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Research Report

Usability of AcceSS for Web Site Accessibility

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The standard display of web pages is inadequate for users who are visually impaired.Most visually impaired people obtain information from a web page in a linear fashion via a screen reader, whereas sighted users can immediately obtain a bird's-eye view of a web page's organization and content by quickly scanning the page. AcceSS (which stands for Accessibility through Simplification and Summariziation) is an application that allows users who are visually impaired to obtain a gestalt understanding of a web page more quickly by using

simplification and summarization techniques to transform it.

This new and unique way of rearranging web content provides the potential for significant usability issues. For this reason, six think-aloud assessments were conducted to compare AcceSS with the standard web display, with the goal of improving the design of AcceSS by identifying usability issues. The think-aloud assessments allowed the computer users to share their reactions as they interacted with the system while the researchers captured the users' thoughts. This report presents the findings of the usability assessments.

Background

The AcceSS transcoding gateway is a web intermediary that adapts or transforms the content of a web page into a format that is accessible to persons with disabilities. In this study, AcceSS was used to transform the original Yahoo! News (Yahoo! News, 2005) web site into a simpler and more easily navigable "mirror" web site that could be explored by persons with visual impairments with the "virtual dog guide" provided by AcceSS.

Building on work by others (Goble, Harper, & Stevens, 2000; Harper, Goble, & Stevens, 2001; Hori, Ono, Joyanago, & Abel, 2002; Takagi, Asakawa, Fukuda, & Maeda, 2002; Zajicek & Powell, 1997), AcceSS incorporates the concepts of simplification,

summarization, and navigation. Simplification is achieved by using template- and pattern-matching algorithms to determine which parts of the web page are the most important (Parmanto et al., 2005) and discarding those that are not. The result is an absence of clutter, such as headers and footers, images, and advertisements, on the web page. Summarization is then carried out on the remaining content.

The summarization provided by AcceSS is designed to extend the concept of context probing suggested by Harper, Goble, Stevens, and Yesilada (2004) by creating a preview of an entire web page. (The term *context probing* refers to the activity of examining the web page to which a hyperlink leads in order to determine if the information on the linked page is relevant to the user.) AcceSS relies heavily on structure and important landmarks, such as the title and subtitles (Parmanto et al., 2005). Parts of the summary page are often available in a news web site, such as Yahoo! News, in the form of an abstract of the full story (see A in Figure 1). The AcceSS summarization algorithm first checks for an abstract of a news story, and, if one is available, uses it on the transformed page. If an abstract is unavailable, the first few sentences of the story are used. The summarization process produces an outline of the web page that gives the user who is visually impaired a sufficient understanding of the page without further navigation, similar to what a visual user would do in the first few seconds of scanning a web page.

Together, simplification and summarization form a virtual dog guide for the World Wide Web. Figure 2 presents an example of the virtual dog guide page created from the Yahoo! News page, which is seen as a summary of the web page with each separate news story on its own line. The virtual dog guide provides an overview of a web page without requiring the user to listen with a screen reader to the entire original page, which is replete with graphics, advertisements, and other clutter. From the virtual dog guide, users can choose to preview the story if they want to read more about it or choose links to other elements of the web site, such as News Pool, Services, or Resources, or go back to the previous page or to the web site navigation tool.

The web site navigation tool is another feature that AcceSS provides. This tool gives a web site-level outline, allowing the user to navigate from one area of the web site to another quickly and easily (see Figure 3). The web site navigation tool is a stable landmark to which the user can return from any page within the web site from a link that is present at the bottom of every page.

Methods

We implemented think-aloud assessments to identify usability issues. The participants were six computer users (two men and four women, aged 40 and older)

who were visually impaired and were recruited from the local Pittsburgh, Pennsylvania, area.

All the participants used Microsoft Windows operating system (version 98 through XP) and Internet Explorer as their browser. Five participants had a DSL connection, and the sixth had a dial-up connection. They all used a version (higher than 4.5) of JAWS for Windows. In addition, they all used their computers and the Internet on a daily basis to perform tasks, such as searching for information, sending e-mail messages, playing games, chatting online, and word processing.

Procedures

Each 11/2-hour assessment took place in the participant's home or office, to allow the participant to use the computer equipment and assistive technology with which he or she was the most comfortable. Separate study times were scheduled for each participant.

A set of tasks was designated for both the original Yahoo! News web site and the virtual dog guide version of the web site that was created by AcceSS. Each task set was made as identical as the differences between the two presentations of the web site allowed. Each task involved a scenario and required the user to gather information from a story or an abstract within either the original or transformed web site. For example, one task asked the participants to find the

abstract of an article on a new type of synthetic paste that is used to repair early tooth decay and to tell the experimenter the country from which the innovation came.

The order of evaluation of the web sites was randomly selected for the first participant and alternated for each subsequent participant, so that three participants started with the original Yahoo! News web site and three participants started with the transformed Yahoo! News web site. Before each task set, the participant was given 10 minutes to become familiar with navigating the web site. After completing each task set, each participant was asked to complete a usability questionnaire.

Subjective measurements

A slightly modified version of the IBM Computer System Usability Questionnaire (CSUQ) was used to identify the participants' satisfaction. The publicly available CSUQ consists of 19 close-ended questions and has been found to be both a reliable and valid instrument for the field setting (Lewis, 1995). The CSUQ is oriented in a 7-point Likert scale, with the lower number indicating a higher level of satisfaction. It can gauge three factors of satisfaction--usefulness of the system, quality of the information, and quality of the interface. The modified version in this study used a 5-point Likert scale, with the higher number indicating a higher level of satisfaction. The rationale for the

modification was simplicity. Since the questionnaire was read to the participants following each segment of the usability test, we thought that a 5-point Likert scale with a higher number signifying high levels of satisfaction would be simpler than the original questionnaire. Reliability is usually not a serious problem because the attitude scales are summated (Nunnally, 1978) over 19 scales. At the end of the study session, each participant was asked whether he or she preferred the transformed or nontransformed Yahoo! News web site.

Results

Overall, the participants were more satisfied with the transformed Yahoo! News web site than with the original. All but one had positive changes of more than 1.5 in their scores. The exception was the participant who was the most sophisticated web user of the participants, whose scores reflect a smaller difference in satisfaction levels than those of the other participants. We anticipate that the virtual dog guide will be beneficial to all web users who are visually impaired, regardless of experience, but that it may be more beneficial to novice and intermediate users.

The participants' collective satisfaction in all three areas, as rated with the CSUQ, was greater when using the transformed web site than when using the original web site (see Figure 4). For the original Yahoo! News web site, the participants ranked the following

individual statements from the CSUQ with lower satisfaction: "It was simple to use this web browser" (average score of 1.67), "I am able to complete my work quickly using this web browser" (1.67), and "It was easy to learn to use this web browser" (1.67). The statements indicating more satisfaction for the original web site were "The information (such as online help, on-screen messages, and other documentation) provided with this web browser is clear" (3.20) and "I am able to complete my work efficiently using this web browser" (3.17).

The participants scored the transformed web site with the virtual dog guide much higher on the questionnaire than they did the untransformed original web site. Responses to the following statements evoked the highest average scores (higher satisfaction): "The organization of information on the web-browser screens is clear" (4.67), "I like using the interface of this web browser" (4.67), and "The interface of this web browser is pleasant" (4.50). The statement indicating the least satisfaction was "The web browser has all the functions and capabilities I expect it to have" (3.33). Other statements suggesting lower levels of satisfaction (scores of 3.67) were "I am able to complete my work quickly using this web browser," "I am able to complete my work efficiently using this web browser," and "I believe I became productive quickly using this web browser." Even the lowest scores for the transformed web site were higher than the highest scores for the original web site. This

finding highlights the greater level of satisfaction with the dog guide than with the original Yahoo! News web page.

Discussion

On the basis of the responses to the questionnaire, we concluded that the participants found the transformed web site to be more satisfying in all areas for which the CSUQ accounts: usefulness, information quality, and interface quality. The transformed format was found to be more efficient than the original format. The participants were able to go directly to a news story by clicking on the link from the virtual dog guide page instead of having to listen to all the category links that are listed in the left-hand column of every page of the Yahoo! News web site (see B in Figure 1). One user thought that "the organization of the [transcoded] page allows you always to know where to find the links you need" and that this ability led to a feeling of "increased control." We observed that in the original page, the participants would often get lost in the list of links (see B in Figure 1) that JAWS for Windows was reading and would never reach the full story. First, the participants would select the link they wanted to follow (such as Sports), and as the new page loaded, JAWS for Windows would start reading through the list of links again. Upon hearing "Sports" for the second time, the participants would select it again. This redundancy occurred because the participants were not sure if the correct page loaded. Another participant thought that

the interface was "very pleasant because there are no graphics."

The participants appeared to gain confidence upon completing a task and to lose confidence when they were unable to complete a task. Some signs of frustration that we observed included heavy sighing and verbal expressions of frustration. The frustration level was higher in the participants with less experience in web browsing than in those who traveled the web more frequently. The participants were able to complete tasks more quickly and efficiently using the AcceSS-transcoded web site and had lower levels of frustration when they were completing tasks on this web site.

The majority of the participants were comfortable using the virtual dog guide and the web site navigation tool by the end of the task session with the transformed Yahoo! News web site. Often, when starting their search for the answer to Tasks 2 and 3, they would say, "The first thing I want to do is go to the site navigation." One participant commented that "making the navigation page separate was a good strategy." Another stated, "Without seeing the page, how can I make a mental model of the page?" and concluded at the end of the session that the transcoded web page allowed for the easier digestion of information: "Audibly, the [transcoded page] is set up well and easily navigable." The participants' observations suggest that the simplification and summarization

provided by AcceSS in the form of the virtual dog guide help to build a gestalt understanding of the page for Internet users who are visually impaired.

All the participants preferred the transformed web site over the original, with the exception of the most experienced participant, who was undecided. However, if AcceSS were available, this participant indicated he or she would try it. Suggestions from the participants that can be addressed in future versions of AcceSS include:

- Adding a search function
- the abstract page to allow the user to go straight to the full story
- Reducing redundancy, by, for example, removing the "You can also" category for links from the virtual dog-guide page.

One participant thought that it would be beneficial to eliminate the preview page--the page that users are taken to from the virtual dog guide when they choose to go to the story preview (see Figure 5). From the preview page, users can choose to listen to the preview or skip the preview and go directly to the full story. The participant who suggested that the preview page was an unnecessary step between the user and the information was also the most experienced web user. Even when the task explicitly asked the participants to find the answer within the preview, three participants

still went to the full story to obtain the information, perhaps because of the order of information as it is presented on the preview page. As may be seen in Figure 5, the option to "Follow this link to skip the Preview and go directly to the full story of the news" is presented before the actual preview of the story. The three participants who obtained the correct answer to the task from the full story, as opposed to the preview, chose to skip the preview and go to the full story. One participant in the pilot study, however, used the preview page while searching for the answer to each of the three tasks on the transformed web site. This participant was observed using the preview as a probe to see if the full story would contain the information being searched for.

Another suggested change that can be made to the virtual dog guide is to change the "go to preview" link (see Figure 2) to be more descriptive. Including the title of the news story in the link will be more beneficial to users who are visually impaired, especially when they are utilizing the links-list option in JAWS for Windows. As it is currently presented, users are unable to ascertain additional information from the JAWS for Windows links list.

There is a balance between simplification and the loss of information. The goal is to provide users with only those elements of the web page that are meaningful to them and to eliminate the clutter, or insignificant information, on the screen. The results of this study

show that the participants were able to get to the necessary information more quickly and efficiently with the virtual dog guide version of the Yahoo! News web site than with the original version.

Enhancements to AcceSS will be made based on the study's findings. A more in-depth analysis will then be conducted to determine whether AcceSS, with summarization and simplification, is better than the standard web page during navigation by users who are visually impaired.

Limitations

We recognize that testing only one news web site is a limitation to the study, given the large variety of structural formats representing different genres on the web. Future studies will be conducted that will expand on the structures and genres.

Contributions

Studies in which real users interact with a system provide realistic and valuable feedback on the usability of the system. This study provided information not only on what is good about the current system and features being tested, but on where the system can be improved. In addition, it provided information on how persons who are visually impaired interact with and travel through web sites. Unlike sighted web users, who can gain an understanding of a specific web site's

model in an instant, users who are visually impaired are required to make a mental map of the web site to interact with it. Learning how users who are visually impaired do so can assist in the development of new presentation methods for users with visual impairments. AcceSS provides a method for simplifying and summarizing a web site to provide the users who are visually impaired with a gestalt understanding of the web site and web page.

References

Goble, C., Harper, S., & Stevens, R. (2000). The travails of visually impaired web travelers. In F. Shipman (Ed.), *Proceedings of Hypertext 2000* (pp. 1-10). Watertown, MA: Eastgate Systems.

Harper, S., Goble, C., & Stevens, R. (2001). Web mobility guidelines for visually impaired surfers. *Journal of Research and Practice in Information Technology*, *33*(1), 30-41.

Harper, S., Goble, C., Stevens, R., & Yesilada, Y. (2004, October 18-21). *Middleware to expand context and preview in hypertext.* Paper presented at the Sixth International ACM SIGACCESS Conference on Computers and Accessibility, Atlanta, GA.

Hori, M., Ono, K., Joyanago, T., & Abel, M. (2002, August 26-28). *Annotation by transformation for the automatic generation.* Paper presented at Pervasive

2002: The International Conference on Pervasive Computing, Zurich, Switzerland.

Lewis, J. R. (1995). IBM Computer Usability Satisfaction Questionnaires: Psychometric evaluation and instructions for use. *International Journal of Human-Computer Interaction, 7*(1), 57-78.

Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.

Parmanto, B., Ferrydiansyah, R., Saptono, A., Song, L., Sugiantara, I., & Hackett, S. (2005, May 10-14). *AcceSS: Accessibility through Simplification and Summarization.* Paper presented at the workshop W4A at WWW2005, Chiba, Japan.

Takagi, H., Asakawa, C., Fukuda, K., & Maeda, J. (2002, July 8-10). *Site-wide annotation: Reconstructing existing pages to be accessible.* Paper presented at the Fifth International ACM SIGACCESS Conference on Computers and Accessibility, Edinburgh, Scotland.

Yahoo!News. (2005). *Yahoo!News* [Online] Available: http://news.yahoo.com

Zajicek, M., & Powell, C. (1997). Building a conceptual model of the World Wide Web for visually impaired users. In S. A. Robertson (Ed.), *Contemporary ergonomics* (pp. 270-275). London:

Taylor & Francis.

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