Accessibility Guidelines Management Framework

Myriam Arrue, Markel Vigo, Amaia Aizpurua, and Julio Abascal

Laboratory of Human-Computer Interaction for Special Needs, Informatika Fakultatea,
University of the Basque Country, Manuel Lardizabal 1, 20018 Donostia, Spain
myriam@si.ehu.es, markel@si.ehu.es, aaizpurua009@ikasle.ehu.es,
julio@si.ehu.es

Abstract. Due to the extensive amount of information regarding web accessibility developed in recent years, developers find difficulties for creating accessible web applications. Accessibility knowledge management tools can facilitate this task. However, existing tools do not provide enough support to all the activities of the development process. In this sense, developers have to use diverse tools focused on different stages and they are also required to search for accessibility information from different sources. The aim of this paper is to present a framework for managing accessibility guidelines. It serves as a central repository where developers can search for accessibility guidelines, define new guidelines, and share them with other developers and evaluating them automatically. Therefore, this framework facilitates developers' tasks as it gives support to several activities of different stages throughout the development process.

1 Introduction

In recent years, an extensive amount of information about web accessibility in terms of best practices, techniques and sets of guidelines has been developed. However, some web developers are not able to produce accessible web content and most of the existing web sites present several accessibility barriers. In fact, web accessibility aware community complains about the amount of heterogeneous guidelines and the difficulty when handling them. Due to the complexity of the accessible web applications development task, web developers usually have to deal with diverse problems [1]:

- Search for the sets of guidelines which are significant for the current development.
- Select the most adequate sets of guidelines.
- Verify the coherence of the selected sets of guidelines.
- Analyse the applicability of the selected guidelines in the current development.
- Develop directly applicable design rules from the selected guidelines.
- Plan and perform frequent accessibility evaluations based on the selected sets of guidelines during the development process.

As mentioned previously, the first step towards developing accessible web applications is to find and select the most adequate sets of guidelines. The most accepted and used sets of guidelines are the WCAG 1.0 [2] and Section 508 [3]. These sets contain general purpose accessibility guidelines. However, for some developments it is necessary to apply also more specific guidelines such as sets of

guidelines for specific application type (e-learning, tele-working), access device (mobile devices) or user type (elderly, children, blind, deaf). For example, when developing a web application for elderly people specific guidelines as the ones defined in [4], as well as general purpose guidelines should be considered. The following figure, Figure 1, shows the taxonomy of the different types of existing web accessibility sets of guidelines.
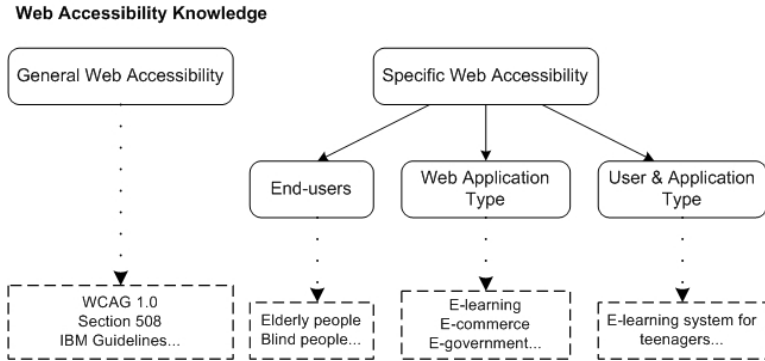

Fig. 1. Taxonomy of web accessibility sets of guidelines

Due to the diversity of formats and structures used for defining accessibility guidelines, finding, selecting, applying and evaluating these guidelines require a great effort from web developers. There are several automatic tools which assist developers evaluating the accessibility of web pages but most of them are based on general purpose sets of guidelines. Therefore, they are not flexible enough to evaluate guidelines for specific application type, user type or access device.

This paper proposes a framework for guidelines definition, edition and sharing which feeds an automatic accessibility evaluation tool. It allows centralizing a guidelines repository from where guidelines can be obtained for customized evaluation purposes. Due to the centralized nature of the repository, sharing guidelines among developers and researchers becomes easy. With the help of this web application, the communication gap between accessibility experts and developers is bridged.

Therefore, this framework is useful during all the development process of accessible web applications since it makes possible to find sets of guidelines according to specific characteristics, defining new guidelines and selecting the sets of guidelines for accessibility evaluations.

2   Related Work

Due to the different formats and level of detail used for defining accessibility guidelines, it is necessary to develop a unified format which contains the required characteristics for specifying guidelines from different sets. The uniform format is the basis for the development of such a management framework. Therefore, it should guarantee that all the necessary data for guidelines evaluation process is included. In this sense, several approaches can be found in the literature.

Vanderdonckt and Bereikdar proposed the Guidelines Definition Language, GDL [5] and recently Leporini et al. the Guidelines Abstraction Language, GAL [6]. These guideline specification languages make possible adapting quite straightforwardly to new guideline versions or novel guidelines.

However, these guidelines specification languages are mostly based on general purpose accessibility sets of guidelines. Consequently, some specific purpose guidelines may not be defined as any previous study of specific accessibility sets of guidelines and their definition in those languages is not provided. In addition, the developed definition languages are quite complex and appropriate tools for defining, editing, sharing and searching for accessibility information are needed.

In one of our previous work [7], UGL a new language for guidelines definition developed based on a comprehensive study of different sets of guidelines is described. This language has been selected for the development of the management framework proposed in this paper.

In respect of guidelines management tools, previous research has been carried out. SIERRA [8] is one of the first approaches for managing usability knowledge by a software tool. However, this tool does not support any evaluation process. Sherlock [9] manages usability guidelines by a client-server system and evaluates automatically only some of the defined guidelines. Another system, called GUIDE, for managing usability guidelines and storing the guidelines applied for a particular application development is presented in [10]. Nevertheless, none of this approaches support completely the development process.

More recent approaches, such as Mariage et al. [11] and Leporini et al. [12] are useful throughout the development process of web applications including the evaluation stage. Both aim at abstracting the interaction with accessibility guidelines with graphical interfaces. Unfortunately, both are standalone applications which have some drawbacks compared with a web application. Moreover, the guideline formats used by these applications are not proven to have been developed based on the results obtained from an analysis of the different types of sets of guidelines. Therefore, some guidelines may not be adequately evaluated or either specified.

3   Guidelines Management Framework

Expert users may prefer to directly specify guidelines in UGL in order to gain efficiency and accuracy. Yet, editing UGL directly may turn out to be a difficult task. Mastering its structure could make novel users reluctant to adopt UGL. Therefore, the proposed framework aims at abstracting the interaction with guidelines sets defined in UGL. The framework consists of a web application which guides the user through all the process of guidelines creation, edition and management. The fact that it is a web application has some advantages over a stand alone application such as:

- It is universally accessible from the browser so there is no need to install software or plug-ins.
- Since the application is WCAG 1.0 compliant users with disabilities are empowered to make their contribution to the guidelines corpus.
- Collected data are stored in the same server where the web application is hosted. The centralization of resources makes feasible access by other users and data are easier to manage.

The framework works jointly with an online accessibility evaluation tool called EvalAccess [13] and is capable of evaluating web pages against the guidelines defined in the framework.

3.1   Characteristics of the Framework

An UGL document contains information regarding web accessibility guidelines in different abstraction levels. The information a level contains is called PACK item which stands for Piece of web ACcessibility Knowledge. *Guideline-set* item contains general information about the guideline set such as the owner, guidelines application environment (general, mobile devices, e-learning...), guidelines end-users (people with disabilities in general , deaf, blind, elderly...), priorities distribution among checkpoints (priority 1/2/3, required/recommended...) and so on. On the other hand, at the lowest level, *evaluation techniques* specify information with regard to mark-up (HTML elements, attributes and their respective values) which is necessary for evaluation purposes. A *Guideline* item is a container which groups *Checkpoints* by their similarity.

As stated in the previous section, the application will lead the user during the process of guidelines creation/edition. The XML-Schema defines the constraints and hierarchical structure of every UGL document: *Guideline-sets* contain *Guidelines* which at the same time contain *Checkpoints* and these contain *Evaluation Techniques*. Therefore, high level PACKs are containers of low level PACKs.

Guidelines creation task is top-down driven and makes possible filling in all the necessary nodes or PACKs in a UGL document. More information about the XML-Schema[1] and which facts led its development can be found at [7]. The following sections describe in detail the functionalities of the management framework.

3.1.1   Guidelines Creation and Edition

First of all the user must sign up in the system and fill in a form regarding to his personal information. Hence, the system has to deal with user management but this task is not a mere personal information collection task, it has to do with the guideline-sets the user creates and shares. Once the user has signed up in the system is able to do the following tasks which are applicable to the following PACKs: *Guideline-sets*, *Guidelines*, *Checkpoints* and *Techniques*.

- Create a new PACK.
- Edit an existing PACK.
- Delete an existing PACK. This implies that all the PACKS that it contains will be also removed.
- View the information of an item. Its title and description are showed together with mark-up information in the case of *evaluation techniques*.

Note that if an *evaluation technique* is going to be defined (as depicted in Figure 2), all the high level PACKs or containers have also to be defined. It is necessary to define the UGL document from the PACK of higher level, in this case the *Guideline Set*, then *Guideline*, *Checkpoint* and finally *Evaluation Technique*. Since this task can be tedious

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[1] XML-Schema of UGL: http://sipt07.si.ehu.es/evalaccess3/ugl.xsd. Its representation: http://sipt07.si.ehu.es/evalaccess3/ugl.png

Fig. 2. Element definition in Web Accessibility Guidelines Framework

we are studying the use of predefined UGL templates with the minimum information required so that the evaluation engine will be able to automatically evaluate it.

The process of guidelines definition can be interrupted in any step and the framework will store the state and retrieve it next time the user logs in. Once that a set of guidelines has been completely defined, data are stored in the centralized XML database.

3.1.2   Guidelines Sharing

Once the user has created the PACKs, permissions can be set to them. They can be *not shared*, that is, they will be for personal and private use, *shared* and *shared but not editable* which implies that other users can access, retrieve and use them but the former cannot be changed while the later can be edited. As previously mentioned the system also manages user information such as his personal sets or shared guidelines. Note that permissions of high level PACKs are inherited by lower PACKs.

In order to not to redesign an existing *guideline*, *checkpoint* or *technique*, the system allows users to search for specific information. Search results only show guidelines or techniques which are *shared* or *shared but not editable*. Different search criteria are provided:

- General search: the search will be performed through the accessibility guidelines corpus.
- Specific search: this search is specific to PACKS focused on specific users or applied to particular applications, e.g.: accessibility information (*guidelines*, *checkpoint* and so on) about deaf users or e-learning environments can be obtained.

- Search according to hypertext criteria such as HTML elements and attributes: the users can seek for *evaluation techniques* that contain determined HTML labels or attributes. If they wish they can access the container PACKs such as *Checkpoint* or *Guidelines*.

The following figures show the interfaces for web accessibility guidelines searching (Figure 3) and the results yielded after a query (Figure 4).

Fig. 3. Interface for guidelines searching

Fig. 4. Results produced after query

Obtained results can be selected and added to a predefined set of guidelines called "My borrowed set" which will keep all guidelines defined and shared by other users. In addition, the PACKs labeled as "shared" could be edited in order to get more personalized accessibility knowledge. Both a copy of the original PACKs as well as the edited version are stored in the XML database in order to keep the consistency since some users may still use the original version (especially the owner).

4   Conclusions and Future Work

The proposed framework assists web developers in creating accessible web applications. It is useful and reliable throughout the development process as different functionalities have been included. In this sense, web developers can edit, update, search for guidelines, include new accessibility guidelines as well as select guidelines for performing automatic accessibility evaluations. Consequently, it is flexible enough to facilitate the development of web applications according to diverse sets of guidelines.

In addition, all the functionalities included in the framework would allow creating a comprehensive repository of accessibility guidelines which could be shared among developers community. Moreover, the implemented language for guidelines definition UGL includes the components for defining diverse types of test cases. Therefore, it guarantees that new guidelines will be easily integrated to the framework.

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