

The Influence of Response Time of Applications on the Interaction of Visually Impaired Users

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ABSTRACT

Nowadays, several guidelines support the development of mobile applications that intend to consider aspects of accessibility. These guidelines describe a set of requirements that must be considered during, for example, the specification of user interfaces and interaction strategies. However, these guidelines do not consider the influence of the response time of interactive systems regarding their accessibility. The aim of the present work is to identify concrete cases that show this influence, generating knowledge that can support the extension of the guidelines. Two initial cases are discussed together with possible strategies that could avoid interaction troubles for visually impaired users.

KEYWORDS

Accessibility, Usability evaluation, Mobile devices.

1 Accessibility Guidelines

Time response is an important property of human-computer interaction systems and it is related to the quality of such systems to positively react to user requests. In order, time response usually determines the user engagement of an application and, thus, its success [1]. However, its perception depends on three aspects [2]: it is relative to the type of interaction; it is subjective, since different users may have different levels of tolerance; and it is nonexclusive, since it may be influenced by indirect indications in the Graphical User Interface (GUI).

The research question of this present paper is: “Is response time important to the accessibility promotion regarding visually impaired users?”. The answer for such question is important because it can lead the specification of test cases related to this aspect and their inclusion to the evaluation process of interactive mobile applications. To answer this question, an analysis was conducted on the current guidelines for accessibility, which are:

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- Funka Mobile Accessibility [3];
- W3C Mobile Accessibility [4];
- Google Android Developers Accessibility Guide [5];
- Accessibility Programming Guide for iOS from Apple [6];
- Design Guidelines for Windows Mobile from Microsoft [7];
- BBC Mobile Accessibility Guidelines [8];
- Guide to the Development of Accessible Mobile Applications (GuAMA) [9]

The results of this analysis showed that the time response aspect is in fact not considered along with the requirements of accessibility. However, observations of usability experiments show that time response can affect the quality of the interaction, mainly when users present visual impairments, as demonstrated in some initial observations of usability tests with this group of individuals.

2 Observation cases

All the interface elements have a response time and their measurements can be conducted by means of tools such as the Network Analysis Reference from Google Chrome. Figure 1 shows an example of this tool, where it is possible to see the response time of several interface elements of the IHC 2019 web page, such as scripts (e.g. mail-script.js and main.js) and images (e.g. sigchi_logo.gif and sigweb_logo.gif). Tools like that are important to stress opportunities to improve parts of the code that are inefficient in terms of interaction response.

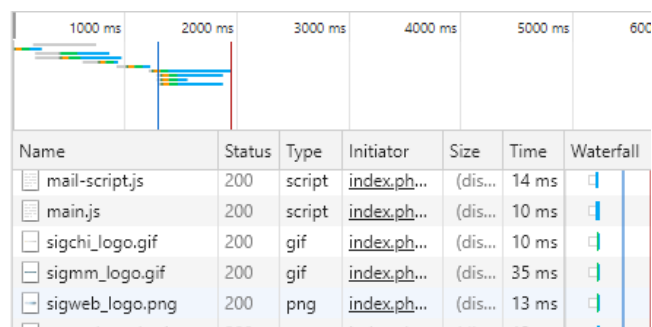


Figure 1: Part of the Network Analysis Reference tool from Google Chrome

Consider the following case, which relates the typical behavior of visually impaired users when they submit a request and the response time of an interface component (e.g. an image) is not adequate. The numbers in this description are related to Figure 1, which illustrates the actions that are being carried out:

“Visually impaired users submit a request (1) and after two or three seconds start to scan the screen looking for the reply. The action is always from left to right, top to bottom (2). If they pass the reply area and the reply is only there after that (3), they will finish the scan (4) and try the submission action again. However, the button will not be there. So they are lost in the interaction”.

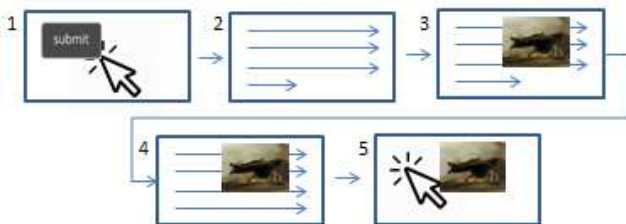


Figure 1: Illustration of an interaction problem caused by an inadequate time response

According to GuAMA guideline, for example, its requirement R31 (*The screen reader must inform the user of all visible events*) suggests the interface object provides some type of feedback when it appears. However, users do not have this information and, after 2 or 3 seconds, it was observed they start the scan process again. Test cases regarding the response time of interface elements could detect this situation and actions could be taken to reduce such time (e.g. if the object is an image, its quality could be decreased). If such a reduction is not possible, the interface should warn users about this delay.

The next case is based on the following GuAMA requirement: *“R12 - All interface images provided by the application must have an audio description”*. This means, rather than providing just a label that identifies the image, accessible documents must also provide an audio description that supports visually impaired users to “imagine” such an image. However, consider the next situation:

“All images must have an associated audio file. However, sometimes the image is there first. Then, the volunteer tap in the image but the audio is not there yet... so they tap again and again...”.

The response time problem in this case is related to the audio element. When users tap on the image, they are sure such image is there. However, they do not know that such image has a related audio file. Thus, after some attempts, they leave the image. This example is important to stress that the R12 requirement may not be enough to ensure the quality of the interaction.

4 Discussion

While the accessibility requirements for mobile applications do not discuss aspects related to the response time of user

interactions; practical observations of usability tests demonstrate that there are cases where such aspects are important to ensure the quality of the interaction. In order, the evaluation of response time is not so usual in the mobile context because there is a lack of resources to support such evaluation in an efficient way. One of these resources is the *Android Code instrumentation* for interaction monitoring. This resource is in fact an API so that developers must include further code in their applications to obtain the response time information. Other recent approaches try to automate this process using traditional tools such as the Selenium [10]. This present paper shows only initial situations where the response time could affect the interaction. Future works intend to create an evaluation protocol for usability test that identifies other situations and supports the extensions of the guidelines regarding aspects of response time for accessibility.

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