An Empirical Investigation into the Role of Avatars in Multimodal E-Government Interfaces

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ABSTRACT

Interfaces for e-government applications are becoming essential for the modern life. E-government uses web-based interfaces to deliver effective, efficient and convenient services to citizens, business and government. However, one of the main obstacles (or barriers) of using such applications is the lack of the user trust and usability. These issues are often neglected in the interfaces of e-government application. This paper describes an empirical comparative study that investigated the use of multimodal metaphors to enhance the usability and increase the user trust. Specific designs of multimodal metaphors were investigated to communicate information using a specially developed e-government interface platform. These designs involved facially animated expressive avatars and auditory stimuli in addition to the typical visual metaphors often used. An experiment was carried out with 30 users to explore and compare the usability and user performance. These results provided a set of empirically derived innovative guidelines for the design and use of these metaphors to generate more usable e-government interfaces. For example, when designing avatars as animated virtual messages or live mail in e-government interfaces, specific facial expression should be incorporated due to its positive influence in enhancing users’ attitude towards the communication process.

Keywords: Avatar, E-government, Earcons, Human Computer Interaction, Multimodal, Record Speech

1. INTRODUCTION

This paper describes an experiment that has been conducted to explore and compare the role of avatars, when used to communicate messages in e-government interfaces, to provide a more usable user communication in this problem domain (Nielsen, 1993). In addition to textual and recorded speech communication metaphors, animated speaking avatars were employed in two different modes of presentation. These were facial expressions and naturally recorded speech. The following sections provide a detailed description of the research aims, objectives, hypotheses, experimental platform, design of the experiment, results and discussion.
2. LITERATURE REVIEW: MULTIMODAL INTERACTION IN E-GOVERNMENT INTERFACES

Usability is one of the most significant factors in evaluating user interfaces (Costabile, 2001) and software quality (ISO, 1998). It can be defined as the “extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction” (Alzahrani, 2011). An effective e-government interface can be implemented and developed only by understanding the problem domain of e-government, user expectations under the citizen-centric approach as well as the barriers that might hinder these applications from providing the desired services through the Internet. This technology can contribute in improving the efficiency and communication of governments, facilitate economic development and reduce cost. It also contributes to meet citizens’ expectations for service delivery by facilitating administrative procedures (Alsaghier, Ford, Nguyen, & Hexel, 2009; Rigas, Memery, & Yu, 2001).

Rigas et al. suggest that the use of multimodal metaphors in interfaces can be more useful to successfully communicate the information that needs to be delivered to the user (Rigas & Alty, 1998; Rigas & Hopwood, 2003; Rigas, 1996). Also, they found that the use of speech and non-speech in interface application helped users to make fewer mistakes and reduced the time taken when accomplishing typical interaction tasks (Oviatt, 2003). The use of auditory channel, as a whole, has demonstrated to benefit user-interfaces but it is not used widely (Rigas, 1996). Interfaces that offer interaction using more than one sense are often considered more usable and therefore their application in e-government interfaces is likely to provide benefits.

Another form of multimodal communication is avatars with facial expressions and body gestures in addition to the use of speech and in some cases written messages (Beskow, 1997). In general, avatars can be classified as abstract, realistic and naturalistic (Salem & Earle, 2000). Abstract avatars are cartoon-like interactive characters with limited animation (Gazepidis, 2008). The help avatar embodied in Microsoft’s office application is an apparent example of these avatars, designed to provide the users with helpful information during the preparation of their documents (Salem & Earle, 2000). An avatar involves both the visual and the auditory human senses. It is a computer-based character that has been utilised to virtually represent one party in an interactive context (Bartneck, Takahashi, & Katagiri, 2004; Dickey, 2003) with the ability to communicate verbal and non-verbal information (Alzahrani, 2011; Alsaghier, Ford, Nguyen, & Hexel, 2009).

3. AIMS AND OBJECTIVES

The aim of this experiment was to obtain an overall viewpoint of feedback from users with regard to the applicability and usability of facially expressive avatars. These avatars can be used to send messages to government through e-government interfaces and present a new kind of communication and interactive content. The study also aims to determine the facial expressions, that as part of an avatar, are more desirable to users. Moreover, the experiment aims to test the usability aspects and users’ communication performance when using e-government interfaces which use avatars to convey the virtual message. These types of new multimodal metaphors are generally assumed to increase the efficiency, effectiveness and satisfaction of e-government interfaces but there is limited empirical evidence to suggest the appropriate use from the design stage of such an interface. Therefore, the paper explores in a greater detail the role of the facial expressions to the overall user experience that significantly contribute to user satisfaction and the development of user trust.

The objectives of this study involved the development of a hypothesis and an e-government experimental platform that was used as a basis to communicate information. An experimental investigation was undertaken into the role of expressive avatars in e-government interfaces using the experimental platform developed by
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