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A study of cross-modal collaboration between blind and sighted users

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Abstract. This paper gives a short description of a study of cross-modal collaboration between blind and sighted users. The study showed examples of shared frame of reference, compact and indexical referencing, gestures and monitoring.

Background

This work is about investigating new techniques for giving blind users better access to graphical user interfaces using sound. The importance is obvious if one takes a look at the situation today for blind computer users. Almost all computer usage today depends on visual output, and applications are getting increasingly more graphically intense.

The major difference between screen reading software for blind computer users and ordinary graphical user interfaces is the difference in presentation of the information (cf. Boyd, Boyd & Vanderheiden, 1990). The screen reader presents the contents of the screen in a line-by-line fashion, using speech synthesis or Braille. This linear presentation does not allow for presentation of concurrent and spatial information in the same way as a graphical user interface does.

We are interested in collaboration between blind and sighted users. This means that it is not only important to find a solution that is accessible, but also that mimics the graphical counterpart. The reason for this constraint is that an important part of the collaboration is the sharing of not only the goal but also the means of achieving that goal. In a collaborative setting, this enables the users to share their work, to give and receive help, to exchange ideas and workarounds to common problems etc. Social issues are also important, to be able to fully participate in the social

interplay that takes place with and around the tools that are used is an important way of achieving full equality in the workplace.

Previous work on auditory interfaces for blind computer users, such as the Mercator project (Mynatt, 1997) and the GUIB project (GUIB Consortium, 1995) has mainly focused on single user systems and the challenge of making a graphical user interface accessible. Both of these projects have discussed possible implications for collaboration with sighted users (Mynatt & Weber, 1994), but only on a theoretical level. There is however none, as far as we know, that has been looking at collaborative settings including blind and sighted users.

Collaborative study

We have performed a collaborative study using an auditory version of the game Towers of Hanoi (Winberg & Hellström, 2001). One blind and one sighted subject played the game together, taking turns in moving. The blind subject used a pair of headphones and the sighted subject a small computer screen, there were no overlap in presentation modalities. By doing this, the subjects had to mutually agree upon a strategy to solve the game, talk about the location of the objects and the actions required to accomplish the goal.

Results

The study shows examples of four important features of a collaborative system

The system supports a *shared frame of reference*. This means that both subjects refer to the objects and the actions in the same way. The difference in presentation modality does not lead to any ambiguity.

The collaborative system supports and encourages *gestures* that are seldom used by blind people, such as pointing. The blind subjects often referred to the objects or the locations just by pointing the mouse at them.

This provides the users with support for a *compact and indexical* way of referring to the objects. Instead of verbally describing the exact meaning of the actions, the subjects often talked about “put the left one here”, “throw the middle disc to the right”, “is the middle one here?”.

Finally, the system also supports *monitoring*. This means that not only the sighted subject, but also the blind subject, could monitor the activity of the other person, knowing from the feedback of the interface and the mouse interaction (move across the table, clicking on the button). This makes turn taking smooth and non-problematic.

Discussion

It is clear that the features presented in the previous section support collaboration in a co-located collaborative setting, but a lot of questions still remain to be investigated. What role does the auditory interface have in relation to the verbal communication when constructing the shared understanding between the users? Does the auditory interface have to mimic all aspects of the graphical interface? If not, what aspects are required to support the task at hand? What role could other modalities have, such as haptic input and output? No matter what the answers are to these questions, we believe that the use of sound could be so much more than just error messages and auditory extensions of visual or haptic information.

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