Enhancing Web Accessibility

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ABSTRACT

This demonstration will illustrate the key technical and user interface aspects of the Web Adaptation Technology. Various transformations underlying the system will be shown that illustrate how this approach enables a wide range of users with reduced visual, cognitive, and motor abilities to access a large proportion of Web pages using a standard browser.

Categories and Subject Descriptors

H.5 [**Information Interfaces and Presentation**]: Hypertext/ Hypermedia and User Interfaces – *interaction styles, user-centered design, and standardization, navigation and user issues.* I.7 [**Document and Text Processing**]: Document Preparation and Document Capture – *document analysis and multi/mixed media.*

General Terms

Algorithms, Human Factors and Standardization.

Keywords

Accessibility, enlarge text, image enlargement, page linearization, page segmentation, speak text, and the Web.

1. INTRODUCTION

Despite Web accessibility standards, guidelines and assistive technologies, many Web pages remain difficult to use. Furthermore, there is a large and diverse user population with multiple and varying degrees of disabilities (e.g., seniors) with needs that fall outside current accessibility standards and guidelines. The Web Adaptation Technology project is exploring an approach that allows such users to dynamically apply one or more Web page transformations in combination to render the content into a form that is more accessible to the user [2]. These transformations manipulate the presentation of Web pages without requiring Web authors and Web content providers to rewrite their Web pages. We have implemented these transformations in a standard Web browser (Microsoft Internet Explorer) and have tested it with a number of user groups including seniors and users with developmental disabilities. The resulting system enables a wide range of users with reduced visual, cognitive, and motor abilities to access a large proportion of Web pages using a standard browser.

Our demonstration will illustrate four technical and user interface aspects of the Web Adaptation Technology. First, we illustrate the variety of page transformations that can be dynamically applied in combination to suit the particular needs of the user. Second, we demonstrate how several of the adaptations use additional media and modalities to enhance a user's access to Web pages through alternate and redundant presentation channels. Third, we illustrate
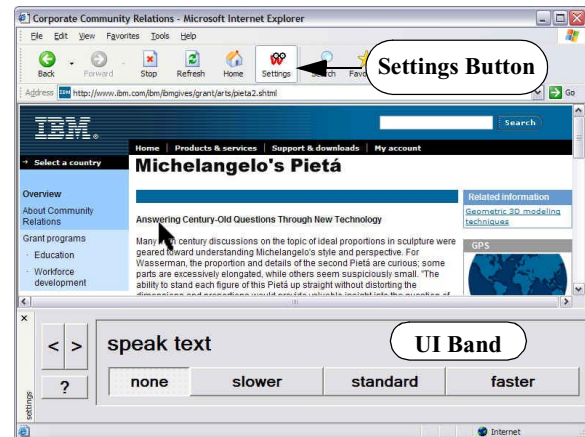
Figure 1: Settings button and UI band with panel for enabling 'speak text' adaptation.

how we use a combination of Web page content analyses and Web page segmentation to support a number of document object model (DOM) transformations such as page linearization and background removal and to provide a number of scaffolding features such as speak text and aural and visual page structure summarization. Finally, we demonstrate how our user interface design addresses the difficult bootstrapping problem of providing accessibility features to users before identifying or retrieving user preference settings. The remainder of this paper provides an overview of our Web Adaptation Technology.

2. WEB ADAPTATION USER INTERFACE

In working with a group of an early user group of seniors, we determined the need to make the Web Adaptation Technology simple because of their low sophistication with computers and the variety of sensory, physical, and cognitive limitations associated with age. Towards this goal, we added a 'Settings' button on the browser toolbar that users can click (see browser's standard buttons bar in Figure 1). In response, the system brings up a user interface (UI) band at the bottom of the browser containing a sequence of control panels that navigated using the '<' or '>' buttons (see Figure 1). The design of the control panels and their buttons are themselves accessible, as well. More importantly, the combination of the 'Settings' button and band nicely address the accessibility bootstrapping problem.

Using the UI band, a user can experiment with the effects of adaptations to evaluate if it improves their accessibility to the Web page as shown in Figure 2. If the results are undesirable, the user can readily undo the transformations. Similarly, a user can evaluate the effects of a combination of adaptations such as larger 'text size', wider 'letter spacing' and wider 'line spacing' by moving to the respective control panels and making the corresponding selections.

Figure 2: Magnification of pointed-to text in banner display.

3. WEB ADAPTATIONS

We created four sets of adaptations that go beyond the accessibility guidelines provided by recent legislation [2]. The first set of adaptations target limitations in hand usage by providing users with easy ways to configure their keyboard settings and for the system to infer optimal configurations based on an analysis of typing. The second set of adaptations such as 'font enlargement', 'font style (sans serif)', 'inter-letter spacing', 'color contrast', and 'hide images/ backgrounds/animations' facilitate changes that improve legibility and make reading of the text easier. The third set of adaptations enable users with greater degrees of visual problems to supplement the pointed-to text with speech output and banner text magnification (see Figure 2).

The final set of adaptations helps users with both cognitive and visual limitations to reduce clutter on visually complex Web pages. 'Page linearization' transforms multi-column pages into one column. 'Page structure summary' gives a visual page map or aural description of the page structure. The aural summaries provide both an overview of the page and information about the core page content. The visual summaries provide a simplified page map whose elements can be selected to bring the content into view in the browser. Both the linearization and summary adaptations help unpack the complex and cluttered page structure for the users and enable users with limited hand use to navigate and scroll Web pages; particularly magnified pages.

4. PAGE ANALYSES & SEGMENTATION

A number of the adaptations are supported by Web-page analyses. An example is 'change background colors' of a Web page containing one or more transparent GIF images. The change involves determining the color that was intended to appear behind the original transparent GIF images and to adjust the images' background color to render them with the page's original background color [3].

A second example is the 'page structure summarization' that is based on an analysis of the page's markup structure and visual layout. This involves several steps (see Figure 3). First, using the type of the HTML markup tags for the page, we select content subtrees. Then, using information about the position and sizes of the visual blocks bounding the content subtree, we segment the blocks into the core and peripheral content regions. Finally, exploiting inter-block whitespace in a page, we aggregate the visual content blocks into the final page segments. Both our approach and the one used by Chen et al. 2003 [1] exploit visual design as a way to partition and present information to the user.

The third example is the 'page linearization' adaptation that must locate the 'skip navigation' link and use it to have the browser reposition to the main content of the linearized page. In cases where the Web page author does not provide a 'skip navigation' link, our system uses the page structure analysis to infer the location of the main content of the Web page.

5. ACKNOWLEDGMENTS

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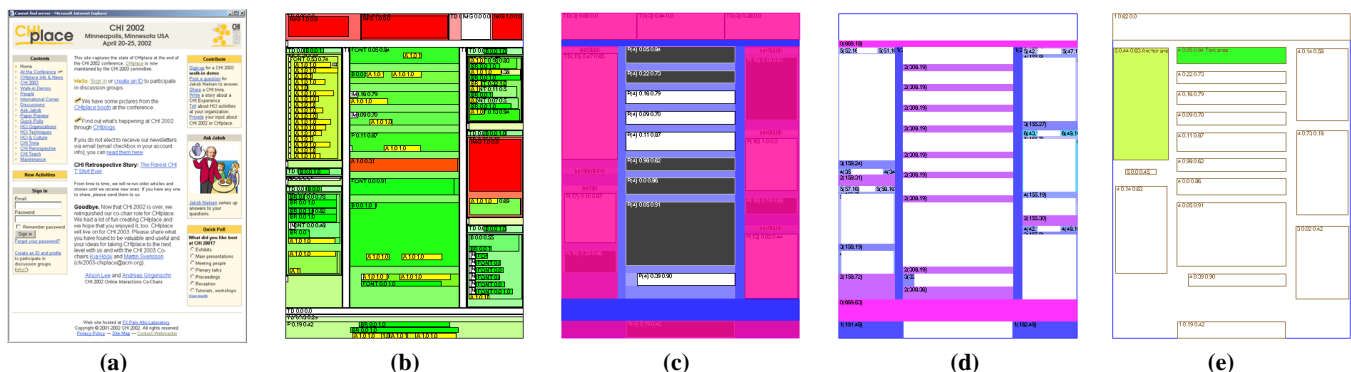

Figure 3: Steps in page segmentation: (a) Web page, (b) DOM elements' rendered position and size, (c) selection of coherent content subtrees and highlighting of peripheral regions (shown as translucent blocks), (d) whitespaces on page and (e) final page segments.