Automatic System for Making Web Content Accessible for Visually Impaired Users

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Abstract: - Although visually impaired people can access digital information by using computers, usually the content of Internet pages is not fully accessible. The dissemination of information available through the World Wide Web makes universal access more and more important and supports visually impaired people in their everyday life. In this paper we present a new system which serves visually impaired people for browsing and interacting with web pages. We propose a system, which uses translation rules to render web pages upon user requests.

Key-Words: - Web Content, Accessibility, Visually Impaired User, Translation Rules

1 Introduction
When the World Wide Web service was created and the markup language HTML became its main pillar of strength, only some people could foresee that it becomes one of the most valuable research or work instruments of wide society. Some of the best qualities that this service offers are availability and immediate diffusion of information published on the Internet. These characteristics are especially useful for users with some types of disability. Moreover, they have seen how their access to leisure, education, business or research activities has been improved.

2 Recent Projects
The IT industry has developed various assistive technology products [1] [3] for visually impaired users.

• Screen magnifiers work like a magnifying glass, enlarging a portion of the screen as the user moves the focus and increasing legibility for some users. Some screen enlargers let users zoom in and out continuously. Commercial screen magnifiers include Zoom Text, Magic, and Biggy [3].

• Screen readers present graphics and text as speech. A screen reader verbalizes everything on the screen, including names and descriptions of control buttons, menus, text, and punctuation. Window Eyes, JAWS, and Outspoken are examples of screen readers.

• Speech recognition systems let users give commands and enter data vocally rather than with a mouse or keyboard. Voice recognition systems include Dragon Naturally Speaking and IBM ViaVoice.

• Speech synthesizers, or text-to-speech systems, receive information going to the screen in the form of letters, numbers, and punctuation marks, and then “verbalize” it. AT&T Nature Voices and Conversa are two current speech synthesizers.

• Refreshable Braille displays provide tactile output of information represented on the computer screen. Users read a line of Braille letters with their fingers and then refresh the display to read the next line. Braille terminals are a type of Braille display.

Although these products are useful, several barriers - such as their cost, complexity or platform dependency - limit their widespread use.

3 Web Accessibility
To develop accessibility standards for Web sites and authoring tools, the W3C Consortium (www.w3.org) [2] [7] adopted the Web Accessibility Initiative (WAI). WAI guidelines group checkpoints into three levels of priority. Priority one includes checkpoints that Web site administrators “must” implement. For example, users must be able to avoid behavior that obscures the page content or disorients them. Flashing content can cause seizures in people with photosensitive epilepsy or distract cognitively impaired people. Distracting background images or sounds can affect those with visual or hearing problems. Priorities two and three are checkpoints that “should” or “may” be implemented [4] [6].

To avoid these problems, users must be able to filter WWW content or multimedia presentations. However, structure and meta information is hard to recognize and to filter. The main problems are:

• to recognize and find titles
• to recognize and find links
• to recognize and find non-textual elements (such as inline images)
• to navigate from title to title
• to navigate from link to link.
• to handle input elements (such as entry fields, radio-, check- and other buttons)

3.1 HTML Content
In general, the accessibility of the HTML content is performed according to the following instructions:
1. IMAGES – images could be easily switched off, resized or the color depth/contrast can be changed according to the user-specific requirements.
2. LINKS – visitors to the web pages are looking for information, and the more efficiently they can find it, the more valuable the site is to them. Most screen readers have a shortcut command that will give users a list of all the links on a page. This is a way to skim a page quickly.
3. COLOR – Consistent use of color can enhance the usability of your pages for many people. We have to be sure that no information is conveyed solely through the use of color.
4. TABLES – there are two simple things we can do to make tables more accessible without changing their appearance. One is to use the summary attribute. This attribute goes in the table tag along with the border, cell spacing and other attributes. The other thing we can do is to use the scope attribute in the first cell in each row and first cell in each column.
5. HEADINGS – those of us who are sighted use headings as a quick way to scan the organization of a page. To create headings, many people use the font tag to make larger text. However, most screen readers have a shortcut command that produces a list of all the headings on a page created with the heading tag. If the page is well organized and uses heading tags for headings, this can be a great way for visitors using screen readers to skim the page.

There are many rules and specific translations that belong to these categories. In general, the translation is based on the use of regular expressions. The inclusion of all the rules and their description is beyond the scope of this paper. The main idea of the translation consist in the searching the proper regular expressions and their replacement with the content upon user requirements.

3.2 Additional Content
The web pages are often created with connection of other external technologies. For example Style Sheets allow you to control the rendering — e.g. fonts, colors, leading, margins, typefaces, and other aspects of style — of a Web document without compromising its structure. Cascading Style Sheets (CSS) are a simple style sheet mechanism that allows authors and readers to attach style to Web pages. One of the main purposes of CSS is to separate the content from the document's structure. The changes are made once and then take effect throughout the entire site. This makes the site much easier to maintain and, if necessary, change a small part of it or its entire format.

Our system also supports the external CSS file insertion. This means that the styles specified within the HTML file has lower priority and the new external styles are applied to the whole document.

4 System Concept
We have developed a new system, which will be useful for accessing web pages by visually impaired users and translate these pages into the accessible form. The system has been designed to make the web pages accessible independently [5] from the presentation devices and technologies used. This is the main advantage in comparison to the other accessibility technologies.

The main idea of the system can be seen from the following figure:

Fig.1. The principle of automatic translation system. The system can be used either as a network proxy server (via proxy settings) or simple document proxy server (via URL prefix).

The system works as a proxy server for translating common internet pages into the accessible form. The web accessibility is described by translation rules, that are applied to the common pages.

The usage of our system is very easy. Before the first use, visually impaired user creates a profile where impairment-specific requirements for the translation are specified (regular expressions for the search and replacement). Then the system is used via the standard web browser by specifying the URL to translate in the
In both modes of use the proxy server is transparent and browser independent. The translation is done according to the settings from the user profile.

6 Practical Example

The system is now going to be put on the Internet for the worldwide testing.

The examples of Internet page translation can be seen on the pictures below [Fig.2a, Fig.2b]. As we can see, the translation process removed the picture and background color. Some other modifications, such as font size and color, were made for making the web page more accessible.

The content modification is supported by the user-profile. This means that each registered users may activate specific requested rules for translation. These specific rules are then applied, no matter where from the world the user is logged in and is platform and device independent.

There are also further features of the system such as setting the implicit font (w/size and color) and general style properties for each user, general translation rules for not-logged-in surfing and others.

5 Conclusions and Future Work

In this paper we introduced several tools that help visually impaired users to solve problems they experience when accessing information published on the Internet. Some of these problems can be analyzed from the Web designer’s standpoint and the others from the user’s perspective.

The main contribution of this paper is the presentation of the system, which is based on document-proxy techniques and translates web pages into the accessible form upon specified translation rules. The main advantage of the presented system is the universality of use and browser independency. Therefore, visually impaired users can use this system from various places with access to the Internet, such as home computers, libraries, school laboratories etc. Additionally, users can use their own stored profiles to make the browsing and accessibility more specific to their requirements.

With the comparison to the existing tools for making web content accessible (as specified in chap. 2), this system is more universal in its use and is fully user-specific and open for further improvements. This makes the presented approach distinct from existing technologies.
Our next plan is improve the power of user-specific profiles and add more translation rules for some other visual handicaps. We then will try to put these improvements into practical use.

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**References:**


