rich graphical vocabulary. Its use has only recently become feasible due to the advent of fast graphics processors and supporting software technologies. However, compared with the use of colour coding, which is supported by a large literature of design guidelines based on decades of experimental studies, there has been little research relating to the effective design of motion codes. Such work is urgently needed because available technologies such as Javascript and image animation have led to a riot of moving and jiggling icons that compete for our attention. The

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات