# Multimodal Interfaces for Visually Impaired People to Access Internet

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**Abstract.** This paper describes collaborative research being conducted by two research centres at the Queens University of Belfast (QUB). Researchers at the Sonic Arts Research Centre (SARC) and Virtual Engineering Centre (VEC) are developing multimodal interfaces that allow blind and visually impaired people enhanced access to the Internet. By using these multimodal interfaces users will not only hear the information and structure on a Web site but also be able to feel the layout and the associated features such as links and images. To facilitate the multimodal interfaces, tightly-coupled audio and haptic feedback are used to emphasize user interactions.

## 1. INTRODUCTION

The Internet has become increasingly prominent due to its easy access, vast amounts of information and array of services available. Its benefits to blind and visually impaired people are not as much as to sighted people because of the limitations of the currently available assistive technology. Information on the Web is graphically-orientated and blind people find it difficult to recognise this kind of visual representation. Current screen-reader packages, such as JAWs and SuperNova cannot handle graphical information and require users to go through extensive training before they can use the software effectively.

The main input and output devices that blind people use on a computer are the keyboard, Braille display and text-to-speech engines. The recent developments in 3D surround sound and haptic devices have not yet benefited blind people in a practical way. Haptic devices are limited by their costs, type of touch feedback (either force feedback or tactile based) and lack of promotion to blind people. Despite these limitations, research on multimodal interfaces for blind people is very active. Brewster and Yu have investigated the use of haptic and audio tools for presenting different types of graphs (i.e. line, bar, and pie chart) to blind people [Yu 03]. In other projects, such as MultiReader[1], tools were developed to help people with a variety of print disabilities (i.e. blind, deaf and dyslexic) to read information that is available in electronic forms. There are also examples of using multimodal interfaces in accessible computer games for blind people [Archambault 01] [Wood 03].

Making Web content accessible to blind and visually impaired people poses special challenges. Although government regulations and guidelines[2] have come into effect, it still relies heavily on web site developers to discipline themselves and provide products which are universally accessible.

## 2. QUB APPROACH

At QUB, research is being conducted to address the problems of blind people's access of the Internet in three main areas: (1) navigation on the Web, (2) representation of information, and (3) accessing graphical contents. To achieve the objectives of the project, audio and haptic

[1] MultiReader Project, http://www.multireader.org.
[2] Web Content Accessibility Guidelines 1.0, http://www.w3.org/TR/WAI-WEBCONTENT/

technology are being used. Issues of multimodal interaction and defining the role of each modality according to the task are being researched with an emphasis on the assistive technology.

To tackle the navigation problems, audio will play a leading role whereas haptics will provide assistive feedback. Melodic motives are easily remembered musical patterns that are more likely to be imprinted on short and long term memory than monotone oriented feedback. It is intended that the use of melodic motives will allow visually impaired users to build up an audio map of a Web site by associating easily identifiable melodic phrases with specific pages in a Web hierarchy. This approach will assist visually impaired users with navigation through the hierarchy of pages associated with complex web-sites. Haptic glove and touch sensitive screen will be used for the interaction in which user will be able to feel the layout of the webpage and select the desirable links.

The design of Web sites that are universally accessible to both sighted and visually impaired users is difficult to achieve due to the diverse requirements needed for each type of user. It is also unrealistic to devise Web sites specifically for visually impaired users as it ignores the potential for them to access and interpret already existing web sites. Therefore, this project will focus on the interpretation of currently existing Web pages and the approaches to represent them in alternative forms. Thus, the developed software will allow visually impaired users to examine the Web page from different viewpoints. The use of viewpoints would typically be how a sighted person would view Web pages. For example, sighted users may browse a page using colour keys, font sizes, links or images. As these normal methods of examining Web pages are not available to visually impaired users, equivalent alternatives based on haptics and audio will be investigated.

As graphical contents are not easily described by screen readers, a multimodal approach is proposed. Haptic devices such as tactile mice or tactile display boards, can render graphical information on its active pins with the possibility of simulating simple animation by rapidly change the height of the pins. Appropriate audio can be attached to the graphical content in order to give additional information to enhance user's perception of the haptic feedback.

## 3. SUMMARY

Currently, we are working with blind people to find out their requirements of the new tools which are truly accessible to the end users.

## ACKNOWLEDGEMENT

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## REFERENCES

[Yu 03] Yu, W. and Brewster S.A., Evaluation of multimodal graphs for blind people. Journal of Universal Access in the Information Society, 2(2), 2003, pp 105-124.

[Archambault 01] Archambault D., Burger D., and Sablé S., The TIM Project: Tactile Interactive Multimedia computer games for blind and visually impaired children, Proceedings of the AAATE'01 conference, 2001, pp 359-363.

[Wood 03] Wood J., Magennis M., Francisca E. Arias C., Graupp H., Gutierrez T. & Bergamasco M., The Design and Evaluation of a Computer Game for the Blind in the GRAB Haptic Audio Virtual Environment, EuroHaptics 2003 (Dublin, Ireland).