Assistive Multimodal Interfaces for Improving Visually Impaired Impaired People’s Access to the Web

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Introduction

• An assistive tool which consists of a multimodal interface and a content-aware Web browser plug-in has been developed to aid visually impaired users when using the Internet.

  - The Web plug-in constantly monitors the mouse position on-screen as well as detecting the objects in the vicinity. Depending on the context of the task, appropriate haptic (force-feedback mouse) and audio prompts can be given, to assist guidance or to help detect surrounding objects.

  - The multimodal interface extends previous work [1, 2, 3, 4], by providing an increased level of spatial information on a page and makes the Internet more accessible for visually-impaired users. The plug-in allows users to explore the Web using familiar browsing technologies.

  - Further assistive guidance will be produced through the use of haptics during the second stage of development.

Content-Aware Plug-In

• The Web browser Firefox has been selected as it offers the advantage for developing extensions and fully implements the W3C accessibility standards.

  - The Logitech Wingman force-feedback mouse (fig 2) has been chosen to facilitate on-screen navigation, due to its compact size and compatibility with Firefox. The Immersion Web plug-in has been linked to the content-aware Web plug-in.

  - Supporting software can model a small array of haptic effects to promote exploration. Visually-impaired users miss out on key structure in a web page. Primitives have been selected to help rebuild this missing structure.

  - The content-aware Web plug-in will be enhanced to convey more complex information to the user. Tactile feedback will also be investigated as one particular method of rendering distinct, informative feedback to users. Methods of reducing the memory burden associated with remembering page structure will be examined.

Real-Time Audio

• Auditory icons are played as the user rolls over an image or a link with the force-feedback mouse, to reinforce the haptic effects. Descriptive audio clips have been used to convey a sense of meaning to the user.

  - Audio Environment

    Fig 1. System Architecture

    • The architecture (fig 1) enables rapid development and prototyping of extensions. By isolating the cursor position, and HTML elements on the screen, haptic and audio devices can be alerted to images and links.

    • Outside the image or link space, the cursor location is mapped to panning and pitch-shift parameters of a continuous background sound (earcon), allowing the user to gain assistive feedback when moving towards the HTML element.

Further Work

• The content-aware Web plug-in will be enhanced to convey more complex information to the user. Tactile feedback will also be investigated as one particular method of rendering distinct, informative feedback to users. Methods of reducing the memory burden associated with remembering page structure will be examined.

  - Haptic icons could be embedded in the web page at strategic points, marking headings, paragraphs, images and hyperlinks. As the user moves the mouse towards each icon, the sensation would increase in intensity providing assistive guidance.

  - A component will be designed to summarise and interpret sections of a web page. In order to overcome the problem of screen-readers outputting extraneous information to the user, a haptic feature will be developed to automatically direct users to certain sections of the content.

  - The system will be developed with a view to reducing auditory space overload found in initial trials. Haptic icons could be developed which convey similar information to the auditory icons. In the event of auditory overload, haptic cues could substitute auditory cues, providing vital feedback.

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Further information available:

http://www.web4blind.org

References