

The Accessibility Toolkit

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Abstract

We propose the creation of a repository of inclusive mobile application design tools and techniques. The repository will be based on existing and future research in the realm of accessibility and initially only available to academic researchers developing user studies. These developers may browse tool features based on operating system, ease of implementation, modality and range of user ability within each particular modality. To educate developers, the toolkit will utilize user personas for each modality that exemplify how users might use the features in the repository.

The proposed framework will make it easier for developers to accomplish their tasks, potentially making academic user studies and focus groups more inclusive to those with disabilities. This toolkit is not a one-size fits all solution, but rather a guide and repository of best mobile accessibility practices in the absence of an international standard. It represents one solution to a multifaceted problem that extends beyond the academic environment.

Categories and Subject Descriptors K.4.2. [Computer and society]: Social issues – assistive technologies for people with disabilities

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Graphical User Interfaces (GUI), Auditory feedback

General Terms Design, Experimentation, Human Factors.

Keywords Mobile application accessibility standards, mobile application design.

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Onward! 2011, October 22–27, 2011, Portland, Oregon, USA.
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1. Introduction

A few years ago I found myself at a boisterous wrap party for the console game my team had just shipped. I was loving life save for the nagging pain in my hands and the tricks my knees seemed to be up to that night. Assuming a few more drinks would assuage the problem, I ignored the pain to focus on the celebration. By the time Monday rolled around my hands didn't work. Forget typing – I couldn't hold a fork, fasten my shoes, or play my own video games. So began my journey into disability.

The most unexpected change was the change to my identity due to my physical ability. I was no longer the person my games were designed for. The icons normally associated with the term accessibility often involve devices to make navigation easier. In my case, accessibility referred to access to my livelihood and the skills I had developed during my career. I had to navigate a new life, with very little guidance.

2. Background

The ways we work, shop and communicate with our loved ones – the World Wide Web has profoundly impacted the social and professional lives of billions of people. The next revolution is taking place now; in the very near future more people will be accessing the web from mobile phones than from desktop computers. Described as the great equalizer, the mobile device has put a host of life altering tools into our pockets. Why then are the majority of the applications available on these devices less accessible than their desktop predecessors?

More than just a calling device, to those with disabilities the mobile phone is becoming a tool to experience the world in ways previously unknown. This transition is not without its foibles however. The mobile applications stores of Apple, Android and Blackberry are loaded with apps that are inaccessible to the able-bodied and differently-abled alike, leaving frustrated users to question what happened.

Largely what has been seen in the accessibility realm thus far has been hardware adapted to the needs of individual modalities. This hardware is often specialized for a few functions, not networked, proprietary and costly. [2] The current generation of smartphones offers functionality that may provide a solution to this problem if appropriately used. The iPhone – arguably the leader in mobile accessibility measures – provides a framework for application developers to make certain functions of the iPhone accessible. Likewise Android's accessibility service provides things like text-to-speech, haptic feedback, and trackball/d-pad navigation that augment the user experience. The iOS and Android operating systems represent almost half of the current smartphone market, but neither of them provides more than a few paragraphs of accessibility information to developers.

The iOS has set the standard for accessibility in mobile application design. While this is promising, this only makes accessible certain functions of the phone. For example, while a user can purchase, download and begin a game using the iPhone's accessibility framework, the operation of the characters or achievements of goals within the game are not made accessible by this framework. While the game is accessible, actually playing the game is not.

2.1 The Developer Experience

Unfortunately the most common design standard is to design for the middle, which carries with it an able-bodied assumption. There are no international mobile accessibility standards to look to for guidance or definitive accessibility rule set to follow. Like the first author of this paper, the mobile application developer wanting to include accessibility features to their applications has very little guidance. There is a definite need for tools that help with the understanding and integration of accessible mobile application design techniques.

Academic developers want to create intuitive, elegant solutions for their chosen areas of mobile research. Without the benefit of a human computer interaction course that delves into accessibility matters, student researchers – and by extension their research studies – are left at a unique disadvantage. Additionally, these nascent developers may not have knowledge of accessibility design needs, either professionally or personally.

A study by Joel Brandt showed that web resources are a ubiquitous and essential part of programming to these types of developers. [9] Given a design task, all of the programmers in the study used web resources to successfully complete the task. Having spent 19% of their development time consuming relevant online information, Brandt describes these developers as an emerging class of "opportunistic" programmers. [9] While there are web accessibility standards, they do not translate well to the creation of mobile

applications. The web design guidelines that exist for accessibility scratch the surface of what is needed to create a truly accessible mobile experience.

Additionally, when speaking of accessibility it is important to realize that there is no "one size fits all" approach. For example, the able-bodied person who breaks their arm may or may not be able to successfully use the same auditory solution a blind user employs for mobile text input. Within each modality there is a wide range of ability. Like the example, these abilities may also be transitory in nature.

3. Toolkit Components

The toolkit is both a space and a place; a space to house information and a space for collaboration. The place will be a wiki informed by the success of the online communities created by websites like Wikipedia, GitHub and Facebook. Though these sites speak to many different collaboration models and participant motivations, they are all successful. The accessibility toolkit will be a place for dialogue between those whose life work is accessibility and those who are subject matter experts in all other areas.

It is important that the toolkit recognizes the both limitations of the developers and the range of abilities within the mobile user population they serve. The reference section of this paper includes some of the exemplary work that our toolkit would include. The toolkit will also feature:

- Tools based on current research in mobility, hearing, vision and cognition.
- A ratings system to help developers determine the level of difficulty for implementation of the selected technology.
- A feature matrix to be able to analyze the techniques, comparing their effectiveness across multiple user modalities.
- User personas to provide consistency, with the knowledge that shared user models can increase the accuracy and depth of data used to adapt interfaces and user interactions [2].

Successful usage of a mobile device usually requires physical stability, tactility, accuracy, and control. Within the developer toolkit, the term mobility is meant to describe both people with a range of motor impairments and able-bodied users with situational impairments. An example of a situationally impaired able-bodied person would be a multitasker; someone who is walking or riding a bicycle while using their phone. A technology like Edge Write would prove useful for both user populations. Developed in Edge Write is a text entry method implemented on PDAs, touchpads, displacement joysticks, isometric joysticks, trackballs, 4-keys and the stylus. The application has been shown to be significantly more accurate than Graffiti for

both able-bodied and motor-impaired users; the trackball version has been shown to be better than on-screen keyboards for some people who use trackballs due to motor impairments. Any software solution that lowers the physical or cognitive load for one user population has the potential to benefit all other populations.

Mobile phone usage also carries a large visual load, which can be difficult for those who are sighted and the growing numbers of those who are not. In 2006, the World Health Organization estimated that there were more than 37 million blind and 124 million low-vision people in the world. For this modality the toolkit would include those who have trouble with their vision to those who are legally blind. For this entire population transportation, shopping, eating out, and simply taking a walk can be major challenges. [22] Current technologies being used include reading machines, screen magnifiers, mobility aids, text entry aids in software like MobileSpeak1 and NuanceTalks. Successful applications in this area include memory aids, aural and haptic feedback mechanisms, software like NavTap and Trekker. [22]

4. Summary

Academic developers want to create intuitive, inclusive solutions for their chosen areas of mobile research. Unfortunately most do not have the knowledge base to do so. The most common design standard is to design for the average user, which carries with it an able-bodied assumption. There is a definite need for tools that help with the understanding and integration of accessible mobile application design techniques.

Conferences on Computers and Accessibility like ASSETS have greatly advanced the sharing of knowledge in this area, but these efforts need to be extended further. When designers are laying out the specifications to manifest their designs, they need a place to go to for advice, support, documentation and code examples that will support their accessibility needs. Our proposed toolkit will fill that need, acting as a repository of tools and techniques to help the academic researcher create accessible mobile applications. It is our hope that this repository will help to advance this area of research and the creation of accessible mobile application design standards.

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