

AB-Web (5003-051321): Active audio internet browser for visually impaired and blind users

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Goal of the project, basic principles of the sonic interaction

In the Internet world, the widespread use of graphical user interfaces (GUIs) increasingly bars visually handicapped people from accessing digital information. In this context our project aims at providing sight handicapped people with alternative access modalities to various types of GUIs and graphic intensive programs, in order for instance to facilitate usage of Web services.

Our driving idea is to map digital documents (e.g. text, graphics) into an immersive virtual 3D audio space, i.e. to transform the elements of the document into sounds that have a precise 3D location. The user interacts via a touch sensitive screen or a graphic tablet, and listens to the system's responses via headphones or loudspeakers (Figure 1). In the basic interaction mode, the user points his/her finger on the screen. In response to this input, the system generates a sound in the virtual 3D audio space:

- the sound location in the audio space corresponds to the finger position on the screen. For example, if the finger is at the bottom-left of the screen, the sound will seem to come from the bottom-left of the audio space;
- the sound characteristics (i.e. pitch, timber, etc.) depend on the nature of the touched element in the display. For example, when exploring a Web page, different sounds are associated with each possible HTML tag.

In this way the user can perform a "tactile/audio exploration" of a screen document in order to understand its layout, that is "what is where". In a further exploration phase, the user can then query more detailed information about a particular screen object. For example, touching a text object sends that portion of text to a text-to-speech converter. In case of images the sound corresponds to the local characteristics of the touched part of the image, such as grey-level, or being or not an edge.

Key results, technology and know-how transfer

Based on these principles, we have developed the following components:

- a Web sonification tool that allows to associate with each HTML tag a given sonic object (earcon or auditory icon) (Figure 2). Each sonic object is then projected into the virtual 3D sound space according to the finger position on the screen by means of the Microsoft DirectX6.0 sound library. Finally, the audio rendering is done by an audio PC board (Soundblaster Live);
- a series of sonic games to help in a playful manner to teach blind pupils notions such as spatial environment and auditory interaction with computers. Examples of such games are a concentration game (Memory), Tic Tac Toe, Simon, etc.
- a tool that allows to comprehend simple drawings, as well as to create graphics (Figure 3). With this tool, the user can follow contours and at any time ask for a sonic rendering of the contour attributes such as its direction, or the location of its extremities. We plan to use this tool to teach basic geometry concepts, or to understand the shape of mathematical curves.

The prototypes have been and are being tested by blind adult users, in cooperation with the ABA and with researchers from the Faculty of Psychology, University of Geneva. In the near future, we wish to make use of haptic devices such as a force-feedback mouse, as well as to extend our experiments with blind pupils.

We plan to accomplish the know-how transfer with the help of a software development unit member of the UCBA/SZB (Swiss Central Union Of and For the Blind), as well as with the ABA (Association pour le Bien des Aveugles, Geneva), which subsidize part of this project. We will also make the components available through the WWW. Finally, these developments have spawned a large new project under the auspices of the ABA, whose goal is to offer blind customers full Internet access to the ABA library of books and audio tapes; this project will also be conducted with the group of Prof. D. Tschritzis and Dr. D. Konstantas (see description of the Hypernews project in this issue of Informatik-Informatique).

Figure 1: system setup, with headphones and touch-sensitive screen.



Figure 2: screenshot of the Web sonification tool, showing in particular on the left panel the HTML structure of the Web page that appears in the middle panel. The tool allows to interactively associate with each HTML tag a given earcon or auditory icon. One can notice the Bobby Approved icon, meaning that the site has passed Web accessibility tests for blind users (<http://www.cast.org/bobby2.0/>).

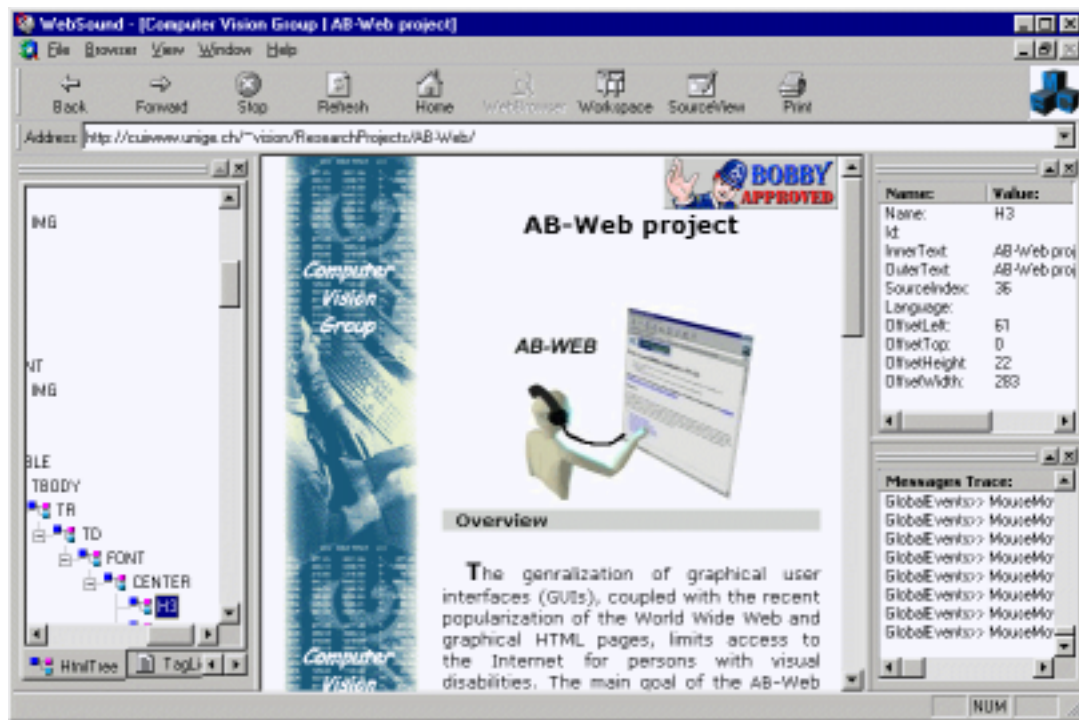


Figure 3: the image drawing and exploration tool. In order to follow a contour, the sound changes when the finger is on top or not of it. Sounds are different within and outside closed elements, and vary according to attributes such as color.

