Accessibility assessments through heuristic walkthroughs

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Abstract. Testing accessibility of a web site is still an art. The paper examines the currently known definitions of accessibility and claims that lack of appropriate standardization of definitions and testing methods is one of the reasons explaining why web accessibility is so difficult to achieve.

The paper suggests that a method based on heuristic walkthrough might help evaluators in better assessing accessibility.

1 Introduction

In the last couple of years awareness of web accessibility has definitely increased. But knowledge of how to test a web site in order to determine its accessibility is still an art.

One difficulty is deciding which method to apply and how to adapt methods that are used for testing usability. For example, one could employ a conformance test to known standards (like WCAG 1.0, Section 508), or apply user testing [4] or even use other methods [11; 8; 6]).

A second facet of the problem are the several definitions of accessibility. Sometimes accessibility is defined in terms of effectiveness; now and then it is defined in terms of usability; but unfortunately there are too often claims that a web site is accessible simply because an automatic accessibility testing tool yielded no error.

The consequence of these methodological problems is that practitioners and regulators are likely to be confused. For example, the current working draft of an official document to be endorsed by the Italian government provides technical advice on how to ensure that a web site is accessible [3]. It suggests cognitive walkthrough as an analytical method for assessing accessibility, but then it provides 12 general usability principles to be used as in heuristic evaluations; finally it suggests empirical usability methods that are suboptimal (*e.g.* subjective assessments). Given that even well established methods are not reliable [7], the likelihood of suboptimal evaluations is very high.

The purpose of this paper is to survey several definitions of accessibility and then propose a heuristic walkthrough method to fill what I consider to be a gap in the evaluation methods for accessibility assessment.

2 Accessibility definitions

The W3C/WAI in Web Content Accessibility Guidelines 1.0 does not give an explicit definition of accessibility, but it mentions concepts like *"graceful transformation of the pages despite . . . physical, sensory, and cognitive disabilities, work constraints, and technological barriers; understandable and navigable content; clear and simple language."*. No definition is given either in the current WCAG 2.0 working draft which says *"web content that is perceivable, operable, and understandable by the broadest possible range of users and robust . . ."*.

The Italian accessibility law refers to *" the ability of computer systems . . . to deploy services and information so that they can be exploited, with no discrimination, also by disabled persons . . ."*. In a more detailed document [2] the Italian government mentions *information that is exploitable in a way that is user friendly, simple, efficient, multimodal, effective, satisfactory and compatible with guidelines.*

A clear definition of accessibility is given by Slatin and Rush [13, p. 3]: *". . . web sites are accessible when individuals with disabilities can access and use them as effectively as people who don't have disabilities"*.

ISO–16071 explicitly defines accessibility as the *"usability of a product, service, environment or facility by people with the widest range of capabilities"*.

Finally, Thatcher et al. [14, p. 8] define the concept of "usable accessibility" in terms of *"designing a user interface [of a web site] to be effective, efficient and satisfying for more people in more situations."*

This quick overview shows that the meaning of accessibility is not unique. Notice how some definitions are based on measurable users' performance parameters, like effectiveness, productivity, satisfaction, rather than properties that cannot be easily detected (*e.g.* understandability, or operability). Notice also that those properties are the ones that characterize usability.

3 Accessibility evaluation methods

Evaluation methods are important as they operationalize the way in which accessibility is measured and monitored. Several methods can be adopted, and most of them derive from usability investigation methods [11; 6; 10; 8; 15; 9].

Conformance tests (called also *Standard reviews*) produce a list of guidelines that are violated. Since the method does not refer to users, tasks, nor scenarios, it cannot be used when usability has to be assessed, and in particular it cannot be reliably used to rank violations. But ranking of defects is needed whenever appropriate fixes have to be implemented in order to remove those defects, which is one frequent reason to assess accessibility.

Heuristic evaluation requires practitioners to possess substantial knowledge to be able to customize the heuristics to specific situations and users. This method could be used for assessing accessibility (in the sense of usability for disabled persons) provided that: (i) it refers to principles that address specifically the interaction patterns that occur when disabled users visit web sites (*e.g.*

[8]), and (ii) evaluators are careful enough to consider all possible ways in which the interaction may violate every principle. Those principles are usually very general, which puts a substantial effort on the evaluators shoulders.

User testing [12; 5] is probably the most effective method that can be used, but it requires access to a community of disabled persons that are representative of different disabilities, that are representative of different levels of experience in using the browser and assistive technology. Evaluators should also know how to conduct an experimental session to avoid common pitfalls [7].

Based on scenarios, heuristic walkthrough [6], because it constrains and guides the evaluator much more than heuristic evaluation, because it requires less resources than user testing, and because it considers users, tasks, and contexts, can be adopted more often, more reliably and also when one needs to go beyond conformance to a standard.

4 An example of heuristic walkthrough for accessibility

The heuristic walkthrough method I propose is based on the concept of *accessibility barrier*, rather than scenario[1]. More details are given in [1], where a simple taxonomy of barriers is suggested and a method for assigning them a severity level is described.

Based on a set of predefined barriers, evaluators examine each page to determine if any of the barrier is likely to emerge. In the end they produce a list of problems, each associated to its severity and possibly the performance attribute that is affected (*e.g.* effectiveness, productivity, satisfaction, security).

Barriers to be considered are derived by interpretation of relevant guidelines and principles (in this example barriers refer to WCAG 2.0 guidelines) coupled with generic scenarios.

These are some examples:

1. Information failures
   (a) A blind user using a screen reader that is unable to perceive the information contained in a diagram or chart; the cause is no textual description associated to the image with any of the technical means (ALT, LONGDESC, D-LINK, adjacent text).
   (b) A low vision user of a screen magnifier that does not see the image because located out of her field of vision.
   (c) ...

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[1] An *accessibility barrier* is any condition that makes it difficult to make progress or to achieve an objective by a disabled person using the web site through specified assistive technology. A barrier is described in terms of

- the type of disability,
- the type of assistive technology being used,
- the activity that is being hindered by the barrier, and
- the features of the pages that raise the barrier.

2. Operability failures
   (a) Functional images (*e.g.* buttons) with no ALT that prevent a blind person from using a screen reader to know what to click. Similarly for Flash buttons.
   (b) Links with labels that are not informative (*e.g.* "click here"), that prevent a low–vision user of a screen reader from selecting the correct link when using the *link list* function. . . .
3. Failures to understand
   (a) Data tables (like a bus schedule) not being appropriately coded (with TH, SCOPE, HEADERS) that prevent a blind user of a screen reader from understanding what is being read as she navigates through the cells.
   (b) . . .
4. No user control
   (a) Missing access keys, that prevent a motor impaired user from quickly and accurately activating certain links.
   (b) Too many links listed in the page, that prevent a low–vision user of a screen magnifier from quickly and reliably locating the needed one.
   (c) . . .

When analyzing a web page it is easy to determine if the barrier applies to some of the tasks supported by the pages. And if it does, it is easy to determine what the consequences with respect to the user activity are. The evaluator can therefore easily assess the consequences of the barrier, and therefore its severity.

Compared to conformity assessments this method provides explicit suggestions to evaluators about which disabilities to consider, which operative scenarios to consider, and which are the possible barriers to look for. Secondly, since the barriers, the scenarios and the activities refer to the actual web site, they can be made much more specific than the techniques associated with public general standards, like WCAG 2.0.

It is also likely that, given the same barriers, two independent evaluations lead to a similar set of problems on the same web site. This assumption is justified because this method is more constrained than conformance test, heuristic evaluation and user testing.

5   Conclusions

The existence of several incompatible definitions of accessibility, and the lack of standard accessibility assessment methods are two causes for the currently low quality level of web sites in everybody's daily experience.

Appropriate testing methods need to be formalized and adopted. A heuristic walkthrough method based on barriers is proposed and claimed to be effective because it can be used by evaluators that lack expertise in usability evaluations.

Future research aims at experimentally determining whether the method is reliable (*i.e.* it captures actual accessibility defects) and repeatable (*i.e.* independent applications lead to similar sets of defects). Another interesting question is to compare effectiveness of this method against other methods (*e.g.* conformity testing or user testing).

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