Mobile Web on the Desktop: Simpler Web Browsing

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ABSTRACT
This paper explores the potential benefits of using mobile webpages to present simpler web content to people with cognitive disabilities. An empirical analysis revealed that the majority of popular mobile sites are smaller than their desktop equivalents with an average of half the viewable content, making them a viable method for simplifying web presentation.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *Evaluation/methodology*.

General Terms
Measurement, Human Factors.

Keywords
Website simplicity, website complexity, mobile web, web accessibility, cognitive disabilities.

1. INTRODUCTION
People with cognitive disabilities often prefer simple presentation of information, and simple interactions, like many other people [3]. But how can these simple user experiences be provided? There are as yet no automatic means for simplifying an existing user interface. But as [4] points out, phone applications are naturally constrained to be simple in some key respects, because of severe limitations on available screen area. Could there be value in offering phone presentations to users who prefer simple user experiences? Of course users can get these experiences by using a phone, but the same small screens, and small keys, pose problems for many users. How about allowing users to see the interface offered to phone users, on their laptop or desktop screens? The presentation of mobile content in a desktop environment could benefit people with cognitive disabilities who find desktop-oriented websites confusing, cluttered, or distracting as well as people with physical disabilities that may find the use of a mobile device challenging or who use assistive technology that requires a desktop machine.

Although some work has evaluated the effectiveness of viewing a desktop-oriented website on a mobile device [6], the opposite has had little attention. We begin this work here, by investigating how Web applications delivered to phone browsers differ from those presented to desktop browsers.

When mobile versions of websites are created, they are often streamlined by removing features, simplifying content, removing advertisements, and reducing the number of interactive elements. This simplification of content can significantly reduce the amount of time required to complete simple tasks, but performance is largely dependent on the physical features of the device used, such as screen size and input method [5, 6]. Furthermore, some tasks can't be completed on a mobile-oriented site or require a much higher level of effort. By presenting mobile content on a desktop environment, these constraints are largely removed. For instance, when a task is not easily handled by the functionality on a mobile website, one can easily revert to and use the standard desktop-oriented site.

To determine the feasibility and potential benefits of presenting mobile webpages to desktop users, we analyzed current desktop and mobile webpages to see how often mobile-oriented alternatives are created, for popular sites, and how mobile-oriented sites differ from desktop-oriented sites.

2. METHODOLOGY

2.1 System Architecture
Servers deliver different versions of sites by examining the user agent string that is provided as part of the header of the request the server receives. To compare mobile and desktop sites, we created a custom web crawler, SimpleWebGatherer, that manipulates this request string, allowing us to receive the versions of sites that are generated for a number of different mobile and desktop browsers, as detailed below. Because modern Web pages are typically not loaded from static content, but rather are built up using scripts (JavaScript, AJAX), one cannot simply examine the response from the server to a request. Rather, our tool incorporates a so-called headless browser, HTMLUnit, which retrieves the pages, executes attached scripts, and saves the fully formed page for analysis. HTMLUnit, an open source project, is widely considered one of the most robust headless browsers, and incorporates Mozilla's Rhino JavaScript engine which is capable of handling many of the web's most popular JavaScript libraries (e.g. jQuery). For any particular website, our web crawler adjusts the user agent of the headless browser to mimic one of seven user agent types. These include 3 desktop variations (Firefox 3.6, Internet Explorer 7, Internet Explorer 8) and 4 mobile variations (Android 2.1, BlackBerry 5.0, iOS 4.3, Symbian 9.4).

We created a second custom tool that uses the jsoup HTML analysis library to produce a number of metrics for the pages retrieved by SimpleWebGatherer, including file size and character/word/sentence counts for both the page source as well as the content that would be seen by users of the page.

ASSETS'11, October 24–26, 2011, Dundee, Scotland, UK.
ACM 978-1-4503-0919-6/11/10.

2.2 Determining Popular Websites

We studied a selection of the most visited websites in the United States, using the 63 sites that appear on both the Google and Alexa top 100 lists [1, 2]. Limitations in the headless browser in SimpleWebGatherer prevented us from including 4 of these sites, leaving us with 59 popular sites in our sample.

3. RESULTS

As expected, mobile sites differ considerably from desktop sites in most cases. For 41 of the 59 sites, the amount of text shown to users differed by 10% or more between the mobile and desktop sites. Across all 59 sites, the mobile versions presented only half as much text as the desktop versions. Figure 1 shows the comparison for all sites. Other measures, including total file size of the rendered page, show a similar pattern.

Interestingly, there are differences among the versions of sites sent to different phones. Across all of the sites, Android and iOS versions are comparable in size, but are about 50% larger than those for BlackBerry and Symbian. However, the amount of content itself was similar. In other words, the Android and iOS platforms seemed to contain much more HTML markup in their source code than BlackBerry and Symbian platforms, but all had nearly the same amount of actual usable content as shown to users.

This indicates that there are effectively three tiers of complexity among the versions of these sites. At the highest tier, desktop content provides the most complexity in terms of markup (111,156 bytes per file average) as well as the most content itself. The middle tier, represented by mobile sites delivered to Android or iOS, still provides some complexity in terms of markup (61,985 bytes per file) but provide less visible content. At the bottom tier, sites as delivered to BlackBerry and Symbian provide less markup (45,498 bytes per file) but about the same amount of visible content.

4. FOLLOW UP

Although our initial analysis has provided insight into how varied mobile and desktop sites are, there are several areas for further exploration.

First, our analysis has only included the homepages of the websites. For example, wikipedia.org is represented by its entry page, not any of its articles. But users spend more time on the subpages, or content pages, of sites, and an analysis of those pages would be important. For instance, comparing the mobile and desktop versions of a Google search results page, an Amazon product page, and a Wikipedia article could provide more practical insight into how mobile pages vary across the web.

Second, user testing needs to be conducted to determine if mobile pages are actually easier to use than desktop pages when presented on a desktop environment. Studies should include users with cognitive and physical disabilities and should focus on what properties of both mobile and desktop pages are the most helpful to users.

Lastly, a deeper analysis of the HTML markup would provide insight into how to better understand and process web data. Evaluations of the amount and types of controls on a page would be helpful in understanding how mobile pages differ from an interaction standpoint and could provide accessibility recommendations for web designers.

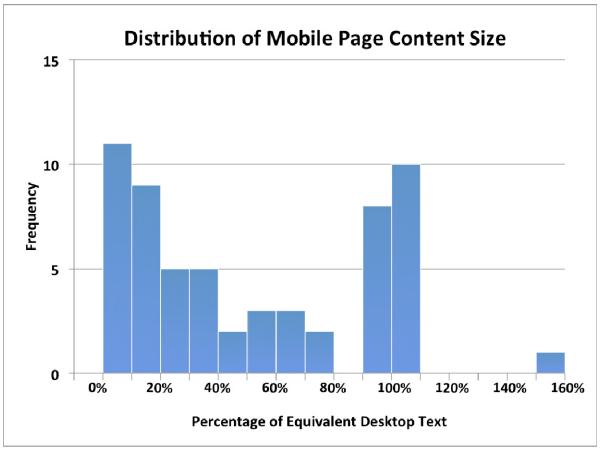

Figure 1. The distribution of mobile text content size as percentages of the equivalent desktop text.

5. CONCLUSION

Our comparisons of mobile and desktop sites indicate that there is a potential benefit to presenting mobile content on a desktop environment. Mobile sites provide less content to users and can benefit those with cognitive and physical disabilities by offering a simpler presentation of web content. Three tiers of web complexity were identified, suggesting that web content should not be seen as having just mobile and desktop variations, but a range of complexities that users can choose from to best suit their needs.

6. ACKNOWLEDGMENTS

We thank the Coleman Institute for Cognitive Disabilities, the RERC for Advancing Cognitive Technology, funded by NIDRR, and the Alliance for Advancing African American Research in Computing, funded by the NSF, for support. We also thank Damon Jones and Sarai Price for their valuable feedback and help in data analysis and preparation.

7. REFERENCES

[1] Alexa. *Top Sites in United States*. 2011; Available from: http://www.alexa.com/topsites/countries/US.

[2] Google. *The 100 most-visited sites: United States*. 2011; Available from: http://www.google.com/adplanner/static/top100countries/us.html.

[3] Lewis, C., *Simplicity in cognitive assistive technology: a framework and agenda for research.* Univers. Access Inf. Soc., 2007. **5**(4): p. 351-361.

[4] Markoff, J. *On a Small Screen, Just the Salient Stuff*. New York Times. 2008; Available from: http://www.nytimes.com/2008/07/13/technology/13stream.html.

[5] Schmiedl, G., M. Seidl, and K. Temper, *Mobile phone web browsing: a study on usage and usability of the mobile web*, in *Proceedings of the 11th International Conference on Human-Computer Interaction with Mobile Devices and Services.* 2009, ACM: Bonn, Germany. p. 1-2.

[6] Shrestha, S., *Mobile web browsing: usability study*, in *Proceedings of the 4th international conference on mobile technology, applications, and systems and the 1st international symposium on Computer human interaction in mobile technology.* 2007, ACM: Singapore. p. 187-194.