THE APPROACH TO THE ASSESSMENT OF VALIDATORS FOR STUDYING WEB-ACCESSIBILITY

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A very important aspect of websites nowadays is their accessibility. Thanks to modern, constantly evolving technologies, it is possible to create friendly services for each user, regardless of his state of health. Web sites accessibility may be considered in aspects of their functionality and readability. One of methods for exploring this issue is the use of validators, i.e. automated tests to check the syntax of the documents posted on the Internet. The purpose of this article is to compare the selected tools. The structure of the article is as follows. Firstly, we explain the importance of the accessibility of the web sites. Then we briefly characterize our proposal of validators evaluation criteria for studying web-accessibility and present the results of evaluation of selected validators. Finally, we are presenting conclusions.

Keywords: web-accessibility, accessibility research, validator, website

1. Introduction

A professional website – one that is well made and kept – should be created according to good design practices. Among desirable traits are web-Visibility, ensuring web-Benefit, web-Usability and web-Accessibility [1]. This last trait is especially important, because, regardless of the reason of making a website, the whole point of WWW portals is to effectively present its content and transmit information to as many users as possible. This means that websites should strive for as many people as possible – whether with disabilities or not – to be able to read their content and use their features [2].
There is no universal method for studying and evaluating accessibility of websites so far. One of the methods is to use validators, which are automatic tests of web-accessibility. They check a website's accordance with certain standards, such as the Web Content Accessibility Guidelines (WCAG) [3]. Accordance to specification is an important part of technology accessibility: if the content is coded incorrectly, supporting software can have problems with interpreting and presenting it.

This article aims to compare some of the website accessibility validators following specific criteria. To achieve this, the first step was literature research, and an analysis of the available tools of this type. Certain validators were then chosen to be analysed and evaluated. The article ends by presenting conclusions.

2. Website accessibility and the methods of studying it

Web-accessibility is a term related to the way a person interacts with a computer, and means that the user interface allows a website to be accessed by all users, regardless of the type of used hardware or software, and regardless of any disability that might concern them [4]. The user interface is the intermediary element between the person and the device or program. This may mean a computer screen and the windows it displays, or a computer mouse and keyboard, or voice-operated software.

Evaluating whether or not a website is accessible, and to what extent, can be done in three different ways.

- By using validators – automated tests that check the correctness of the code of a website (quantitative research)
- By having experts on accessibility inspect a page (inspection methods)
- By testing a website with the help of users with disabilities (task testing) [3, 5].

Accessibility of a website should be scrutinised from two, correlated, points of view: informational and technical. The informational aspect can be studied through exploration and inspection methods (observation and interviews) and user tests. Such research is time consuming and subjective, and may require more resources (both time and funds). The technical aspect can be verified using validators [6].

3. Validators in assessing web-accessibility

A validator is a type of software that monitors a website and informs whether or not it fills the technical accessibility criteria given. The result can be binary (it either does or it doesn't), or more descriptive. Using validators is automated and
very fast, but validators cannot evaluate every aspect of a website that influences actual accessibility. Often, using different validators for the same page gives different results despite using the same criteria. Thus, an analysis of the validators themselves seems indicated, to choose those that give consistent results [7].

The chief task of validators is assessing whether a website is conform to specific technical standards, the most important of which are the WCAG 2.0, ARIA, and the effective form of HTML coding – CSS. Criteria from other specifications can be included sometimes (such as the US Section 508 [8]) or added by the authors of the program (for instance checking how fast contact information can be accessed from a given website, using content readers [9]).

Automatic validators generate reports by analysing and evaluating various areas of a site's construction, using the standard implemented. A good method of forming a final result is assigning weight to each criterion. Using this method, the final grade a website gets is a sum of the products of the resulting values (the degree to which a standard is met) and weights (the importance of a given criterion). In the case of WCAG 2.0, the weights are pre-determined and described as priorities in the document. The first priority, called A, concerns the conditions that a web designer must meet to offer basic accessibility. Better accessibility is ensured by following AA guidelines (what a designer should do), and the best by following AAA guidelines (what a designer can do) [10].

Authors of test software should also take into consideration the fact that most pages of a given website are usually made in a similar way. It can thus happen that one error can lower the accessibility grade repeatedly – or only once, depending on the program. Due to these discrepancies, and the overall complex character of the subject, the best solution is to present all the statistics and results in a large final report. Limiting this to a terse grade presentation can defeat the purpose of using a validator.

There is a large variety of validating software available. They have some traits in common, but they also differ significantly, often in areas crucial for the user, depending on the reason for testing. When choosing a validator, one should therefore be diligent and scrutinise the available programs carefully, especially since validators are most useful at the initial stage of accessibility analysis and will thus influence the next stages. It seems, therefore, that some criteria for evaluating validators themselves are necessary.

4. Proposed criteria for evaluating validator software

Validators of online services have become increasingly popular over the last few years. Choosing the right one is not, therefore, easy. Specific tools vary greatly, by form of access, by the number of web pages they can verify at a time, by their interface, etc. When analysing various tools for automated tests and the acces-
sibility requirements for websites, we have distinguished the following criteria [11], which can be used to compare and grade validator programs:

1. Verification according to WCAG 2.0 standard. This standard was created by the World Wide Web Consortium, an organisation that aims to create standards in the virtual reality of the Internet. The history of W3C, its importance for the development of the Internet, and the fact that hundreds of companies, institutions and schools belong to it, it can be assumed that their WCAG standard is the most complex and precise. Therefore, conformity to WCAG 2.0 standard should be a requirement for validator programs. A tool that can verify a website according to this standard should be preferred.

2. Verification according to other standards and additional test options. Validator programs are very useful in all tests of websites and in evaluating the quality of a website – company's website, for instance. In both these cases, any additional remarks can be very useful. A tool that allows testing according to other standards than the WCAG (such as the US Section 508), or testing for other criteria (such as spelling errors) should be preferred.

3. Number of web pages tested at a time. Free validator tools often test only one page at a time, while in most cases, the user wants to grade their whole website, not just a part of it. A tool that can verify several pages simultaneously should be preferred.

4. Way of presenting results. Accessibility evaluation is a complex subject and cannot be simplified into one final grade. A tool that generates an in-depth, precise and clear report of its analysis should be preferred.

5. Access form. This describes the way of using the automated tests: locally or online. Online access allows to test anywhere (anywhere with an Internet access, that is). A tool that offers both these forms of access should be preferred.

6. User interface. A graphical interface makes use easier, while a text interface (from the console, for instance) allows for better effectiveness or automation. Interface quality should also be taken into account. A tool offering a clear graphical interface with additional option of command console access should be preferred.

7. Software updates. These allow for stable program use, and when choosing a validator, one should check whether it is being updated, as well as whether or not it underwent a testing phase, or how long is it present on the market. A tool that is being supported, developed and suited to current standards should be preferred.

8. Cost. There are three main groups of validator software: commercial products, open source for non-commercial use, and open source. From the point of view of financial advantage only, free open source tool should be preferred.
Thus, eight guidelines for choosing validators were established. Table 1 presents them together with a grading scale. Because these criteria vary in usefulness when choosing a validator program, they were divided in two. The first group is formed by those criteria that concern only the validation process (points 1-4) while the second group (5-8) describe generally the validator programs themselves. The criteria sets have a different weight for choosing the best validator program, and have therefore been assigned a different weight factor:

- 0.6 for the first group;
- 0.4 for the second group.

<table>
<thead>
<tr>
<th>Table 1. Criteria for evaluating web-accessibility validators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion</strong></td>
</tr>
</tbody>
</table>
| 1. Verification according to WCAG standard | 0 – not available  
1 – available |
| 2. Verification according to other standards | 0 – not available  
1 – verification according to other standards or other elements  
2 – verification according to other standards and other elements |
| 3. Number of web pages tested at a time | 0 – only one page  
1 – up to ten pages  
2 – more than ten pages or all pages on a website |
| 4. Way of presenting results | 0 – simple grade and summary  
1 – grade, simple conclusions  
2 – complex report |
| 5. Access form | 0 – local  
1 – online  
2 – both |
| 6. User interface | 0 – graphical or sign interface  
1 – graphical and sign interface  
2 – clear and intuitive graphical or sign interface  
3 – clear and intuitive graphical and sign interface |
| 7. Software updates | 0 – not available  
1 – rarely available  
2 – readily available |
| 8. Cost | 0 – commercial software  
1 – non-commercial freeware  
2 – freeware |

These criteria were used in grading thirteen open source validator programs. The research process and its results were described in the next part of the article.
5. Evaluation of certain validator programs

The many website validators available can be divided into two groups: commercial products and freeware. Among the most popular freeware validators are:

- aChecker, http://achecker.ca
- ACTF aDesigner, http://eclipse.org/actf/downloads/tools/aDesigner
- AInspector Sidebar, http://ainspector.github.io
- Cynthia Says, http://cynthiasays.com
- EvalAccess, http://sipt07.si.ehu.es/evalaccess2
- Functional Accessibility Evaluator, https://fae.disability.illinois.edu
- HTML Validator, http://validator.w3.org
- Total Validator, https://totalvalidator.com
- Utilitia, http://utilitia.pl
- Wave Toolbar, http://wave.webaim.org
- Web Accessibility Toolbar, https://paciellogroup.com/resources/wat

Thirteen of the aforementioned, evaluated programs are open source. Since the study focuses on non-commercial solutions the criterion nr 8 has been omitted. The detailed results of the assessment of the validators chosen to perform automatic tests on the availability of web sites according to the first group criteria are shown in Table 2, according to the second group - in Table 3. Table 4 shows the evaluation of the validators according to the importance of the assigned to criteria groups. In order to facilitate the analysis of the data, the color green has been assigned to the best validators, and red to the worst. Orange and yellow were used to highlight the values in between.

The best tool turned out to be the Total Validator (5 points); whereas the Web Accessibility Toolbar received the lowest score (0.6 points). The analysis of the
points allocated to the criteria indicates that almost all validators provide complex and detailed reports (criterion No. 4 - 69%). A basic feature of most of the validators is also the possibility of verifying the websites for compliance with the WCAG standard (criterion No. 1 - same result). The creators of the open-source tools placed less emphasis on the possibility of simultaneous testing of multiple pages. In 9 of the cases it is possible to validate only one HTML document at a time (criterion 3 - 23%).

Table 2. Evaluation and comparison of WWW availability validators according to the first set of criteria

<table>
<thead>
<tr>
<th>Grade criteria</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
<th>W6</th>
<th>W7</th>
<th>W8</th>
<th>W9</th>
<th>W10</th>
<th>W11</th>
<th>W12</th>
<th>W13</th>
<th>Sum</th>
<th>% max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Verification of compliance with the WCAG standard</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>2. Verification of compliance with other standards</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>3. Number of simultaneously verifiable pages</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>23%</td>
</tr>
<tr>
<td>4. Method of result presentation</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>18</td>
<td>69%</td>
</tr>
<tr>
<td>Sum</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% as compared to the maximum sum</td>
<td>71%</td>
<td>71%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>71%</td>
<td>29%</td>
<td>43%</td>
<td>29%</td>
<td>71%</td>
<td>57%</td>
<td>57%</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3. Evaluation and comparison of WWW accessibility validators according to the second set of criteria

<table>
<thead>
<tr>
<th>Grade criteria</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
<th>W6</th>
<th>W7</th>
<th>W8</th>
<th>W9</th>
<th>W10</th>
<th>W11</th>
<th>W12</th>
<th>W13</th>
<th>Sum</th>
<th>% max</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Mode of access</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>6. User Interface</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>13</td>
<td>33%</td>
</tr>
<tr>
<td>7. Software update</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>12</td>
<td>46%</td>
</tr>
<tr>
<td>Sum</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% compared to the maximum amount of points</td>
<td>14%</td>
<td>14%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>0%</td>
<td>71%</td>
<td>71%</td>
<td>71%</td>
<td>71%</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Comparison of the validator’s results according to the importance assigned to the criteria

<table>
<thead>
<tr>
<th>Grade criteria</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>W4</th>
<th>W5</th>
<th>W6</th>
<th>W7</th>
<th>W8</th>
<th>W9</th>
<th>W10</th>
<th>W11</th>
<th>W12</th>
<th>W13</th>
<th>Sum</th>
<th>% max</th>
</tr>
</thead>
<tbody>
<tr>
<td>First group (0,6)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>27</td>
<td>49%</td>
</tr>
<tr>
<td>Second group (0,4)</td>
<td>0.4</td>
<td>0.4</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>14.8</td>
<td>41%</td>
</tr>
<tr>
<td>Sum</td>
<td>3.4</td>
<td>3.4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>14.8</td>
<td>41%</td>
</tr>
<tr>
<td>% compared to the maximum amount of points</td>
<td>49%</td>
<td>49%</td>
<td>43%</td>
<td>43%</td>
<td>43%</td>
<td>60%</td>
<td>34%</td>
<td>26%</td>
<td>46%</td>
<td>71%</td>
<td>71%</td>
<td>71%</td>
<td>71%</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>
6. Conclusions

This paper focused on one of the methods of evaluating the accessibility of WWW pages, which is using validators, programs that check the consistency and correctness of the syntax by means of automatic tests. The advantage of such tools is the possibility of verifying all pages of a given website in relatively short time. It allows for a general assessment of the degree to which the page is accessible to a generic user. Currently there are many tools of this type available, differing vastly in the available scope of validation. Due to that, studies have been launched in order to propose criteria for grading the technical capabilities of the validators in use.

The presented results and recommendations will serve as a basis for further research. More in-depth studies will be performed for the tools which have received the highest grades (the highest amount of points) and will include – among others – the verification of selected WWW pages.

Since validators do not allow for the assessment accordingly to all criteria of WWW accessibility, they can be used only as the first step of the verification, followed by a more detailed study conducted by specialists or users. Keeping this in mind, the subsequent WWW availability verifications will feature inspective methods alongside the application of the best open-source type validators.

REFERENCES


[11] In literature, there are also other criterias allowing the evaluation of the tools to conduct automated testing. See also: G. Kozłowski, M. Rotnicki, M. Trzeciakiewicz, P. Witk, J. Zadrożyń (2014) *Narzędzia do badania dostępności i tworzenia dostępnych treści*, FIRR, Warsaw, Poland.