

A Study on Web Accessibility Improvement Using Alternative Text Watermarking

*Dae-Jea Cho

Dept. Of Multimedia Engineering/ Andong National University, South KOREA

Corresponding Author: *Dae-Jea Cho

ABSTRACT: Web accessibility is a concept of whether or not the Internet users are able to acquire the information without difficulty and use it conveniently through easy access to the web contents that they need. Currently, the main focus of the web accessibility is if the web site is accessible when the users are physically challenged or when the users are in the low-speed communication environment as well as if the web site is built in a way that it is easily compatible when using the wireless internet.

This study suggests the way to improve the web accessibility for the visually impaired people. The watermark is inserted into the images without text to explain the contents of the picture and the inserted watermark is read by the screen reader to make it easier for the visually impaired people to understand the contents of the pictures.

Keywords: Web accessibility, Digital watermark; Text to speech; Visually impaired people

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I. INTRODUCTION

With the development of the internet and the utilization of the web, the latest information can be identified real-time. The public institutions, businesses, and individuals provide various contents such as images and video for the characteristics of the web and publicity, turning even things that can be provided only by text into images. On the web with a lot of visual elements, average people can find the information easily but the visually impaired cannot identify the information on the contents since they rely on hearing only.

There are roughly three ways for the visually impaired people, who cannot identify the information with eyes, to perceive the information that appear on the monitor [1].

1. Using while enlarging the screen.
2. Using while hearing the input or calculated contents.
3. Identifying the contents of the computer with braille display by utilizing the braille terminal.

Among these, 'Using while hearing the input or calculated contents', is most widely used as it costs the least and is not affected by the kinds of the visual impairments. The visually impaired perceive the web information with the screen reader utilizing the TTS (Text to Speech), which reads the contents of the web site that appears on the monitor screen. When the visually impaired people use the web with the screen reader, providing accurate information is necessary as they have to find the information while hearing.

The kinds of contents that can be approached through the web are various including texts, videos, images, and sound. Especially, images are the most used contents, taking up 73% of the whole web contents as of 2000[2]. Through images, the information of the contents can be expressed most efficiently. They are being utilized in most of the web areas such as electronic commerce, digital libraries, and medical services. The visually impaired cannot perceive the information of the image contents with the average methods used universally like this. For the users with visual impairment, one of the contents that are hardest to acquire the information of is the images. Even if they are much used on the web, the visually impaired people are hard to get information. This is why the web accessibility guides such as WCAG and KWACG mention the offering of alternative text first [3, 4]. Therefore, when building the web site, it is necessary to provide alternative texts that are adequate for the meaning and contents of the images to allow the visually impaired to perceive the information as average people do.

The web images need to provide the alternative text to meet the evaluation of the web accessibility. When the alternative text is provided for the images, it should be simple and precise. The image with simple text

makes it easy to create the alternative text, but the alternative text of the images with long phrases or no text cannot provide meaning easily.

This paper suggests the alternative text for the improvement of the web accessibility using digital water marking to allow the visually impaired people to get the image information on the web for the images without text.

II. RELATED WORKS

The letters on the web pages are output through sound when using the screen reader. On the other hand, the images frequently provided on the web pages cannot be output through sound using the screen reader. Therefore, the alternative text needs to be provided as an alternative means that can represent images through sound. The alternative text of image is provided using the alt property. As alt= "contents and meaning that the image has" is provided, the screen reader outputs it through sound, which enables the visually impaired to perceive the information on the web site after hearing the output sound. However, if an alternative text is not provided or alt= "" is provided, the screen reader does not output through sound, which prevents the visually impaired from perceiving the information. Therefore, for the web accessibility of the visually impaired, the alternative text of alt= "contents and meaning that the image has" is necessary.

The automatic evaluation tools to assess if the web accessibility follows the standard include N-WAX and K-WAH. These tools check the simple provision of alt property for the evaluation of the image alternative text. "Pass", if the alt property is provided, and "Fail", if the alt property is not provided [5].

To provide the alternative text of the images with text, "The research on the offering techniques to improve the web accessibility" of Park [6] suggested and materialized the method of providing the alternative text on the web browser after judging if the alt property is vacant, extracting the letters that the image with the text has using OCRSDK, an OCR program, when the alt property is vacant, and posting up the value on the web browser in the form of alt= "extracted letters".

III. WEB ACCESSIBILITY IMPROVEMENTS USING IMAGE OF WATERMARK

This paper inserts the water mark into the images without text using the block DCT transformation method with 8x8 to improve the web accessibility. To extract the watermark text, we extract watermark and watermark text through IDCT inverse transformation. When extracting the watermark from the watermarked images, the original image is not needed.

The process of recognition characters from extracted watermark and alternative text automatic processing is as follows.

Step 1: Parses the HTML document.

Step 2: Store path from tag

Step 3: Determine whether alt="" or not from <alt> tag

Step 4: If alt="", extracts the embedded watermark from the image file.

Step 5: Recognize the characters from extracted watermark using OCR program.

Step 6: Alt="" is replaced with alt="recognized characters" and HTML document is modified.

Let's analyze following example HTML code.

```
<IMG src="http://220.154.19.13/butterfly_image.jpg" alt="">(1)
```

In above HTML code (1), because alt is "", along the stored path and 'butterfly_image.jpg' file is loaded. The process of extraction of the text of the watermarked image and the automatic insertion of the replacement text is as Fig. 1.

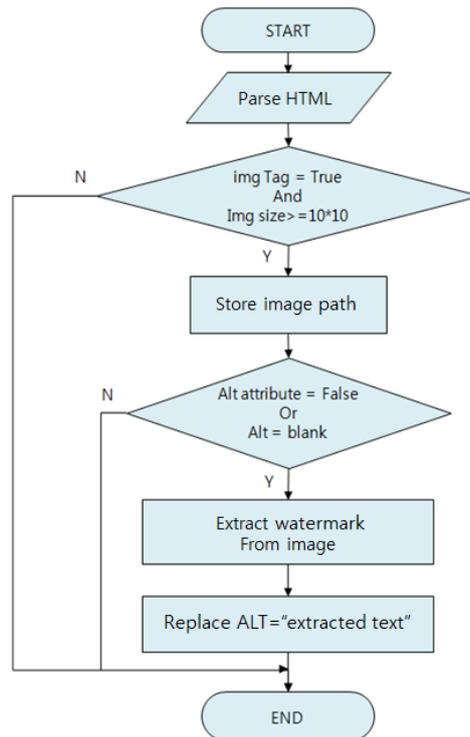


Fig. 1.Process of extraction of the text of the watermarked image and the automatic insertion of the replacement text

In Fig. 2, 'butterfly_image.jpg' file is watermarked image which insert 'Butterfly' as watermark into original image. This watermarked image is saved as file name 'butterfly_image.jpg'. And extract embedded watermark from 'butterfly_image.jpg' file. 'pepper_image.jpg' file is watermarked image which insert 'Pepper' as watermark into original image. This watermarked image is saved as file name 'pepper_image.jpg'. And extract embedded watermark from 'pepper_image.jpg' file.

Fig. 3 is extracted watermark from 'butterfly_image.jpg' file and 'pepper_image.jpg' file. It recognizes characters from the extracted watermark in Fig. 3 using OCR program. If recognized text is "Butterfly", alt="" is replaced with alt="Butterfly". Following HTML code is the result code that alt="" is replaced with alt="Butterfly". And if recognized text is "Pepper", alt="" is replaced with alt="Pepper". Following HTML code is the result code that alt="" is replaced with alt="Pepper".

(2)

 (3)

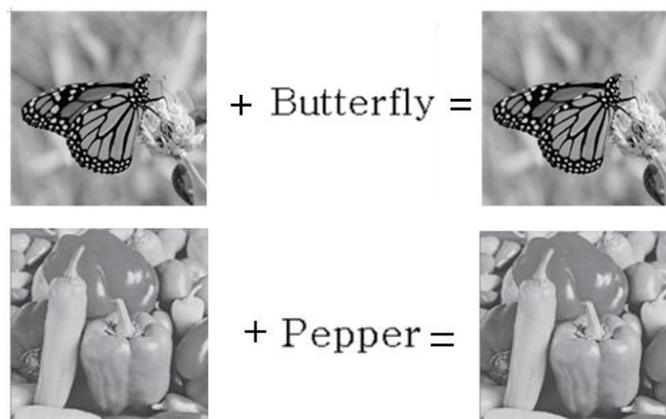


Fig. 2.Generation of watermarked image

Butterfly

Pepper

Fig. 3.Extracted watermark

When the visually impaired search the information using the Internet and HTML code (1) is performed, they cannot find out that butterfly_image.jpg represents a butterfly. But if HTML code (2) is performed, the screen reader recognizes alt="Butterfly" tag and reads "butterfly" with sound, allowing the visually impaired people to perceive it. And if HTML code (3) is performed, the screen reader recognizes alt="Pepper" tag and reads "pepper" with sound, allowing the visually impaired people to perceive it. The limitations of this paper are as follows. When making the web pages, all the developers need to use the watermarked images embedded with text to explain the images. This is necessary to enhance the web accessibility of the visually impaired people.

IV. CONCLUSION

On the web with a lot of visual elements, average people can find the information easily but the visually impaired cannot identify the information on the contents since they rely on hearing only. When building the web site, it is necessary to provide alternative texts that are adequate for the meaning and contents of the images to allow the visually impaired to perceive the information as average people do.

To improve the web accessibility of the images without text, this paper suggested a system in which the watermark is inserted into the images and an alternative text is automatically provided by extracting the text of the watermark inserted in the image when the text is not provided in the alt tag. The web producers can provide the alt property by inserting the watermark into the image, which explains the contents of the image. The visually impaired people can conveniently identify the web information by using this alternative text.

In case of web accessibility evaluation according to the proposed and implemented method in this paper, visually impaired people can get web information the same as non-disabled people. So web accessibility for visually impaired people is improved. The improvement of web accessibility is not only for the visually impaired, but also for various users. In addition, web developers can embed text as a watermark, providing images that do not damage the image to match the characteristics and intent of the web. Even if web developers do not enter text in the alt attribute, they can improve the development efficiency by automatically inserting the text into the alt attribute using a watermark.

Further researches will be done on the ways of providing the alternative text to improve the webaccessibility regarding the videos and contents as well as images.

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