A "Dream" Interface Design

Rachel Rivera

November 25, 2014

Abstract

This investigation purposes a "dream" user interface for touch screen devices.

Contents

1   System Description

Mobile devices are ubiquitous in contemporary society. The latest figures from the United Nations' telecommunications agency estimate that there are around 6.8 billion cell-phone subscriptions in the world [3]. Thus, the investigation and development of usable interfaces for mobile devices is a significant research topic.

Many mobile devices use touchscreen keyboards instead of physical keyboards. This allows for a larger display without increasing the size of the device. Furthermore, touch-screen keyboards have the ability to change their layout based on user input and disappear when not needed. To compensate for the lack of tactile feedback provided by physical keys, touchscreen keyboards often include aural feedback in the form of audible clicks from a speaker. Haptic feedback in the form of device vibrations is often included as well.

Even with these alternate forms of feedback, the literature suggests that insufficient feedback is still a major usability issue with touchscreen mobile devices. [9, 12, 14, 17, 23]. A study by Hussain Tinwala and Scott MacKenzie submits that the lack of physical keys requires heightened visual attention from the user, which diverts the user's concentration from the thoughts being expressed [23]. The lack of physical keys not only diverts the attention of some users, but it also makes the device almost entirely unusable for others. A study from Virginia Polytechnic Institute and State University demonstrates how touch-screen mobile devices do not provide sufficient feedback for Individuals with Blindness or Severe Visual Impairment (IBSVI) as the users are only able to "develop a spatial mental model for the interface or the screen through dead reckoning" [12].

I have designed a "dream" interface for touchscreen mobile devices that aims to tackle some of these usability issues. My design provides a significant amount of tactile feedback that will be helpful for individuals without visual impairments and IBSVI alike.

2   Top-Level Design

3   Usage Scenarios

4   Rationale

5   Usability Metric "Forecast"

References

[1] Apple inc. `http://www.apple.com/accessibility/iphone`. Accessed: 2014-10-08.

[2] Creating applications for android that help change people's lives. `http://code.google.com/p/eyes-free/`. Accessed: 2014-10-08.

[3] Statistics. `http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx`. Accessed: 2014-11-20.

[4] Tactus technology. `http://tactustechnology.com/`. Accessed: 2014-10-08.

[5] Voiceover for os x. `https://www.apple.com/accessibility/osx/voiceover/`. Accessed: 2014-10-08.

[6] Pär-Anders Albinsson and Shumin Zhai. High precision touch screen interaction. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '03, pages 105–112, New York, NY, USA, 2003. ACM.

[7] Xiaojun Bi, Tomer Moscovich, Gonzalo Ramos, Ravin Balakrishnan, and Ken Hinckley. An exploration of pen rolling for pen-based interaction. In *Proceedings of the 21st Annual ACM Symposium on User Interface Software and Technology*, UIST '08, pages 191–200, New York, NY, USA, 2008. ACM.

[8] Matthew N. Bonner, Jeremy T. Brudvik, Gregory D. Abowd, and W. Keith Edwards. No-look notes: Accessible eyes-free multi-touch text entry. In *Proceedings of the 8th International Conference on Pervasive Computing*, Pervasive'10, pages 409–426, Berlin, Heidelberg, 2010. Springer-Verlag.

[9] W. Buxton, R. Foulds, M. Rosen, L. Scadden, and F. Shein. Human interface design and the handicapped user. *SIGCHI Bull.*, 17(4):291–297, April 1986.

[10] Gerald P. Douglas, Zach Landis-Lewis, and Harry Hochheiser. Simplicity and usability: Lessons from a touchscreen electronic medical record system in malawi. *interactions*, 18(6):50–53, November 2011.

[11] Anne Eisenberg. Tackling the limits of touch screens. *The New York Times*, May 2014.

[12] Yasmine N. El-Glaly, Francis Quek, Tonya Smith-Jackson, and Gurjot Dhillon. Touchscreens are not tangible: Fusing tangible interaction with touch glass in readers for the blind. In *Proceedings of the 7th International Conference on Tangible, Embedded and Embodied Interaction*, TEI '13, pages 245–253, New York, NY, USA, 2013. ACM.

[13] Clifton Forlines and Ravin Balakrishnan. Evaluating tactile feedback and direct vs. indirect stylus input in pointing and crossing selection tasks. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '08, pages 1563–1572, New York, NY, USA, 2008. ACM.

[14] Robert Hardy and Enrico Rukzio. Touch & interact: Touch-based interaction of mobile phones with displays. In *Proceedings of the 10th International Conference on Human Computer Interaction with Mobile Devices and Services*, MobileHCI '08, pages 245–254, New York, NY, USA, 2008. ACM.

[15] Shaun K. Kane, Jeffrey P. Bigham, and Jacob O. Wobbrock. 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*, Assets '08, pages 73–80, New York, NY, USA, 2008. ACM.

[16] Shaun K. Kane, Meredith Ringel Morris, Annuska Z. Perkins, Daniel Wigdor, Richard E. Ladner, and Jacob O. Wobbrock. Access overlays: Improving non-visual access to large touch screens for blind users. In *Proceedings of the 24th Annual ACM Symposium on User Interface Software and Technology*, UIST '11, pages 273–282, New York, NY, USA, 2011. ACM.

[17] Shaun K. Kane, Jacob O. Wobbrock, and Richard E. Ladner. Usable gestures for blind people: Understanding preference and performance. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '11, pages 413–422, New York, NY, USA, 2011. ACM.

[18] Seungyon Lee and Shumin Zhai. The performance of touch screen soft buttons. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '09, pages 309–318, New York, NY, USA, 2009. ACM.

[19] Donald A. Norman. *The Design of Everyday Things*. Basic Books, New York, reprint paperback edition, 2002.

[20] Andrew Sears and Ben Shneiderman. High precision touchscreens: Design strategies and comparisons with a mouse. *International Journal of Man-Machine Studies*, 34:593–613, 1991.

[21] Shigeo Shionoya and Hajime Yamamoto. Cathode ray tube. page 17. Plenum Publishing Corporation, 2003.

[22] B. Shneiderman. Touch screens now offer compelling uses. *Software, IEEE*, 8(2):93–94, March 1991.

[23] Hussain Tinwala and I. Scott MacKenzie. Eyes-free text entry with error correction on touchscreen mobile devices. In *Proceedings of the 6th Nordic Conference on Human-Computer Interaction: Extending Boundaries*, NordiCHI '10, pages 511–520, New York, NY, USA, 2010. ACM.