



Social4all: Definition of specific adaptations in Web applications to improve accessibility



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ABSTRACT

Web accessibility guidelines help developers to create websites which can more easily be used by people with different limitations. The principles and techniques of accessibility focus on the suitable use of standard Web components, alternative methods to present information, and alternatives to facilitate user interaction. Currently, the biggest part in creating accessible websites is played by Web developers, because they manage the page code. Unfortunately, there are millions of websites which do not follow accessibility guidelines, as this usually requires great effort and knowledge of accessibility issues. This research aims to create a platform, based on a novel approach, which allows a set of accessibility problems to be solved without modifying the original page code. The proposed platform is able to analyse websites and detect many accessibility problems automatically; after this, a guided assistant is used to offer adequate solutions to each detected problem. The assistant tries to abstract references to Web implementation issues and to explain every accessibility problem in an understandable way for non-technical people. This new approach could be useful to improve the level of accessibility of many websites for people besides Web developers.

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1. Introduction

Web accessibility is a key issue to ensure that people with different disabilities can use the Web. Some people with disabilities have a lot of problems perceiving and interacting with Web applications [1]. Web accessibility principles and techniques focus on the suitable use of standard Web components, the use of alternative methods to present information, and alternative systems to facilitate user interaction. Web accessibility includes recommendations related to text size and style, presentation of multimedia information, description of links, use of mouse events, navigation systems, page organization, colours and contrast, forms, pop-ups, and many other Web elements. (See Table 1.)

These accessibility measures are very useful because some people with disabilities could find the use of some features of websites very complex. Therefore, the main aim is to facilitate the use of websites for persons with low vision, deafness, speech disabilities, cognitive limitations or neurological disabilities. Millions of people in the world have these kinds of problems and must still be able to use the Web [2]. According to European Union data, between 10% and 15% of the population of the European Union 27 have some type of disability [3].

There are some important guidelines in existence which can help developers to create websites with good accessibility. One of the most

extensive sets is WCAG 2.0, which covers a wide range of recommendations for developing accessible Web content. WCAG 2.0 is an evolution of WCAG, which was published in May 1999. W3C recommends compliance with this guide. According to WCAG criteria it is possible that some websites require a greater level of accessibility than others; for this reason WCAG proposes three different accessibility levels from lowest to highest [4] Level A, Level AA and Level AAA.

The Section 508 1194.22 Standards Guide is another popular set of guidelines [5,6], which provides recommendations on many of the issues also covered in WCAG 2.0.

Unfortunately, millions of websites do not follow accessibility guidelines, as this can require great effort and knowledge about accessibility on the part of the Web developer. It is a very complex task to estimate how many websites have accessibility problems. There are millions of sites on the Web and accessibility reports encompass only an insignificant part of them: most accessibility reports focus on popular networks, or networks which provide institutional services, e.g., for hospitals, universities, and governments. In many countries accessibility guidelines must complement government or public websites as a legal obligation. Many reports and academic studies have focused on an analysis of the fulfilment of accessibility guidelines in some specific areas such as education [7,8] or government services [9].

The most part of the responsibility for Web accessibility falls upon Web developers, who need to apply the recommended techniques during implementation and maintenance processes [10,11]. They need to make extra efforts to ensure that websites are suitable for different

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Table 1
Load times for the original website and the same website through the Social4all platform.

Evaluated scenario	Dom ready (ms)	Everything loaded (ms)
<i>Original website</i>		
Without cache	79	208
With cache	12	24
<i>Website in Social4all – no adaptations defined</i>		
Without cache	163	284
With cache	56	83
<i>Website in Social4all – ten adaptations defined</i>		
Without cache	177	299
With cache	79	130

types of users, including users who may be unable to perceive information and navigation systems in the same way as others. Accessibility has to be analysed and tested like other website requirements [12].

The team involved in the development of a website has to know the accessibility guidelines inside out, and to be aware how to present information in the right way, along with alternatives for people with disabilities. Developers also have to know how to properly use HTML, CSS and JavaScript elements. To evaluate the accessibility of a website, developers can carry out a set of validations and checks throughout the development process or during the testing phase.

There are different methods to evaluate accessibility issues; the most effective is the use of accessibility experts to examine all the website and evaluate whether the code and user interfaces meet all the requirements specified by an accessibility guideline, for example WCAG Level AA. Guidelines outline all the issues that developers have to check in websites; many of these need to be interpreted carefully as they can be expressed in an ambiguous way. For example, developers should check whether alternative descriptions of an image describe the image correctly or not.

The team in charge of checking website accessibility can use certain defined tests [13,14]. Some research works have proposed specific tests, surveys or procedures to assist developers in responding to accessibility issues [15,16].

Some tools can detect certain accessibility problems automatically. These tools can also offer some assistance in human evaluation, for example searching a website for potential errors, which must then be evaluated manually later [17–19]. These tools are not enough to automate solutions of accessibility problems but are a great help to save time in the process of finding such problems [20].

Web accessibility faces important challenges, including in particular the following: 1) There are a lot of websites on the Web which do not meet accessibility guidelines; 2) Many elements of accessibility techniques are highly subjective, for example alternative descriptions may be suitable for people with certain limitations, but not for others.

These two problems have no unique and direct solution, because they are motivated by a wide range of different factors. Websites might not follow accessibility guidelines due to various reasons: sometimes the Web developers are not committed to accessibility; in other cases they do not have enough time to check all accessibility issues, or may even not be familiar with the accessibility concept. The creation of automatic tools to assist developers in accessibility evaluations could help in accessibility adoption in many websites.

Many problems related to the subjectivity of some accessibility issues can be solved if the website has more than one version. It could be very useful for example for a website to have a version with alternative descriptions for people with limited vision and another version for people with cognitive limitations; probably, the information needed in order to understand the content will not be the same for people with different limitations [21].

Another measure to improve the accessibility level of websites is the promotion of the implication of more people in the accessibility adoption. Currently, a lot of organizations and old people assistants are

interested in Web accessibility but they cannot choose to make their websites accessible because website developers are the only people with the necessary expertise. Organizations need the collaboration of website developers, and this commitment can be very difficult to obtain in many cases. Also another other profiles related to technology could be interested in use this kind of services like SEO consultants and industries 4.0 experts.

The main objective of this research is to create a novel platform which allows a set of accessibility problems to be solved for any website, without the need to modify the original code of the website, as sometimes it is difficult to include the original developers in tasks related to Web accessibility. The proposal intends to enable the detection of different types of non-accessible content, and to provide an adequate mechanism to fix these accessibility issues. The mechanism to fix the problems has to be suitable for people without programming skills. The platform must try to abstract references to Web technologies, and must explain every problem in an understandable way that is accessible to people without technical expertise. In many cases people who belong to organizations know how to explain the concepts for people with limitations – but perhaps these people do not have technical knowledge. For example: a person may be able to define an alternative description for a picture and provide a good summary of a table of data in a specific way for people with cognitive limitations, but the same person may not have Web development knowledge. Finally, one version of a website may be inadequate for people with different limitations to use the website in a comfortable way. Therefore, a dynamic solution must allow the creation of different accessible versions of the same pages and resources, this multiple-version system offering new opportunities to adapt the Web content for different situations and profiles.

The structure of the paper is as follows. Section 2 presents related works. Section 3 provides a description of the proposed platform. Section 4 presents a use study of the platform. Section 5 presents an evaluation of the results. Finally, Section 6 presents conclusions and future work.

2. Related works

Web accessibility is very important in contemporary society. Companies, organizations and governments have the responsibility to make online information accessible to all kinds of people [21].

Web accessibility has been important for 20 years [22]. Several important sets of accessibility guidelines have been developed since the first guidelines were compiled by Gregg Vanderheiden in 1995 [23]. Accessibility guidelines express requirements which developers' websites have to meet [24]. One way to ensure these requirements are met is by carrying out a human evaluation of the website, but this can often be a complex task, as many websites have a huge amount of content. Some tools can help developers evaluate accessibility automatically or semi-automatically [25].

There is a wide range of professional tools available to evaluate websites' accessibility. These tools are often very popular among Web developers. Some have been around for as long as 12 years [26]. Some of the most popular automatic accessibility evaluation tools are AChecker [19], 508 Checker [27], Evaluera [28], Access Monitor [29], Access Lint [30], Cynthia Says [31], SortSite [32], WAVE – Web Accessibility Evaluation Tool [18], Eval Access 2.0 [33] and some others with similar features. These tools apply algorithms to analyse and detect accessibility errors in Web code.

Most of these tools are in a process of continuous improvement, so they commonly include regular new features or mechanisms to detect accessibility problems. After analysis most of the tools show a report with information about detected problems. Some research works focus on normalizing the results of accessibility analysis [34]. Most of these tools classify the results of the analysis in errors and warnings since in many cases it is not possible to know with certainty whether pages contain some types of accessibility errors, because the diagnosis

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