

A Study on Web Accessibility Improvement Using QR-Code

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ABSTRACT : Web accessibility makes it possible for the disabled to get equal access to information provided in web like the normal. Therefore, to enable the disabled to use web, there is a need for construction of web page abide by accessibility. The text on the web site is output by sound using screen reader, so that the visually impaired can recognize the meaning of text. However, screen reader cannot recognize image. This paper studies a method for explaining images included in web pages using QR-Code. When producing web page adapting the method provided in this paper, it will help the visually impaired to understand the contents of webpage.

Keywords: Web accessibility, QR-Code, Visually impaired, Accessibility guidelines

I. INTRODUCTION

With the development of internet, anyone can sail around the sea of infinite information anywhere anytime. However, the visually impaired are the group of people who are isolated from the internet. They are not able to read flow of information on the web site. This information gap phenomenon is getting much serious with people who have physical limitation. It is pointed out as one of the main factors of hindering social integration[1-3].

Web accessibility means letting the disabled to used web easily. Specifically, it enables the disabled to recognize and understand web to utilize and interact with it. Web accessibility includes every type of disability influencing web access such as visibility, hearing, intelligence, linguistic, cognitive, and nerve disability[4]. Web site that ensures the web accessibility enables the disabled or the elderly who has physical or cognitive disorder to use internet service and contents[5, 6]. Therefore, there is a need for constructing web page ensuring accessibility for the disabled and the elderly.

Basically, web site is created to be recognized by sight. Therefore, it is impossible for the visibly disabled to recognize the information provided on the web just like the normal. There should be an alternative method for the visibly disabled to recognize the information on the web site with their physical limitations. The most essential program for the visibly disabled to use computer is a screen reader program. Screen reader is a assistive equipment which helps to understand information not by sight but by hearing. The visually impaired recognize the web information using screen reader which adapts TTS(Text to Speech) technique which reads out loud the contents of web site shown on the screen.

When the visually impaired access to web using screen reader, they can only recognize the information through the sound, so there is a definite need for correct information. However there are too many types of contents that are available in web site such as text, video. Especially, image occupies over 70% of the entire web contents[7]. But the visually impaired can't see picture and image.

For this reason, there are web content accessibility guidelines for creating webpage to provide text to explain the image. Those guidelines clearly mention that "there should be alternative text for non-textual contents to explain the meaning and usage". When using tag to use image on the web site, the developer should use 'alt' attribute to provide with alternative text. When providing alternative text, it should focus on its meaning and function rather than the visual description of the image[8].

Park[9, 10] has proposed and exercised a method which provides alternative text automatically and extracting the text from the image to improve the web accessibility. The method proposed by this paper judges whether the alternate text to the image is alt="" or not. If the alternative text to image is alt="", is uses OCR program to extract the letters in image. If there are extracted letters, it input extracted letters to alt ="extracted letters" to automatically provide with alternative text. However, this method has its own limitation. If the image on the web page does not include letters, it cannot provide with alternative text.

In this paper, studies a method for explaining images included in web pages using QR-Code. When producing web page adapting the method provided in the paper, it will help the visually impaired to understand the contents of webpage.

II. EXTRACTION AND INSERTION PROCEDURE OF TEXT USING QR-CODE

The program in this study, developed for the visually impaired operates on add-on program of web browser. When a visually impaired person add-on this program to his web browser, the add-on program's operating process is as follows.

Firstly, the program parses HTML file to find alt tag and judges if alt tag is blank or not. If the alt tag is blank, the program extracts text from the QR-Code of the image. And insert the extracted text to part where alt tag is operated as blank(`alt=""`).

Algorithm of program developed in this study for the visually impaired is following Fig. 1.

```

while NOT eof(HTML document)
{
  parse HTML document;
  if find alt="" then store path and order of image file;

  QR_Code_Extract(path of image file);
  alt tag's blank is replaced by Text;
}

QR_Code_Extract(path of image file)
{
  extract QR-Code from image;
  extract Text from QR-Code;
  return(Text);
}

```

Fig. 1 Algorithm of program developed in this study

III. EXPERIMENTAL RESULT AND DISCUSSION

Fig. 2 shows two images for experiment. QR-Code describes the contents of the images. The sentences which describe the contents of the images are "This figure is the Eiffel Tower" and "This figure is the London Bridge". Those sentences are embedded in image's QR-Code.



Fig. 2 Images used in the experiment (a) eiffel.jpg (b) bridge.jpg

Fig. 3 is HTML document that does not consider web accessibility of the visually impaired. Because there is no information about the image, the explanation to image is provided as blank(`alt=""`). In this case, because screen reader cannot read anything, the visually impaired cannot hear any sound.

```

1 <html>
2 <head>
3 <title> New Document </title>
4 </head>
5 <body>
6 </img>
7 </img>
8 </body>
9 </html>

```

Fig. 3 HTML document that does not consider web accessibility

Fig. 4 shows an alternative text presented by recognizing QR Code included in the image and extracting the letters from the QR Code. Blank part of alt="" is replaced by extracted letters and alt="extracted letters" is supplied. Extracted letters are "This figure is the Eiffel Tower" and "This figure is the London Bridge". In this case, screen reader reads above two sentences and visually impaired can hear explanation about image in web page.

```

1 <html>
2 <head>
3 <title> New Document </title>
4 </head>
5 <body>
6 </img>
8 </img>
10 </body>
11 </html>

```

Fig. 4 Result of web accessibility improvement

IV. CONCLUSION

This paper studies a method for explaining images included in web pages using QR-Code. Firstly, the program parses HTML file to find alt tag and judges if alt tag is blank or not. If the alt tag is blank, the program extracts text from the QR-Code of the image. And insert the extracted text to part where alt tag is operated as blank (alt=""). When producing web page adapting the method provided in this paper, it will help the visually impaired to understand the contents of webpage.

The condition of limitation for this study is as follows. The web pages created in the future should insert image explanation text by transforming it into QR-Code. In order to achieve this goal, improving the web accessibility evaluation guideline is our new assignment.

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