Large Scale Web Accessibility Observatories

Introduction to the Special Thematic Session

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Abstract. This paper is an introductory to the special thematic session “Web Accessibility Observatories”. The presented papers in this session tackle different dimensions of accessibility evaluation from different perspectives e.g. user requirements elicitation for large scale evaluation of websites, using meta data of digital artefacts such as chatbots to assess their accessibility, physical versus digital accessibility and tools to evaluate easy language on websites. Holistic web accessibility evaluation is a complex task that requires powerful cloud infrastructure to cope with the huge amount of data produced during the evaluation process according to legal frameworks.

Keywords: Accessibility · Large scale · Monitoring bodies · Easy language · Chat bot · Web accessibility · Mobile applications · Digital accessibility · Physical accessibility

1 Introduction

Accessibility refers to the design of products, devices, services, or environments for people with disabilities e.g. accessibility of computer software systems such as web and mobile applications. The concept of accessible design ensures both “direct access” (i.e., unassisted) and “indirect access” meaning compatibility with a person’s assistive technology (for example, computer screen readers). Accessibility and usability of physical devices including wearables, sensors and actuators requires special attention to ensure access and ease of use for users with disabilities and elderly persons throughout the entire development life cycle. This can be achieved in case of web and mobile applications through consideration of accessibility guidelines already from the user requirements phase to design, development and finally evaluation phase at running time. Usable and accessible design features of physical gadgets include aspects related to workflow (suitability for typical user tasks, etc.), interaction design (conformance to user expectations, e.g., dialogue design), information presentation (clear and consistent page layout, wording) [3]. Evaluating the virtual prototypes of physical devices can be achieved by using simulated users.

Accessibility is strongly related to universal design which is the process of creating products that are usable by people with the widest possible range of abilities, operating within the widest possible range of situations. This is about making things accessible to all people (whether they have a disability or not) and to enhance user experience.
As mentioned above accessibility should be considered in all dimensions of product life cycles from the user requirement phase, design, specification and development. There are many approaches and tools to support the consideration of accessibility at all phases of product life cycle. Evaluation and monitoring of the accessibility status at every phase is probably the most important category.

Web and mobile apps’ accessibility has seen a lot of attention especially from W3C/WAI\(^1\) - Web Accessibility Initiative, where many accessibility guidelines have been created such as Web Content Accessibility Guidelines WCAG\(^2\) and Authoring Tools Accessibility Guidelines ATAG\(^3\) etc.

One of the accessibility questions, which was discussed in the last years was about automatic versus expert evaluation of websites and mobile applications. There is a consensus that a holistic approach combining both of them should be followed in order to achieve good and cost effective state of accessibility.

Furthermore accessibility was in the last decades internationally subject for regulatory efforts based on the work of W3C/WAI e.g. in the USA in form of section 508, in Europe in the form of Web Accessibility Directive WAD and respectively the implementation of WAD in national laws in the EU member states.

The Web Accessibility Directive (WAD)\(^4\) establishes accessibility requirements for websites and mobile applications of public sector bodies, which public sector bodies needed to start applying since 23 September 2019.

WAD defines accessibility as “principles and techniques to be observed when designing, constructing, maintaining, and updating websites and mobile applications in order to make them more accessible to users, in particular persons with disabilities”. The content of websites and mobile applications includes textual as well as non-textual information, downloadable documents and forms, and two-way interaction such as the processing of digital forms and the completion of authentication, identification and payment processes.

WAD’s accessibility requirements describe what must be achieved for the user to be able to perceive, operate, interpret and understand a website, a mobile application and related content. But it does not specify what technology should be selected for each website, online information or mobile application. WAD defines mobile applications as “application software designed and developed, by or on behalf of public sector bodies, for use by the general public on mobile devices such as smartphones and tablets. It does not include the software that controls those devices (mobile operating systems) or hardware”.

WAD aims to ensure that the websites and mobile applications of public sector bodies are made more accessible based on common accessibility requirements. It defines the four principles of accessibility as:

- **perceivability**, meaning that information and user interface components must be presentable to users in ways they can perceive.

\(^1\) [https://www.w3.org/WAI/](https://www.w3.org/WAI/).

\(^2\) [https://www.w3.org/WAI/standards-guidelines/wcag/](https://www.w3.org/WAI/standards-guidelines/wcag/).

\(^3\) [https://www.w3.org/WAI/standards-guidelines/atag/](https://www.w3.org/WAI/standards-guidelines/atag/).

\(^4\) Directive (EU) 2016/2102 of the European Parliament and of the Council of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies (OJ L 327, 2.12.2016, p. 1).
- **operability**, meaning that user interface components and navigation must be operable.
- **understandability**, meaning that information and the operation of the user interface must be understandable; and
- **robustness**, meaning that content must be robust enough to be interpreted reliably by a wide variety of user agents, including assistive technologies.

This regime of such requirements needs the implementation of large-scale accessibility observatories at micro (single website) and macro (organization up to member state) level. Observatories as a regime software must provide easy access for monitoring bodies, web commissioner, web accessibility experts and web developer. The monitoring body selects the required websites in a sample that fulfills the WAD requirements; the web commissioner can conduct the automatic evaluation of the websites of the sample, the web commissioner can provides then access to the web accessibility expert to conduct the manual part of the evaluation based on the automatic evaluation results. A combined report out of the automatic and manual results should be created automatically and the results should be made available to the monitoring body and other stakeholder. On the other side, the web commissioner can provide access to the web developer to correct any detected issues during the evaluation. These observatories require holistic technologies and sophisticated powerful cloud infrastructure that requires a lot of development and experimentation to reach efficient and cost effective results as described in the WADcher project [1, 2]. The WADcher project is building a large-scale infrastructure by integrating extended and enhanced existing web accessibility solutions, and by making them customizable to the needs of different stakeholders in EU member states. This will result in the minimisation of costs and development-time along with increased scalability, accessibility and usability for all types of end-users including older users and users with special needs.

WADcher will be a large-scale infrastructure by integrating extended and enhanced existing web accessibility solutions, and by also making them customizable to the needs of different stakeholders in EU Member States, to meet the requirements of the WAD in all European public sector websites and mobile applications, while minimising costs and development-time along with increased scalability, accessibility and usability for all types of end-users, to enable “Web Access by Default”.

WADcher users should be able to readily and reliably achieve WAD Compliance of their websites and mobile applications through

- WAD Compliance Evaluation - using a choice of appropriate Accessibility Assessment Tools.
- WAD Accessibility Statements
- Periodic Simplified Monitoring
- Periodic In-Depth Testing.
- Evaluation Reports for WAD Monitoring Bodies
- Periodic National WAD Compliance Reports.

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[5] https://wadcher.eu/
The WADcher Observatory aims at facilitating web commissioners to govern accessibility policy of the sites for which they are responsible. It is comprised of three different components, namely:

1. **Dashboard** which is responsible for the visualization of the evaluation results,
2. **Aggregation Manager** which connects the automatic evaluation results with the feedback of the experts, described in the following section, and
3. **Machine learning** results and the big data analytics component, which assists the dashboard in summarizing the evaluation results.

In the following, we will present four research papers that tackle crucial questions of accessibility evaluation aspects from different angels.

## 2 Areas Covered by This STS

The papers presented in this STS elaborate on questions including the following:

1. Maria Laura de Filippis et al. present a common framework and guidelines on how to assess the perceived quality of interaction of chatbots. They investigate these aspects from a system’s perspective; the subjective experience of quality derives from the interaction between the user and the application under specific conditions and contexts. They investigate then how factors of perceived quality of interaction are measured in studies of AI-based agents that support people with disabilities or special needs through a systematic literature review performed in accordance with the PRISMA\(^6\) reporting checklist. The results of the present study suggest that informal and untested measures of quality are often employed when it comes to evaluating user interactions with AI agents. This is particularly relevant in the health and well-being domain, where researchers set out to measure the clinical validity of tools intended to support people with disabilities or special needs.

2. Ana Iglesias et al. introduces the Comp4Text online readability evaluation tool, which is able to calculate the readability level of a web page based on classical linguistic measures (sentence to sentence), and detects unusual words and abbreviations. The authors introduce Comp4Text checker, a new web readability evaluation tool for Spanish web pages, based on classical linguistic measures and making recommendations to improve the readability of the web pages in a very visual way.

3. Christophe Ponsard et al. present a paper about the accessibility evaluations of digital and physical worlds. Digital services reduce the need to physically move hence to have to face physical accessibility barriers, but it becomes then more critical to make sure they are not replaced by digital accessibility barriers. In order to assess the interplay of both worlds from the accessibility perspective, the authors collected available data and used automated tools from three different perspectives: one starting from physically accessible places and looking at the digital accessibility of their online services, the second going the other way and finally a representative

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\(^6\) [http://prisma-statement.org/](http://prisma-statement.org/).
sample of services from the same smart city. They found a good combined level of accessibility in about one third of the places. Mutual strengthening could also be observed, usually greater on the digital accessibility side and revealing that awareness actions in one field also contribute to improve the other.

4. Fabio Paternò et al. present a paper about user requirements elicitation for large-scale accessibility evaluations of websites. They argue that the recent European legislation emphasizes the importance of enabling people with disabilities to have access to online information and services of public sector bodies. To this regard, automatic evaluation and monitoring of Web accessibility can play a key role for various stakeholders involved in creating and maintaining over time accessible products. They then present the results of elicitation activities that they carried out in the WADcher project to collect experience and feedback from Web commissioners, developers and content authors of websites and web applications. The purpose was to understand their current practices in addressing accessibility issues, identify the barriers they encounter when exploiting automatic support in ensuring the accessibility of Web resources, and receive indications about what functionalities they would like to exploit in order to better manage large-scale accessibility evaluation and monitoring. Each of these stakeholders represents a user role with specific requirements that emerged during their research and which have been considered in the design phase.

3 Future Research Areas

The presented papers in this STS cover a wide range of topics related to accessibility evaluation methods, techniques and practices. As mentioned above accessibility evaluation is a complex multidimensional task involving full stack technical layers and various stakeholder such as developer, tester, policy maker etc. Accessibility evaluation research should cover in future beside the feasibility of semi-automatic large-scale monitoring pilots additional state of the art topics like Artificial Intelligence, Machine Learning, Mixed and Augmented Reality etc.

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