Accessibility Testing of Website through Statistical Technique

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ABSTRACT

This paper is motivated with social and moral obligation of society, with an aim to provide equal opportunity to impaired persons. In the era of information explosion one shall not be deprived of inaccessibility due to any impairment. Presently Internet is information superhighway, and web sites are one of the most significant medium of information. Making accessible websites refers to the inclusive practice of constructing them usable by people having all abilities as well as impaired one.If an organization is making its website accessible then it can lead in financial benefit on the organization.The direct and indirect financial gains is the major benefit of the web accessibility and it is due to the increased website use.It becomes easier for people to find a website, access it, and use it successfully, thus resulting in more users and increased use.In this work a tool is developed to test accessibility of websites for specific impairment through random testing technique.In this the input website is tested through automated random test cases. The experiment was conducted for visually impaired accessibility specifications according to W3C guidelines. By analysing the obtained results it is found that random testing is a suitable technique to test accessibility of websites.

KEYWORDS

Accessible websites, random testing, website testing.

I. INTRODUCTION

Accessibility nowadays is an important attribute in website design, it means that a given page on the Web should be accessible. It is about enabling all the people to get the shared information, which is the main vision of the web.

For a non-disabled person, it is easy to browse the web to see images, point the mouse, see the screen, and concentrate on the area of page that contains the content. It is easy for these people to see the headings and search for the area of interest and concentrate on the relevant area and read the actual information. But, disabled people have difficulty to do the same as they cannot access the sites in similar way. The site can be much more accessible to people with disabilities if the website is carefully designed keeping in mind the disabled persons. We can allow users with disabilities to reach, perceive, operate and understand the content without affecting the attractiveness of the website. Therefore more people will have the opportunity to access the resources on the web, buy and sell the products, or do the research, and can access to plenty of resources pertaining to the web. Many disabled people use extra gadgets which help them to use the web which are known as assistive technologies for e.g. a program called screen reader is used by the blind people which has a speech synthesizer that reads aloud the web page. Some deaf/blind people use a Braille display which allows users to feel a set of pins that the computer moves up and down to form Braille- the keyboard. People with low

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vision can use a screen magnifier. To include everyone in the Web the Web's governing body the World Wide Web Consortium (W3C) formed a group called the Web Accessibility Initiative (WAI). The aim of WAI was to develop strategies, guidelines and resources tomake theWeb accessible to people with disabilities. It provided the Web Content Accessibility Guidelines (WCAG) version 1.0 in May 1999 to make content both understandable and navigable. These are generally considered by web developers. The WCAG guidelines help authors to make accessible websites for disabled people [1].

The objective of this paper is to test the websites for the accessibility. The tool is developed to test whether an accessible website is following the WCAG guidelines or not. Random testing is used to test the website in which the input website is tested through automated random test cases. After conducting testing on the website it is found that the random testing is suitable to test the accessibility of the website.

II. WHAT IS WEB ACCESSIBILITY

Web Accessibility means that the people with disabilities can also use the web easily. Or we can say that the web accessibility means that the people with disabilities can perceive, understand, navigate and interact with the web. Web accessibility also benefits the other people like old people which suffers from disabilities because of aging.

Web accessibility includes all disabilities that hinders access to the web like visual,auditory,physical,speech, cognitive and neurological disabilities. Across the world there are millions of people suffering from different disabilities. In present time there are many websites which are difficult for many people with disabilities to use it. If more websites are designed considering disabled people,then the people with disabilities are able to use and contribute to the web more affectively. In some situations the people without disabilities are also benefitted by web accessibility in some situations like people using slow Internet connection, people with temporary disabilities like broken arm, and people with disabilities due to aging [2].

In many aspects of life the web is an increasingly important resource like education, employment, government, commerce, healthcare, and more. In order to provide equal access and equal opportunities to people with disabilities it is necessary for the websites to be accessible.

There are also additional benefits of web accessibility. The organizations allocate more resources to accessibility when they come to know that it can increase their market, decrease maintenance efforts, and result in many other benefits. Although the main focus of web accessibility is on web usage of disabled people, but we can also say that accessibility is also about designing the website so that more number of users can use the website. For example, commercial companies can get more sales, educational institutions can get more students. Increased usability means website users achieve their goals effectively. When users have a positive experience with a website, they will use site more, return to the site more often, and tell others about the site [5].

III. POSSIBLE SOLUTIONS TO MAKE WEBSITES FOR DISABLED

A. Solution to vision impairment

For blind users it is easy to access and use the pages with texts as text can be easily fed into the screen readers. It is difficult for the blind then sighted users to access the long pages as it is difficult for them to scan the required part on the website.

In order to facilitate scanning it is recommended to emphasize the structure of the page by proper HTML markup as mentioned: Use <H1> for the highest level heading, <H2> for the main parts of the information within the <H1>s, and <H3> and lower levels for even finer divisions of the information. By doing so, the blind user can get an overview of the structure of a page by

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having the <H1>s and <H2>s read aloud and can quickly an uninteresting section can be skipped by instructing the screen reader to jump to the next lower-level heading.

Use the ALT attribute to provide alternative text for images, though there are still many Web pages without ALTs. Theaccessibility experts recommend verbalizing (what a user would see) the objects that contains images with text. The users with reduced eyesight need large fonts which is a standard feature of most Web browsers. To support these users, one should never encode information with absolute font sizes but use relative sizes instead. For example, when using Style Sheets, the font-size attribute should not beset to a number of points or pixels but should set it to a percentage of the default font size. By doing this, , the text cangrow or shrink as the user issues "text larger" or "text smaller" commands and the page will be displayed according to the user's convenience..

B. Solution for people with auditory disabilities

People who are deaf or have other auditory disabilities have very less problems on the Web since sound effects are usually not required.. If the sound is turned off in the website the usability of a site almost always remainsthe same.. With increasing usage of multimedia this isnot the case, though. In particular, transcripts should be made available of spoken audio clips and videos should be made available in versions with subtitles (which is also beneficial for the users who are not native speakers of the language used in the video).

C. Solution for people with cognitive disabilities

Cognitive disabilities include language-based difficulties such as dyslexia, intellectual disabilities and other conditions such as autism or attention deficit hyperactivity disorder.Cognitive disabilities have not been the focus of as much user interface research as physical disabilities.People vary in their spatial reasoning skills and in their short-term memory capacity. Programmers and graphic designers tend to get uncommonly high scores on tests of spatial reasoning skills and are therefore good at visualizing the structure of a Web site. Similarly, young people (i.e., most Web designers) certainly have better memories for obscure codes (e.g., a URL) than older people. It is safe to assume that most users will have significantly greater difficulty navigating a Web site than its designers have.Simplified navigation helps all users. The site designers can help the people who have difficulty in visualizing the structure of information, by producing visualization for them in the form of a sitemap. They would be further helpedif the browser updated the display of the sitemap with the path of the navigation and the location of the current page.Users with dyslexia may have problems reading long pages and will be helped if the design facilitates scan-ability by proper use of headings. Selecting words with high information content as hypertext anchors will help these users, as well as blind users, scan for interesting links.

Many search user interfaces requires the user to type in keywords as search terms. Users havingspelling impairment(and foreign-language users) will obviously often feel difficultyto find what they need as long as perfect spellings are required. A first suggestion is to for search engines to include a spelling checker; other ideas from advanced information retrieval like query-by-example and similarity search can also help these users (and benefit everybody else at the same time).

D. Solution for motor disabilities

Motor impairments can affect the use of people's upper limbs and hands – the way most people interact with a computer and web.Many users have difficulty with detailed mouse movements and may also have problems holding down multiple keyboard keys simultaneously. Most of these issues should be taken care of by improved browser design and should not concern content designers except for the advice not to design image maps that require extremely precise mouse positioning. Client-side image maps will work even for users who cannot use a

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mouse at all: the browser should be able to move through the links under keyboard control [10].

IV. WEB CONTENTS ACCESSIBILITY GUIDELINES

In May 1999 W3C published Web Content Accessibility Guidelines 1.0 (WCAG 1.0) which explains that how to make Web content accessible to people with disabilities. WCAG is mainly for content producers but it can also be used by others like authoring tool developers to use it to create tools that generate accessible content, user agent developers use it to create tools that utilize accessible content, and evaluation tool developers to use it to create tools that find out the accessibility issues with content. Many organizations have adopted or referenced WCAG 1.0 in their policies since it has been published. On 11 December 2008, the WAI published the WCAG 2.0 which aims to be up to date and more technologically effective [11].

V. WEBSITE TESTING THROUGH RANDOM INPUTS

We will perform testing on a website to check whether a website is accessible or not. We will check whether a website is meeting the W3C guidelines of accessibility or not. For this we have used a tool to check the accessibility for visually impaired i.e. people with low vision and blind users. This tool will check randomly the website given as an input against the W3C guidelines for accessibility.

VI. EVALUATION OF WEBSITE THROUGH RANDOM TESTING

We will check whether a website is meeting the W3C guidelines of accessibility or not. For this we have created a tool to check the accessibility for visually impaired users i.e. people with low vision and blind users. This tool will check randomly the website given as an input against the W3C guidelines for accessibility.

We will perform the random testing on the website and will check that when a particular error (the mismatch in the number of tags- defined by WCAG and its corresponding attributes) is detected i.e. we will check that how many times or how many iterations it takes to perform random testing to check an error and also we perform the same test to check for multiple errors. The following are the observation taken while performing random testing.

Observation Table 1

Table 1: Observation table for one erroneous page

S.no.	Maximum pages in website	Erroneous page no.	Average iterations to find the erroneous page
1	20	11	3
2	30	1	10
3	40	30	16
4	50	10	18
5	60	48	23
6	70	15	31
7	80	60	37
8	90	18	39
9	100	70	46
10	200	90	77
11	300	250	97
12	400	300	136
13	500	2	187
14	600	330	234
15	700	454	260
16	800	764	305
17	900	21	373
18	1000	9	408

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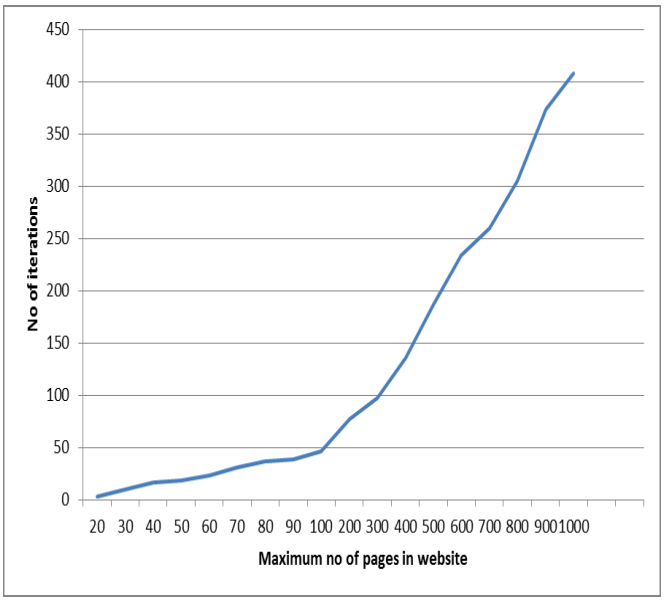

Figure1: Relationship between error in page in website and no of iterations to find the erroneous page.

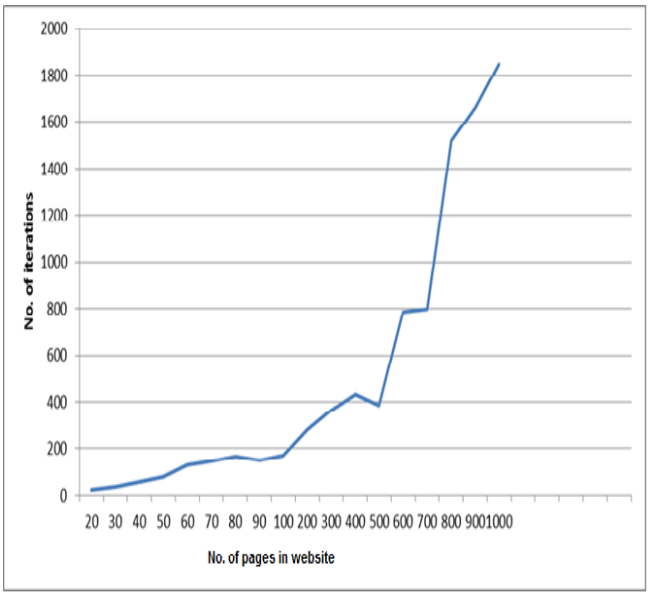

Figure 2: Relationship between no. of pages and no of iterations required to find multiple erroneous page

Table 2: Observation table for multiple erroneous page

S.no.	Maximum pages in website	Erroneous page no.	Average iterations to find the erroneous page
1	20	2,10	21
2	30	25,12	37
3	40	8,9	55
4	50	40,30	78
5	60	55,45	128
6	70	1,3	143
7	80	7,70	164
8	90	78,88	149
9	100	50,60	172
10	200	11,100	282
11	300	280,180	363
12	400	16,25	433
13	500	300,460	454
14	600	5,6	784
15	700	540,640	797
16	800	83,720	1521
17	900	110,111	1664
18	1000	900,901	1850

VII. CONCLUSION AND FUTURE SCOPE

This project is based on the accessibility testing of websites which are developed for the disabled. The testing is done to check whether the website is developed according to the W3C guidelines for accessibility or not. The testing done is random testing i.e. randomly a page of the website is tested for the accessibility. If any errors are there the percentage of error is shown. This project is developed to do the accessibility testing for visually impaired users or the users with low sight. The prototype of the tool is developed to test the websites. This project will be helpful for the web developers who develop the websites for disabled persons. So this project will help the developers to test the website for the W3C guidelines and in turn will help the disabled users to access the pool of content on web.

In future this project can be extended to test the website accessibility for other disabled users like color blind users, deaf users and the users with cognitive disabilities.

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