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Annotated Bibliography  
Due: 10/09/09  
  
Topic: Accessibility in Computing: Techniques for Improving Accessibility of Mobile Applications for Blind and Visually Impaired Users  
  
Description: This research attempts to provide some techniques to improve accessibility of mobile applications to blind and visually impaired users.  It will discuss application development methodologies to improve "eyes-free" usage of a mobile application.  Platform-wide considerations for improving overall interface interaction will also be reviewed. and will cover current developments on popular platforms in addition to providing suggestions for improving device-wide accessibility.  
  
Motivation: The popularity of advanced and "data ready" mobile devices is increasing at an astonishing rate.  Despite these advancements, considerations for the accessibility of these devices to blind and visually impaired users has been lacking.  In addition, the ability for third parties to develop applications has caused further setbacks by adding less-accessible applications to the suite of available software offerings.  This research will provide useful and implementable strategies for improving this type of accessibility at both the platform and application level.  
  
References:

* Kane, S. K., Bigham, J. P., and Wobbrock, J. O. 2008. Slide rule: making mobile touch screens accessible to blind people using multi-touch interaction techniques. In *Proceedings of the 10th international ACM SIGACCESS Conference on Computers and Accessibility* (Halifax, Nova Scotia, Canada, October 13 - 15, 2008). Assets '08. ACM, New York, NY, 73-80. DOI= http://doi.acm.org/10.1145/1414471.1414487  
    
  *[This paper focuses on the topic of making touch screen devices accessible to those with visual impairments and blindness by leveraging capabilities of newer touch screen technologies.  The authors propose a solution known as “Slide Rule”, an implementation of a touch screen device centering on a navigational model using gesture control.  These “gestures” take the form of certain touch, drag, tap, and flick movements on or across the touch screen device.  The researches first held a user study which defined the scope and goals of the project.  Then, through an iterative prototyping methodology, they generated an Objective C application on the iPhone andiPod Touch platform that implemented their Slide Rule routines.  The application itself was an independent phone dialer, email solution, and music player all centered on gesture control.  The touch screen was divided into fingertip sized elements which could be identified by dragging a finger over them.  Each time a new element was encountered, a speech synthesis engine would speak the name of the element.  Slightly more elaborate gestures were developed foractions such as selecting and contextual navigation.  After development was complete, the authors performed several experiments with a series of blind and low vision users to determine the device’s usability as compared to a device with physical navigation buttons and screen reading software.  They found that the speed of navigation and action completion greatly improved with their prototype, but the number of errors encountered was greater than with a traditional device.]*
* Li, K. A., Baudisch, P., and Hinckley, K. 2008. Blindsight: eyes-free access to mobile phones. In *Proceeding of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems* (Florence, Italy, April 05 - 10, 2008). CHI '08. ACM, New York, NY, 1389-1398. DOI= http://doi.acm.org/10.1145/1357054.1357273  
    
  *[This paper focuses on the implications of needing to access secondary data on a mobile device while using that device in another capacity, such as being on a phone call.  In an attempt to solve this problem, the authors created a prototype of an alternate in-call menu that allows for greater accessibility of device-wide information.  The end goal of this implementation was to allow the user to obtain the information they needed without interrupting their current activity.  The authors created a prototype called “BlindSight”.  The C++ application, which ran on the Windows Mobile platform, utilized a series of voice responses to keypad presses that provided information to the user through the earpiece.  The voice and information cues were quick, as to not interrupt the conversation, and could be heard only be the party using the phone.  A follow-up study showed that users preferred using the BlindSight interface rather than visually navigating through the menus of their mobile device.  Although this paper did not provide a specific use case for persons with disabilities, one can be implied by making the assumption that such a person would benefit from having easy auditory access to secondary device information.  This is certainly the case as a person with a visual impairment, who would need to focus all of his or her usable vision on the task at hand. ]*
* Kane, S. K. 2009. Context-enhanced interaction techniques for more accessible mobile phones. *SIGACCESS Access. Comput.* , 93 (Jan. 2009), 39-43. DOI= http://doi.acm.org/10.1145/1531930.1531936  
   *[This paper focuses primarily on enabling, disabling, and changing the level of aid of accessibility features on mobile devices based on “context, location, and ability”.  This adaptive technique aims to improve accessibility by using predictive measures to change the user experience and interface.  The authors note that persons with disabilities have historically had difficulty operating mobile devices, but the situation worsens when the user is in a busy or distracting setting.  This additional challenge was referred to as a “situational impairment”.  The presented methodologies, or “situational accommodations”, attempt to improve this use case by evaluating the environmental conditions of the device and altering its interface or behavior based on that information.  The authors provide the examples of magnifying displayed text if the device is moving, and increasing the display contrast if the device detects that it is in a low-light environment.  It is further suggested that the device should then reevaluate the user’s response to situational accommodation and adapt to fit the user’s needs as they change.  The overall structure of this proposition is broken down by the authors into three primary routines.*

*·*         *Context – Using an array of sensors on the device, create a model of the user’s current environment and abilities.*

*·*         *Alter User Interface / Experience – Based on the contextual model created, modify or replace the user interface or automatically perform tasks within the scope of the context model.*

*·*         *Allow for Customization – While still using the predictive model, ultimately allow the user to enable and disable certain types of situational accommodations based on their needs or impairments.*

*Future work in this area includes conducting a user study that evaluates the difficulties people with disabilities have with the operation of mobile devices.  From that information, specific situational accommodations can be planned and implemented.]*

* T.V. Raman, Charles L. Chen, "Eyes-Free User Interfaces," Computer, vol. 41, no. 10, pp. 100-101, Oct. 2008, doi:10.1109/MC.2008.424  
    
  *[In this article, researchers T.V. Raman and Charles Chen of Google Inc. discuss the future and applicability of user interfaces of mobile devices.  Raman, who happens to be totally blind, has spent the greater part of two years making incredible advancements in the accessibility of Android, Google’s mobile device platform.  They authors discuss how devices are becoming less and less visual, and as people do more and more with their lives, looking at their mobile devices will become less important.  The point is made that having alternate methods of interfacing with these devices will yield more productive individuals.  This is, of course, applicable to the field of accessible computing in that the same interfaces will allow people with visual impairments to be able to interact at the same level as fully sighted individuals.  Charles and Raman see the future of mobile user interfaces as an eyes-free experience, relying almost entirely on touch input and tactile or auditory output.  On a personal note, having had an opportunity to work closely with these individuals, their passion for advancing this area of computing is impressive, almost as much so as their results.]*
* McGookin, D., Brewster, S., and Jiang, W. 2008. Investigating touchscreen accessibility for people with visual impairments. In *Proceedings of the 5th Nordic Conference on Human-Computer interaction: Building Bridges* (Lund, Sweden, October 20 - 22, 2008). NordiCHI '08, vol. 358. ACM, New York, NY, 298-307. DOI= http://doi.acm.org/10.1145/1463160.1463193  
    
  *[This paper discussed much of the general background related to the difficulties most visually impaired individuals have with the everyday use of touch screen based mobile devices.  The authors go into some detail regarding the use of these touch screens and how the lack of tactile or auditory feedback presents a challenge for this subset of users.  They note that with the recent explosion in sales of touch screen devices, there is a distinct opportunity to make accessibility improvements that will impact this area of the market and computing as a whole in the future.  The authors then continue to introduce a survey-based study which they conducted regarding the use of technology in the daily lives of seventeen persons with visual impairments.  Some questionable tactics were used in obtaining the data, including snowball sampling via email distribution lists, which likely biased their results to those who are already very comfortable with technology.  They discovered an interesting trend regarding the use of assertive devices versus appropriated devices, in that many users utilized both in combination in their day to day routines.  Many of the participants mentioned the increased use of touch screen based interfaces in public terminal machines such as ATMs, gym equipment, or ticket kiosks.  The authors then continue to discuss two methodologies for improving these interfaces.  The first, the use of tactile overlays, was extremely primitive and did not appear to be at all applicable to the dynamically changing nature of mobile device interfaces of present.  The second was another implementation of a gesture based control model.  Although more suitable to some of the common devices, this is not a new idea, and has been discussed heavily in other papers and implemented several times on actual mobile platforms.  These researches then continued to conduct an additional experiment whereby they gave tasks to blindfolded participants who were asked to set customizable gesture controls and act on them at certain times.  I do not believe that this experiment yielded any relevant results; as fully sighted persons with their sight removed do not accurately represent people with visual impairments, which is what this study attempted to measure.]*

Other Related Sources

* Vigo, M., Aizpurua, A., Arrue, M., and Abascal, J. 2008. Evaluating web accessibility for specific mobile devices. In *Proceedings of the 2008 international Cross-Disciplinary Conference on Web Accessibility (W4a)* (Beijing, China, April 21 - 22, 2008). W4A '08, vol. 317. ACM, New York, NY, 65-72. DOI= http://doi.acm.org/10.1145/1368044.1368059 *[Provides some background related to evaluating the ease of access to web platforms on mobile devices.]*