WebAnywhere: Enabling a Screen Reading Interface for the Web on Any Computer

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ABSTRACT

People often use computers other than their own to access web content, but blind users are restricted to using computers equipped with expensive, special-purpose screen reading programs that they use to access the web. WebAnywhere is a web-based, self-voicing web application that enables blind web users to access the web from almost any computer that can produce sound without installing new software. WebAnywhere could serve as a convenient, low-cost solution for blind users on-the-go, for blind users unable to afford another screen reader and for web developers targeting accessible design. This paper describes the implementation of WebAnywhere, overviews an evaluation of it by blind web users, and summarizes a survey of public terminals that shows it can run on most public computers.

Categories and Subject Descriptors

K.4.2 [**Social Issues**]: Assistive technologies for persons with disabilities; H.5.2 [**Information Interfaces and Presentation**]: User Interfaces

General Terms

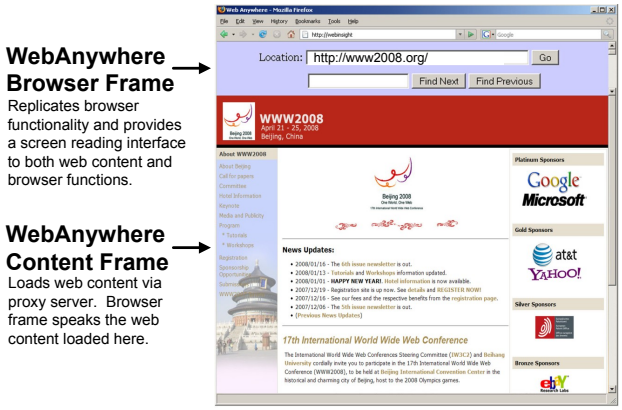
Design, Human Factors

Keywords

Screen Reader, Web Accessibility, Blind Users

1. INTRODUCTION

People often access the web on computers that are not their own. From terminals in public libraries to the local gym, from Internet cafés to pay-per-use computers at the airport, from a friend's laptop to a school laboratory; web access is vital for such tasks as checking email, viewing the bus schedule or finding a restaurant. The ease of use of web mail and document editors has not surpassed their desktop analogs, but their popularity is increasing, indicating the rising importance of accessing the web from wherever someone happens to be. Blind web users lack the ability to access the web from all available computers because their access relies on expensive, specialized software programs called screen readers. The WebAnywhere web-based screen reader enables access from any computer with a standard web browser and the ability to play sound.



Popular screen readers such as JAWS [3] or Window-Eyes [2] are expensive, special-purpose software programs and are seldom installed on public terminals or other computers not normally used by blind individuals. Both the NVDA screen reader[1] and the Fire Vox screen reading Firefox extension[2] are free, but neither is likely to be installed on most systems. Users are rarely given permission to install new software on public terminals and many would be hesitant to install new software on a friend's laptop. PDA solutions such as Braille Sense[3] cost roughly $5000. A smartphone with the screen reading software Mobile Speak Pocket[4] costs about $1000. Many cannot afford or would prefer not to carry such expensive devices. The Serotek System Access To Go[5] screen reader can be downloaded via a speech-enabled web page, but the program requires Windows, Internet Explorer, and permission to run executables on the computer. The AIR Foundation has recently made this product free[6].

The WebAnywhere screen reader enables blind users to quickly access web content on any available computer and supports a rich set of user interaction. Users can browse web pages, skipping by paragraph, sentence, word or character. They can quickly navigate between tab-indexed elements, heading elements, form elements, links and table rows and columns using standard keyboard shortcuts. Form input is also supported and does not require a separate forms mode.

[1] www.nvda-project.org/
[2] www.firevox.clcworld.net/
[3] www.gwmicro.com/Braille_Sense/
[4] www.codefactory.es/
[5] www.serotek.com/
[6] www.accessibilityisaright.org/

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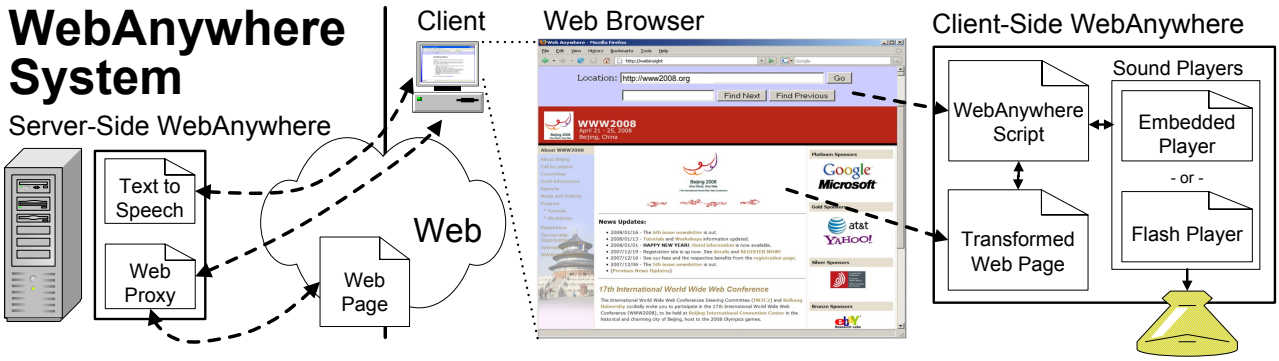
ACM 978-1-60558-085-2/08/04.



Because the system is web-based, it leverages existing functionality provided by the browser when possible. The system is simply a web page run with standard permissions and, therefore, does not have access to the interface of the browser. Instead, it replicates needed functionality, such as the location bar and search box. UsaProxy enables fine-level recording of user actions as they browse the web [1]; WebAnywhere observes user actions in order to provide a new self-voicing, web-based browser within the existing browser.

WebAnywhere is also useful for web developers and blind users who cannot afford a traditional screen reader. Mankoff *et al.* showed that web developers create more accessible web pages when they review them with a screen reader [4], and WebAnywhere provides a convenient, inexpensive mechanism to do so. For blind users unable to afford a traditional screen reader, WebAnywhere might serve as a temporary alternative. Voice output while navigating through a page can also be beneficial for people who have low vision or dyslexia. WebAnywhere could provide this functionality anywhere.

2. SYSTEM DESIGN & EVALUATION

The WebAnywhere interface is similar that of traditional screen readers. Support for some functionality has been moved to a remote server in order to compensate for web application limitations. The system consists of the following three components: 1) client-side Javascript that supports user interaction, determines which sounds to play and coordinates the other subsystems; 2) server-side text-to-speech generation and caching; and 3) a server-side web proxy that makes web pages appear to come from a local server to overcome cross-site scripting restrictions. (See the diagram above.) WebAnywhere maps the domain of pages retrieved using it to a unique sub-domain in order to maintain the same-origin policy of web browsers that enforces separation of scripts. For instance, the bank.com domain maps to bank.com.wadomain.org, and scripts on maliscious.com, mapped to maliscious.com.wadomain.com, cannot access it. Future work will apply similar protections to cookies.

WebAnywhere plays sounds using the SoundManager 2 Flash Object[7]. Adobe reports that 98.8% of desktops have Flash installed[8]. WebAnywhere also supports embedded sound players for increased compatibility. In a small study over five web pages, the latency of retrieving each new multi-word sound was less than 300 ms on a high-bandwidth connection. The system prefetches sounds based on a model of what users are likely to request be read next, which reduces latency by nearly 20%. Sound files that are retrieved are cached and most sounds previously played can be retrieved immediately. In a survey of 15 public computer terminals in the Seattle area, 14 would have enabled blind web users to access the Internet using WebAnywhere (9 required headphones). The public computer on which WebAnywhere did not work had a malfunctioning sound card.

If the browser window containing WebAnywhere loses focus, the system is unable to respond to user input. WebAnywhere attempts to prevent losing focus by aggressively blocking popup windows and page redirects that do not go through the web proxy. In the event that focus is lost, users are directed to switch through applications (Alt-Tab on most systems) until WebAnywhere regains focus and announces itself or to attempt to close the popup (by pressing Esc).

WebAnywhere has been developed with consultation of blind web users who have been overwhelmingly enthusiastic about the system. In an initial evaluation, six blind participants (3 female) could effectively browse the web using WebAnywhere. During this evaluation, we first outlined the available features of the WebAnywhere system. We then asked our participants to perform three tasks: check a gmail.com email account, find the next arrival time at a particular bus stop, and look up the phone number for a local restaurant. All of our participants were able to successfully complete these tasks with limited verbal coaching. Our participants listed the lack of the full screen reader functionality as the main limitation of the system. Notably, none of our participants mentioned any concerns about the responsiveness of the system, which was a primary concern because speech is retrieved from a remote server.

Future versions of WebAnywhere will implement more features offered by commercially-available screen readers. Participants in our user study requested support for key combinations specific to their usual screen reader and we are working to provide modes for WebAnywhere that fully mimic the shortcuts provided by popular screen readers.

[7]www.schillmania.com/projects/soundmanager2/
[8]www.adobe.com/products/player_census/flashplayer/

3. REFERENCES

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