Fujitsu Accessibility Assistance

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INTRODUCTION

With the rapid expansion of the Internet in recent years, websites have become a popular way for providing all kinds of information. However, for the most part, persons with disabilities that make it difficult to access information and services via the Internet have been excluded from this new technology.   This inequality (sometimes known as The Digital Divide) is becoming a major problem and is spurring demands for Internet accessibility products that can create websites that anyone, including the elderly and disabled, can easily use.

Fujitsu has set forth the goal of ensuring that "Everyone can participate in IT society" and has promoted diffusion of Universal Design. As part of those efforts Fujitsu has launched "Fujitsu Web Accessibility Policy (Fujitsu Web Accessibility Guidelines,2001)" aimed at improving Internet accessibility and put the diagnostic tool   "WebInspector 2.0", on the Internet in July 2003. Many persons are now using this diagnostic tool. Fujitsu also released "Fujitsu Accessibility Assistance" as an accessibility diagnostic toolset designed to be useful for office workers on the Internet in February 2004.

This toolset is a systematized diagnostic software product that makes it easy for visually impaired persons and persons with achromatopsia to read characters and images. More than 20,000 copies of this toolset were downloaded within the first three months   a figure that was significantly higher than what was expected.

This thesis outlines the development background and functions of Fujitsu Accessibility Assistance.

CURRENT STATUS OF INTERNET ACCESSIBILITY

Currently, few websites pay sufficient attention to accessibility problems. Indeed, many websites created for municipalities do not address the problem of Web accessibility at all, and it is clear that most website designers and administrators have an insufficient understanding of the importance of Internet accessibility.

However, when the new Guideline for Older Persons and Persons with Disabilities (JIS X 8341-3) is applied to the Internet in June 2004, the problem of Web accessibility can

be expected to come under increased scrutiny. If stronger Web accessibility standards, which have been vague until now, are adopted, accessibility requirements for the websites of high-visibility government and other public offices can be expected to strengthen simultaneously.

WEBINSPECTOR

WebInspector is a tool that diagnoses Web accessibility.

Outline

As part of efforts aimed at making websites that anyone can use, including the elderly and disabled, Fujitsu established its Internet Accessibility Policy in June 2002 and has since promoted its application in the Fujitsu Group websites. This policy is also outlined on our website for the benefit of other companies and organizations.

To ensure the practicality of this policy, we interviewed website designers from Japan and abroad as well as outside experts, and Internet users. Based on these interviews, we selected 49 criteria where improvements are needed to increase Internet content accessibility. Additionally, the implementation effectiveness is indicated using one of three priority levels for each criteria. "Explanations" and "Examples and Implementation", showing concrete implementation methods, are provided to help make each criteria more practical and understandable.

Concurrent with this, we emphasize consistency with existing standards and guidelines such as "Web Content Accessibility Guidelines 1.0" of the Web Accessibility Initiative (WAI), Section 508 of US Rehabilitation Act, and "Guidelines of Ministry of Public Management, Home Affairs, Posts and Telecommunications."

WebInspector is designed to check 20 of the 49 criteria by Fujitsu Web Accessibility Guidelines (14 criteria with priority 1 and 25 criteria of priority 2). It checks 13 criteria with priority 1 and 7 criteria with priority 2. These criteria are those, which can be checked at HTML tag levels. Table 1 lists the criteria to be checked by WebInspector.

Table 1: Criteria Checked by WebInspector

No	Description	Priority
1	Titles that accurately show the contents of pages and enable users to identify pages are assigned to all pages.	1
2	Basic language used for page description is indicated.	1
3	The difference (e.g., contrast and brightness) between character color and background color is sufficient.	1

4	Representations that cause the entire window to blink or cause changes such as blinking and scrolling are not used for items that contain a large quantity of information and/or important information. When using these representations, do not use representations whose contrasts change rapidly and/or items that change quickly.	1
5	Messages are not displayed in the status bar.	1
6	All operations can be performed and necessary information can be obtained via the keyboard.	1
7	The alt attribute that accurately indicates the contents of an image is added to the image.	1
8	The alt attribute that accurately indicates the contents of a link destination is added to images that have links.	1
9	The alt attribute that accurately indicates the contents of a link destination is added to the image map.	1
10	The image map is on the client side, not on the server side. If the server side is used, a text link is added to the same window.	2
11	Link destinations are displayed in the same window. New windows open only when absolutely necessary.	2
12	Character qualification tags that change meanings by a wide margin such as strike-through are not used alone and they are written with words such as "cancel".	1
13	Symbols such as "O", "x", and "Δ" are not used standing alone for identification and they are written with words. Also machine-dependent characters (e.g., circled numbers and roman numbers) are not used.	1
14	Font sizes, line spacing, and display positions are specified in an easy-to-read way.	2
15	The relationship between rows and columns and display order (cell unit, from upper left to lower right), etc., are considered to ensure listings are easily understandable.	1
16	A title is written on top of a table.	2
17	Use of frames is minimized.	1
18	Information can be read without frames, in consideration of browsers that do not support frames.	2
19	A frame scroll bar is displayed.	2
20	Information equivalent to voice and text are provided for video transmission.	2

Check method

WebInspector analyses HTML tags to verify accessibility. For example, when it checks to determine if the alt attribute accurately indicating the contents of an image is added to the image, WebInspector also checks whether text information that explains the image data such as <img> defined in HTML source is defined with the < alt= " "> attribute.

Consideration of persons with cataracts and persons with color deficient vision

Many times website information consists of visual information such as characters, photos, pictures, and animations.   For this reason, many of the issues related to Internet accessibility are targeted at persons with visual impairments such as total blindness and lazy-eye blindness. The authors also think it is necessary to consider those who are not normally considered to be "people with visual impairment", such as persons with cataracts and persons with color deficient vision.

This is because there are numerous persons with cataracts and persons with color deficient vision. According to a survey conducted by the Health and Welfare Ministry in 1996, the total number of persons in Japan with cataracts is approximately 1,582,000 (433,000 men and 1,149,000 women), and among persons aged 70 and older, 80% or more have cataracts. This figure includes those with mild cases (Japanese Journal of Ophthalmology, 1993).

As for color deficient vision, statistics show that   5% of men suffer from its effects. This figure amounts to approximately 3 million persons in Japan alone. Despite this, there are numerous websites employing color schemes that take neither cataracts nor color deficient vision into consideration. From this background, the conditions under which persons with cataracts and persons with color deficient vision could easily read characters and appropriate background colors was investigated.

The result of this investigation was the creation of a WebInspector function that determines which characters persons with cataracts and persons with color deficient vision can easily read. This unique function is not available with other diagnostic tools. The following explains the WebInspector standards that apply to persons with cataracts and persons with color deficient vision.

Easy-to-read font standards for persons with cataracts and persons with color deficient vision

Most of the research done to date on the readability of text and the contrast of font and background colors on CRT monitors (ISO9241-3, 1992),(Kubota, S. 1998) are based persons with normal sight. There have been little research done based that take into consideration the effects of cataracts and color deficient vision.

During the development of WebInspector, we investigated the relationship between text readability and the appropriate font and background color contrast both for persons with normal sight and for persons with cataracts.

First, we determined how much contrast persons with normal sight require for text readability and appropriate font and background colors. For this experiment, ten subjects with normal vision (five men, five women) looked at 28 font and color background combinations patterns using eight basic web colors (white, red, lime, blue, maroon, purple, green, and black) and evaluated their readability at four levels (easy to read, legible, hard to read, and illegible).

Next, we experimented to determine how much of the contrast (brightness difference between font and background colors) are required by persons with cataracts in order to read characters easily. The same subjects with normal vision were used, but they wore goggles that closely mimic the effects of cataracts (Fig. 1).

Figure 1. Subject wearing goggles

Our analysis result showed that there is a correlation between the text readability and the brightness difference between font and background colors in the vision standards for persons with normal sight and persons with cataracts. It also showed that persons with cataracts require even more contrast than normally sighted persons. The evaluation contrast level of "readability" for the normally sighted subjects is about 53 in the brightness difference of the L*a*b* color specification system. Persons with cataracts, on the other hand, require about 62 as the contrast level. Compared with normally sighted persons, persons averaging around 70 years old with cataracts require a contrast brightness difference by 9 or more.

Standards for persons with color deficient vision

WebInspector applied "Transformations from CIE Trichromatic to Dichromatic Color-Matching (Günther Wyszecki, 1982)" presented by Günter Wyszecki.

WebInspector uses this formula to calculate the brightness values of protanopes,

deuteranopics, and tritanopics from the RGB values. It also uses this formula to calculate brightness values from the RGB values of the website font and background colors, and then determines whether the brightness difference is sufficient to meet the standards of each person with color deficient vision.

Operability

WebInspector operates on both Windows and Macintosh personal computers. When the URL of a web page or an HTML file folder is specified as a check object, WebInspector automatically determines the accessibility and displays the result on your browser. Specifying the HTML file folder improves efficiency because the HTML files in the folder are checked at the same time. Macintosh personal computers are supported because many website designers prefer to use them.

CSS file checking

Cascading Style Sheet (CSS) is a standard used for defining layout items such as the fonts, sizes, and line spacing of a website. CSS is used by many large-scale websites because it can define the entire layout of a website collectively. WebInspector 3.0 can diagnose HTML file accessibility, including font colors, character sizes, and line spacing. It can also output comprehensive diagnostic results in the CSV format so that they can be processed easily.

COLORSELECTOR

ColorSelector determines whether background and font color combinations are easy to read for persons with normal vision, persons with cataracts, protanopes, deuteranopics, and tritanopics, and then displays the optimum combination when designing a web page, etc. This function is effective not only for website design, but also for slide creation using PowerPoint and various screen designs.

ColorSelector is very convenient because the color accessibility check can be performed via simple operations such as selecting a color from a color pallet.

COLORDOCTOR

ColorDoctor can simulate and display information the way they would be seen by persons with cataracts and persons with color deficient vision. Thus, ColorDoctor enables persons with normal sight to visually check screen accessibility. ColorDoctor can check not only websites, but also almost anything displayed via programs such as PowerPoint. It can also simulate and displays photos and animations in real time.

For this reason, ColorDoctor can determine whether persons with color deficient vision can recognize the colors of presentation materials, etc easily. We anticipate that many office workers and researchers will use ColorDoctor. Fig. 2 shows that the simulation result of a person with deuteranopic vision in the left window is displayed in the right window. This indicates that persons with normal sight can check the accessibility from the right window.
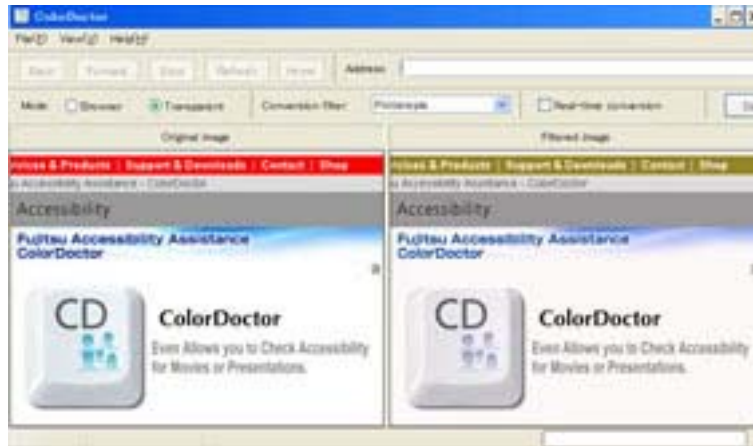

Figure 2. ColorDoctor

CONCLUSION

This article has introduced Fujitsu Accessibility Assistance, a software toolset that consists of the following three software products: WebInspector, ColorSelector, and ColorDoctor. WebInspector checks Internet accessibility.   ColorSelector checks the accessibility of background and font color combinations for designers.   ColorDoctor checks the accessibility of presentation materials used by office workers. These software products are offered free of charge in the hope that as many persons as possible can use them and find them helpful in improving Internet accessibility around the world.

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