
Improving Older Adults' Search Experience Using Speech Interface in Health Practices

Xiaojun Yuan
College of Computing and Information
University at Albany, State University of New York
Albany, NY 12222
xyuan@albany.edu

Bo Xie
College of Information Studies
University of Maryland
College Park, MD 20740
boxie@umd.edu

Abstract

Exploring techniques that can help older adults search for health information on the Web or in information systems is important in this information-overloaded digital society. We propose that older adults' experience of information systems can be improved if the system allows them to speak to the system about their information needs, and use gestures to point out relevant documents in the system retrieved results.

Keywords

Spoken interface, multi-touch screen, user studies, searching

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Information behavior, speech technology, Measurement, Performance, Experimentation, Human Factors.

Introduction

Research shows that the majority (80%) of Internet users have sought health information online [9], and

that searchers use different information seeking strategies or techniques to search for information to solve their information problems [20,21].

In this information-overloading age, we urgently need a search engine that can “interpret a user’s question, extract facts from all the information on the web, and select an appropriate answer” [8]. To achieve the above goals, we need to develop appropriate and effective ways to elicit clear information needs from users, understand more about their questions, and allow them to choose appropriate answers effectively. Age-related changes in cognition, motor skills, and sensory abilities [4], coupled with poor website designs that do not take into full account older adults’ special needs, preferences and skills [18], impede older adults’ learning and use of new technology.

We hypothesize that older adults will provide more useful descriptions of their information problems if they are able to speak to the system and indicate through speech and gesture those documents and aspects of documents which they find useful or not useful.

In this paper, we discuss relevant prior work, and describe some thoughts towards this direction.

Relevant Work

Recently, computers and the Internet are increasingly being used in health information seeking and decision-making [9, 12]. This presents both new opportunities and challenges for older adults. A national survey shows that older adults have the lowest level of proficient health literacy among all adult groups in the United States, with only 3% of older adults have proficient health literacy [11]. In particular, older adults typically experience difficulties with the computer mouse and keyboard, making it challenging for them to interact with computers equipped with these conventional input devices [16].

Relatively little is known about how older adults search for health information online, particularly via more sophisticated search interfaces like faceted search interfaces that are increasingly prevalent on the web

[15]. Evidence suggests that older adults tend to start their online searches from commercial search engines with limited search keywords, and, not surprisingly, their searches end up unsuccessful [17].

As 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. Research has shown that average users of information systems tend to begin their searches with brief queries because of the general inability of people to specify precisely which documents they require to resolve their information problems (cf. [1]); and, people have difficulty in finding terms appropriate both for describing their information problems, and matching the terms that have been used to describe the documents in the database they are interacting with.

How to encourage effective interaction of older adults with information systems? We propose to move from keyboard-based interaction to spoken language and gestural interaction of the searcher with the information system [22]. This new approach can help overcome a major barrier to older adults’ use of information systems: that is, the computer mouse and keyboard-based input devices [16].

Further, recent research has shown that the longer queries and more extensive response to search results that would be afforded by this mode of interaction does improve retrieval effectiveness (e.g. [2],[10]); when encouraged to describe their information problems more fully, searchers will do so [3,10]; and, spoken language interaction with information systems appears to be either doable right now [23] or in the very near future, with commercially available speech understanding systems (e.g. Dragon). There is also evidence that speech recognition technology is already in place in a mobile environment [13]. For example, Google outlined developments in voice search, which allows users to search the Internet from a mobile phone by speaking their requests or queries to Google in Japanese, in addition to Chinese and English.

Crestani and Du [6] 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 [6]. Some of their work has investigated the effectiveness of spoken queries, as well as their length, but in simulated rather than real interaction. In an ongoing project, Yuan and her colleagues [22] designed a spoken interface that allows users to view the retrieved documents by pointing on their titles, or by saying which document they would like to view. Useful documents are saved directly with the subjects touching the "Save" button to the right side of each retrieved document, or, again, by saying which document(s) should be saved.

Future Directions and Work

We aim at producing the evaluation of a new method of interaction with 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. We hope through this mode of interaction, older adults can experience satisfactory using the online information systems. It is clear that the mode of interaction that we are testing is especially applicable to search with mobile devices. We hope that this kind of research can draw sufficient attention in human computer interaction in improving search system effectiveness and gaining satisfactory user experience of using such systems. We plan to conduct the testing in summer 2012 at public libraries that have served as research sites for our other research projects since 2007. These public library sites, due to their convenient locations and friendly environment, have proven to be conducive of attracting older adults to participate (e.g., [19]).

This research has implications for clinical practices: with an increasing emphasis on shared decision-making in health care in recent years, there is growing interest in helping patients access, understand, and use health

information to make informed decisions about their own health care. Older adults generally have a great need for health information and services; however, they typically also experience difficulties using new technology to obtain health information needed to make decisions. For example, in a situation that older adults cannot formulate effective search queries to represent their real information needs, with a spoken interface, they can speak to the system using their own words about what they want, and then receive the expected results from the system. Such interaction would lead to their better communication with medical professionals. By improving older adults' interaction with the technology, our approach may help bridge the gap between older adults' health information needs and their abilities to obtain such information.

Acknowledgements

This research is partly sponsored by the Institute of Museum and Library Services grant (RE-04-10-0053-10) (PI: Xiaojun Yuan) and an R01 grant (1R01AG041284-01) from the National Institutes of Health (PI: Bo Xie).

References

- [1] Belkin, N.J. (1980). Anomalous States of Knowledge as a basis for information retrieval. *Canadian Journal of Information Science*, 5, 133-143.
- [2] Belkin, N.J. & Kwasnik, B.H. (1986) Using structural representations of anomalous states of knowledge for choosing document retrieval strategies. In: *SIGIR '86: Proceedings of the 1986 ACM SIGIR International Conference on Research and Development in Information Retrieval*, Pisa, Italy. Pisa, ACM: 11-22.
- [3] Belkin, N.J., Cool, C., Kelly, D., Kim, G., Kim, J.-Y., Lee, H.-J., Muresan, G., Tang, M.-C., Yuan, X.-J. (2003). Query Length in Interactive Information Retrieval. In *SIGIR '03. Proceedings of the 26th Annual International ACM SIGIR Conference on Research and Development in Information Retrieval* (pp. 205-212). New York: ACM.

- [4] Birren, J. & Warner, S. K. (1990). Handbook of the psychology of aging. San Diego: Academic.
- [5] Chin, J., & Fu, W. (2010). Interactive effects of age and interface differences on search strategies and performance. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Atlanta, GA, USA, April 10-15, 2010). CHI 2010. ACM, New York, NY, 403-412.
- [6] Crestani, F. & Du, H. (2006). Written versus spoken queries: A qualitative and quantitative comparative analysis. Journal of the American Society for Information Science and Technology, 57, 881-890.
- [7] Czaja, S. J., Charness, N, Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., et al. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). Psychology and Aging, 21(2):333-352.
- [8] Etzioni, O. (2011) Search needs a shake-up. Nature, 476 (4 August 2011): 25-26.
- [9] Fox, S. (2011). Health Topics. Pew Internet. Washington D.C. <http://www.pewinternet.org/Reports/2011/HealthTopics.aspx>.
- [10] Kelly, D., Dollu, V. J., & Fu, X. (2005). The loquacious user: A document-independent source of terms for query expansion. In: Proceedings of the 28th Annual ACM International Conference on Research and Development in Information Retrieval (SIGIR '05), (pp. 457-464). Salvador, Brazil: ACM.
- [11] Kutner, M., Greenberg, E., Jin, Y., & Paulsen, C. (2006). The Health Literacy of America's Adults: Results From the 2003 National Assessment of Adult Literacy (NCES 2006-483). Washington DC: National Center for Education Statistics.
- [12] Oh, H., Rizo, C., Enkin, M., & Jadad, A. (2005). What is eHealth?: a systematic review of published definitions. World Hospitals and Health Services, 41(1), 32-40.
- [13] Stone, B. (2009). Google Adds Live Updates to Results. New York Times, December 8. Retrieved from <http://www.nytimes.com/2009/12/08/technology/companies/08google.html>
- [14] Tullis, T. (2007). Older adults and the Web: Lessons Learned from eye-tracking. Proceedings of the 4th International Conference on Universal Access in Human Computer Interaction: Coping with Diversity (July 2007, Beijing, China) HCI (5) 2007: 1030-1039.
- [15] Tunkelang, D. (2009). Faceted Search. Synthesis Lectures on Information Concepts, Retrieval, and Services, 1-80. Morgan & Claypool.
- [16] Xie, B. (2003). Older adults, computers, and the Internet: Future directions. *Gerontechnology*, 2(4), 289-305.
- [17] Xie, B. (2008). Older adults, health information, and the Internet. ACM Interactions, 15(4), 44-46.
- [18] Xie, B., Watkins, I., & Huang, M. (2011). Making Web-based multimedia health tutorials senior-friendly: design and training guidelines. In Proceedings of iConference 2011, February 8-11, 2011, Seattle
- [19] Xie, B. (2011). Effects of an e-health literacy intervention for older adults. *Journal of Medical Internet Research*, 13(4):e90. <http://www.jmir.org/2011/4/e90/>
- [20] Yuan, X.-J., & Belkin, N.J. (2010a). Investigating information retrieval support techniques for different information-seeking strategies. Journal of the American Society for Information Science and Technology, 61(8): 1543-1563.
- [21] Yuan, X.-J., & Belkin, N.J. (2010b). Evaluating an integrated system supporting multiple information-seeking strategies. Journal of the American Society for Information Science and Technology. , 61 (10), 1987-2010.
- [22] Yuan, X.-J., Belkin, N.J., Jordan, C., & Dumas, C (2011). Design of a Study to Evaluate the Effectiveness of a Spoken Language Interface to Information Systems. Accepted to Proceedings of the Annual Conference of the American Society for Information Science & Technology (ASIS&T) 2011 (10p.). New Orleans, LA, October 9-13.
- [23] Zue, V. et al. (2000) JUPITER: A Telephone-Based Conversational Interface for Weather Information," IEEE Transactions on Speech and Audio Processing, Vol. 8, No. 1, January 2000.