The Future of the Android Operating System for Augmentative and Alternative Communication

Jeff Higginbotham

Center for Excellence in Augmented Communication
Buffalo, NY

Steve Jacobs

Ideal Group, Inc.
Columbus, OH

Abstract

We have experienced one of the most remarkable years in augmentative and alternative communication (AAC). The iPad, along with the iPhone, redefined mobile communications and personal computing technology. In the ensuing 9 months after the iPad's release, more than 50 non-iPad tablets have been developed and demonstrated at the 2011 Consumer Electronics Show and are ready for the consumer market. For the AAC consumer, the proliferation of these mainstream technologies will result in increasingly inexpensive hardware and software, availability of alternative access methods, opportunity to use standard software applications, and availability of applications that meet the specific needs of individual consumers. Because the Android platform is still in its infancy—especially with respect to AAC—we will focus on the potential effects this operating system could have on AAC. We will describe Android, its current offerings, and future possibilities. The emergence of iOS and Android has disrupted the AAC field, transforming the ways that we look at, purchase, and use technology.

Introduction

We have experienced one of the most remarkable years in augmentative and alternative communication (AAC). The iPad, along with the iPhone, redefined mobile communications and personal computing technology. In the ensuing 9 months after the iPad's release, more than 50 non-iPad tablets have been developed and demonstrated at the 2011 Consumer Electronics Show and are ready for the consumer market. The emergence of these competitive technologies is evidence of the current sophistication of portable devices and the worldwide interest in mobile communication and computing platforms. For the AAC consumer, the proliferation of these mainstream technologies will result in increasingly inexpensive hardware and software, availability of alternative access methods, opportunity to use standard software applications, and availability of applications that meet the specific needs of individual consumers. Because the Android platform is still in its infancy—especially with respect to AAC—we will focus on the potential effects this operating system could have on AAC.

Android vs. iOS

Besides Apple, the Android operating system (produced by Google) has the greatest potential to significantly affect the AAC and assistive technology (AT) market. Unveiled in 2007, Android is designed for mobile phone and computing products (Hashimi & Komatineni, 2009). Currently, 8% of mobile phones use this operating system. Approximately 80,000 apps are available for Android-based products (Jacobs, 2010). Android differs from Apple's iOS operating system is several significant ways:

- Android is an open source operating system. Developed and supported by Google, it is free to cell phone and tablet developers to use in their technologies. As a consequence, almost all cell phone manufacturers (e.g., Motorola, Samsung, Qualcomm) and wireless operators (e.g., AT&T, Tmobile, Verizon) offer Android products.
- Google makes Android available to software developers to develop their products. Programmers can also contribute to the Android operating system itself. Small programming communities, like AAC, can contribute accessibility features, like alternative access and haptic feedback to the Android code base. In turn, these features are available to all AAC developers through Google.
- In contrast to Apple's tight control of application development and distribution, Google places few restrictions on Android developers in terms of application functionality or distribution. Without prior approval from Google, they may write software that alters the Android operating system and/or interacts with a wide variety of peripheral devices. Google also does not restrict the distribution or sale of any Android-based software. Developers are welcome to sell it from their respective websites, Google's app store, or any other venue.
- Versions of Google applications like Gmail, Google, Search, and Youtube are optimized for Android use and freely available to consumers.

Although relatively few AAC applications have been developed for the Android compared to iPhone and iPad, current and future AAC development will take advantage of the wide variety of Android smart-phones and tablets.

- Unlike Apple's iOS, which prevents any app from controlling the operating system, Android's open development policy allows developers to build application that control multiple applications. Currently, the Android code base, hosted by Google, contains support for synthesized speech output as well as a variety of alternative access methods.
- Because Android-based technology is relatively inexpensive, consumers may be able to afford multiple devices, addressing different aspects of a consumer's lifestyle (e.g., a tablet for home and work, a phone for going out).
- To support multiple device use, vocabularies can be stored and synced across the Internet. Cloud storage like Dropbox already provides robust, low-to-no cost sync and storage services for all forms of media (documents, audio, video).

Apps and Accessibility

Android-based applications (apps) in AAC and AT are just beginning to appear. These applications and organizations are in the forefront of assistive technology development for Android.

AAC specific apps (http://www.androidzoom.com/android_applications/augmentative%20communication) include

- iAugcom, Alexicom, Voice4U, TapToTalk. These graphic symbol based devices represent a significant portion of the current AAC apps. All support direct selection, but not scanning. While all apps support digitized sound recordings, only Alexicom provides text-to-speech (TTS). iAugcom indicates support for TTS in future releases.
- SpeakIt, Speaking Pad. These apps are examples of text-based TTS apps that allow users to type to produces spoken text.

There is a significant effort in the Android market to ensure that the digital world is accessible. Because of the open-source infrastructure of the Android operating system, these resources could be utilized as part of Android-based AAC devices. Two general AT accessibility-enhancing projects are described here:

- The Digital Living Network Alliance (DNLA, http://dlna.mobi/) and the Zigbee alliance are developing Android-based controls, chips, applications, and standards that allow Android device users access to thousands of current technologies including computers, cameras, digital photo frames, televisions, lighting, mobile gaming, data services and a host of other smart household devices.
- Near Field Communications (http://nfc-Android.org) is an effort that could enable Android-based devices to function like credit cards or physical keys consumers can use to perform financial transactions and/or gain access to offices, hotel rooms, homes, and cars.

Android solution organizations include

- Apps4Android, Inc. (http://apps4android.org), an Android software development company dedicated to developing free-to-the-user and very low-cost, high-quality Android apps that enhance quality-of-life, independence, employability, and educational success of people with disabilities, individuals 65 years of age and over, and consumers who never learned to read. To date, Apps4Android has developed and marketed 19 apps, including talking barcode reader, sms, gps; AAC apps, video magnification and image recognizers; and accessible Internet and e-mail apps. Apps4Android also collaborates with a number of manufacturers and groups to make accessible consumer products. Apps4Android released a series of foundational apps that will allow developers to integrate current and future access methods into Android-powered devices. Apps4Android Home Health Care has released suite tools to monitor, transmit, and display an array of vital signs to a phone, tablet, or netbook or to a remote health care records system (e.g., Google Health) via wireless or cellular network.
- Raising the Floor or RTF (http://raisingthefloor.net), a collaboration of individuals and organizations dedicated to "To help ensure that access to Internet technology and content is available to all, regardless of ability or economic resources" (http://raisingthefloor.net/about/mission). In line with its mission, RTF uses open-source technology standards to develop software and software infrastructure solutions to provide access to all technology.

Challenges for AAC Use

While many of Android's strengths lie in Google's open-source approach to its product, that approach also presents challenges to developers in producing quality apps. A lack of strong programming guidelines has resulted in a proliferation of user interfaces, resulting in inconsistent location and visual identity of application and system icons and control buttons (Savov, 2010). Although a tolerable inconvenience for some, such inconsistencies lack of a standard means of access can create barriers to learning for some individuals. The large variety of Android hardware, while providing much needed device diversity, will require developers to create apps that function with a range of sizes and formats and a variety of other device

features. Although program resources are being developed for alternative access, currently there is no standard repository for developers to use. This situation may affect the degree to which individual apps can effectively interact with one another. For example, if a writing recognition app (that provides input to a speech output device) cannot interact with a DNLA-compliant app that controls the TV or lights, the AAC user will not be able to use the AAC device for both purposes. For a small developer community like AAC's, the diversity of Android hardware and software, in the short run, may significantly impair the developers' ability to distribute high quality AAC software across a majority of hardware and software platforms.

Since the Android tablet market is largely undeveloped, it would be premature for us to make recommendations for specific tablet technologies. Instead, we have developed a set of questions pertinent to the purchase of a mobile technology.

- What is the desired size and shape of the device (e.g., cell phone, paperback book, pad of paper)? Should it fit in a purse or pocket? Will it be mounted on a chair? Size will dictate functionality to a large extent.
- Can the AAC user see all the items (buttons, messages icons) on the device's interface? If the user plans to show someone else the message display, can the display be read from a reasonable distance?
- Is the device responsive to touch? Can the AAC user reliably access the keys? If the user has direct access issues, like tremor or accuracy, does the device have touchscreen and keyboard adaptations that reduce input error to an acceptable level?
- Does the AAC user need multiple devices for different purposes or places (e.g., one for socializing at different locations and one for communicating fixed standard locations like home, school, or work)? If so, can the user maintain synchronized copies of the latest version of his/her vocabulary across devices? Can vocabulary be organized specifically for device size, shape, and intended function (e.g., provide easy access to "shopping talk" on a smartphone).
- Does the AAC user plan to use the Internet or make phone or video calls? Do his/her communication apps require Internet connectivity? If so, the user may want to consider an Internet data plan consistent with his/her budget and communication needs.
- If alternative access is required, the AAC user should consider whether a system's hardware and software configuration supports access needs (e.g., scanning)? If the AAC user intends to use multiple apps, he/she needs to make sure the alternative access method allows for navigatation between apps.
- Does the AAC user need sound or TTS output? If so, is the device loud enough to be used in most daily living contexts (e.g., Can communication partners hear the output in a restaurant)? If not, a set of portable Bluetooth speakers may be required.

Conclusion

In this article, we have tried to describe Android, its current offerings, and future possibilities for AAC. The emergence of iOS and Android are a disruptive force in the AAC field, transforming the ways that we look at, purchase, and use these technologies. We believe there is reason to believe that a year from now the potential of these technologies will be more fully realized, with many more apps and peripherals available in the commercial marketplace. These are exciting times!

References

Hashimi, S. Y., & Komatineni, S. (2009). *Pro Android.* Berkeley, CA: Apress.

Jacobs, J. S. (2010). *The corporate social innovation model: Enabling positive societal change through the distribution and use of accessible ICT products and services* [policy paper]. Office of Disability Employment Policy, U.S. Department of Labor. Retrieved from http://www.apps4android.org/Corporate_Social_Innovation_Whitepaper.doc

Savov, V. (2010). *Visualized: The real Android fragmentation* [Web page]. Retrieved from http://www.engadget.com/2010/12/07/visualized-the-real-android-fragmentation/