Design of a Study to Evaluate the Effectiveness of a Spoken Language Interface to Information Systems

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ABSTRACT

Users of digital libraries and other information systems typically carry out searches with very short queries, on the order of two words or so. This makes it very difficult for the systems to disambiguate their queries and identify potentially relevant documents, resulting in sub-optimal retrieval performance. We hypothesize that users will provide better and more useful descriptions of their information problems if they are able to speak to the system and easily indicate through speech and gesture those documents and aspects of documents which they find useful, and not useful. In this paper, a spoken interface is described, and a planned wizard of oz study will be introduced.

Keywords

User studies, searching, spoken interface, user performance

INTRODUCTION

As Digital Libraries (DLs) and other digital information systems become increasingly ubiquitous and important in people's lives, issues regarding ease of access to, and effective use of such systems becomes correspondingly more important. Two major problems exist:

1. Users of DLs and other information systems tend to begin their searches with brief queries: the general inability of people to specify precisely what documents they require in order to resolve their information problems (Belkin, 1980).

2. People have difficulty finding terms appropriate both for describing their information problems and matching the terms which have been used to describe the documents in the database with which they are interacting.

To address these two problems , a variety of ways have been proposed and investigated. One approach has been to devise interface techniques which encourage searchers to input longer queries (Karlgren & Franzen, 1997); another has been to automatically enhance the initial query without the searchers' intervention, or through query expansion based on thesauri or similar tools (Efthimiades, 1996); a third was to offer to searchers, based on their initial queries, terms which could be used to enhance their initial queries (Belkin, Marchetti & Cool, 1993; Koenemann & Belkin, 1996). Although these approaches have shown to afford some benefit in retrieval effectiveness, none of them have involved searchers developing and understanding their information problems, finding better ways to express their information "needs", nor have they succeeded in substantially improving either retrieval effectiveness or searcher satisfaction with the interaction (Kelly, 2005).

We propose to address the problem of encouraging effective interaction of the searcher with the DL or other information systems by moving from keyboard-based interaction to spoken language and gestural interaction of the searcher with the information system. The origins of this approach are based on Taylor's research regarding question negotiation between users and librarians in special libraries (Taylor, 1968). Also on the experience of elicitation of verbal descriptions of searchers' information problems in studies of Anomalous State of Knowledge (ASK)-based information systems (Belkin, 1980). Subsequently, Saracevic et al. (1997) showed that there was substantial direct commentary by both searcher and intermediary on results retrieved with respect to a query put to the system. Crestani & Du (2006) have shown that asking for expression of search need in verbal terms results in significantly longer queries than those expressed through a keyboard interface. Crestani has led a group which has considered spoken language queries and their effectiveness in a variety of contexts (Crestani & Du, 2006). Some of this work has investigated the effectiveness of spoken queries, as well as their length, but in simulated rather than real interaction.

In the following section, a spoken interface is described, and a user experiment to investigate the utility of such interaction is briefly illustrated.

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METHODOLOGY

As shown in Figure 2, the interface has a query entry box, a list of saved documents and a ranked list of retrieval results. It allows the subjects to view the retrieved documents by clicking on their titles. Useful documents are saved directly with the subjects clicking on the "Save" button to the right side of each retrieved document. The baseline interface is the same as the speak to me interface.

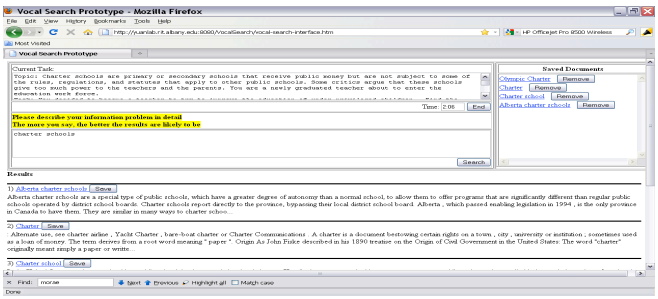

Figure 2. Speak to me interface

A speak-to-me Wizard of Oz experiment will be conducted. The purpose of this study is to investigate the usefulness of an information retrieval system which accepts spoken and gestural input in comparison to one which accepts typed input. Our hypothesis is that the system which allows the user to speak about her/his information need, and to indicate through speech and pointing good and bad things about the system's response, ultimately will collect more useful information about the person's information needs than that which allows interaction only through typing and mouse movement.

The experimental design is within-subjects. There will be two systems in the laboratory, one running the Baseline System and the other running the Experimental System. The Baseline System will be equipped with a keyboard and mouse, while the Experimental System will have no keyboard, and will have a touch-screen monitor. The monitor interfaces for both the experimental and baseline system are identical. These systems are located side-by-side, and the participants will alternate search tasks between the two systems. There will be two experimenters. One experimenter will interact with the participant and administer the experiment, while a second experimenter will play "The Wizard of Oz" and input the queries and query modification commands that are issued by the participant when using the Experimental System. The second experimenter will be situated in the control room, behind an observation mirror. The interaction between the subject and the system will be recorded by TechSmith Morae 2.1[1].

Twelve different search tasks will be given to the subjects to perform. These tasks will be described using scenarios that attempt to involve the subjects in the context of the search, according to the concept of "work tasks" proposed by Borlund (2003). This is done to give some degree of ecological validity to the experiment. The tasks are categorized into three types in terms of the analysis by Kim (2006); that is, factual task, interpretive task and exploratory task. According to Kim, factual tasks collect facts by asking and are close-ended. Interpretive tasks and exploratory tasks are open-ended and include evaluation, inference, and comparison, while the former is more focused and goal oriented than the latter.

CONCLUSIONS AND FUTURE WORK

This is an on-going project. The pilot testing is about to start on August 2011. The results of the project will be the evaluation of a new method of interaction with digital libraries and other information systems, as compared to a normal keyboard-based interaction, and, design criteria for a spoken language and gesture input interface to information retrieval systems. Although this experiment will be carried out with desktop computers, it is clear that the mode of interaction that we are testing is especially applicable to search with mobile devices.

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[1] http://www.techsmith.com/morae.asp

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