

Assistive Mobile Communication Support

Sonya Nikolova and Xiaojuan Ma

Princeton University, Princeton, NJ 08540, USA

{nikolova, xm}@cs.princeton.edu

Abstract

This paper reflects on our work in providing communication support for people with speech and language disabilities. We discuss the role of mobile technologies in assistive systems and share ongoing research efforts.

1 Introduction

Designing assistive communication technologies for people with speech and language disabilities involves a number of challenges including addressing stigma and portability concerns. Mobile devices have the potential to resolve some of these issues if disadvantages such as small screen size and difficult interaction techniques are tackled.

Our experience shows that a mobile device and a desktop computer can serve in synergy as an effective communication support for people with aphasia, a disability that impairs the language modalities. Our work has also showed that assisting the user effectively is interlaced with the ability to provide flexible and personalizable support.

2 Mobile Support for Communication

Being able to communicate is essential to leading a self-sufficient and satisfying life. Individuals who suffer from aphasia experience many challenges, including social isolation (Kauhanen et al., 2000). Technology has the potential to help such individuals, but to enhance the users' daily communication effectively, tools need to be portable and usable outside of the home.

Our research focuses on designing multimodal communication systems for people with aphasia. We are interested in small and light-weight devices because their use is inconspicuous in public which addresses stigma issues prevalent among users with disabilities. Mobile devices have obvious shortcomings such as limited screen size and interaction techniques, and relatively small memory. However, if they assume the role of an extension instead of a replacement of traditional desktop and

laptop assistive systems, we can easily take advantage of their positive characteristics—portability being the most important one. In addition, mobile devices which have embedded camera, microphone, and speaker are convenient for taking photos, recording videos and sounds which can enhance communication. To compensate for the loss of language, visual and audio representations are essential support for information comprehension and speech production.

There has been consistently increasing interest in using mobile platforms for applications that support communication. For example, Davies et al. (2004) extensively studied one individual with aphasia who incorporated a personal digital assistant (PDA) into his daily communication strategies and demonstrated the device's potential. Moffatt et al. (2004) implemented an electronic daily planner enhanced with images and sounds, running on a PDA. Even though it received positive feedback when evaluated with aphasic individuals, the prevalently elderly subjects had difficulty in composing and editing appointments directly on the PDA.

Considering the advantages and disadvantages of a personal digital assistant, we combined a PDA and a desktop computer into a hybrid communication system for people with aphasia.

3 Hybrid Communication System

The desktop component of the hybrid communication system is used to compose and edit sentences and the PDA is used as a portable extension for conversations outside of home. A multimodal approach is used to compensate for the considerable variability in language impairments among individuals with aphasia. In the system's vocabulary, nouns are represented by text, sound and an image while verbs are represented by text, sound and an animation depicting the action. Users enjoyed and were able to work with the system, and they incorporated multiple photographs taken with the PDA into their communication (Boyd-Graber et al., 2006). The evaluation also revealed certain weaknesses and confirmed the need for flexibility and

customization in assistive technology outlined in previous work (Moffatt et al., 2004 and van de Sandt-Koenderman et al., 2005).

4 Work-in-Progress

We are currently redesigning the system and improving its flexibility by introducing some adaptive and adaptable features.

4.1 Web-based System

The fact that most mobile devices nowadays can access and browse the Internet relatively easily encourages us to explore a web-based system. By having the desktop and mobile components communicate online, we circumvent the time and location constraints of traditional synchronization methods. Even though data can be transferred easily between the two components of our system, the need for physical contact is a drawback if multiple parties are involved in the information sharing (for example, when the aphasia patient, her speech-language pathologist and her caregiver need to access and modify information on different desktops at different locations).

A web-based system will also eliminate the dependence on the mobile device's limited storage, which dictates the quantity and quality of the multimedia data available to the user. The user will have access to more pictures, videos, and audio clips stored on the server. A web-based system will also allow for sharing of resources online among users within the aphasic community which could forge new social connections.

4.2 Building an Adaptable Vocabulary

An essential component of a communication system that attempts to be flexible, extensible, and expressive is the vocabulary that it offers to the users. Vocabulary depth, breadth, organization and management are major challenges in existing assistive technologies including our own.

We are addressing these problems by designing a vocabulary application enhanced with adaptive and adaptable features. The goal is to enable aphasic users to build phrases quickly by browsing through a smart network of words represented by a triplet of image, sound and text. The links between words are based on the individual's vocabulary profile (frequently used words, personal interests and communication context) as well as word similarity and evocation measures derived from WordNet (Miller, 1990). The system's adaptability will

let the user add and remove words, group the words in a personalized manner by creating their own categories (such as a "Favorites" folder) and enhance them with images and sounds. The adaptive part will study the usage frequency of each word, make context relevant suggestions, and adapt the vocabulary organization automatically. Thus, frequently used words and words relevant to the user's interests or the context of the communication will surface faster. Naturally, the challenge is balancing the adaptive and adaptable aspects of the system to best benefit the user.

5 Conclusion

Even though small screen size and challenging interaction techniques make most existing mobile devices unusable for persons with aphasia, they hold a significant potential to assist daily communication effectively. We envision that a web-based communication system with a mobile and a desktop component will be an effective support because it will eliminate constraints related to data transfer and information updating. We are also working on creating adaptive and adaptable techniques that allow the vocabulary used for communication to be tailored to the user's needs. We are interested in discussing effective design strategies and interaction technique for language application for mobile devices as well as methods to make them serve as better communication support.

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