Mobile Phones for People with Disabilities

M

Hend S. Al-Khalifa
Southampton University, UK

AbdulMalik S. Al-Salman
King Saud University, Saudi Arabia

INTRODUCTION AND BACKGROUND

Nowadays, the demand for mobile phones by people with special needs is evolving. Disabled people can utilize mobile phones for personal communication, security, social integration, and autonomy. Personal communication is one of the most important reasons that disabled person uses a mobile phone. For example, people with motor disabilities cannot easily reach the wired telephone within a limited period of time when it rings. Security is another reason that most disabled people strive for. In case of emergency, illness, or accident, mobile phones are considered a fast communication channel. Furthermore, to keep in touch with society and to feel autonomous, people with special needs think that the mobile phone is a good medium for social integration and self-independence (Abascal & Civit, 2000).

Enrico and Stephen (2003) stated that mobiles could also be used as an aid to carry out everyday activities, as though they were not disabled—for example, using the mobile phone to remotely instruct PCs, lifts, doors, and ATMs. Abascal and Civit (2000) emphasize Enrico and Stephen's (2003) argument on the use of mobile phones to control other devices by saying "with the emerging Bluetooth standard, a user will be able to use her/his mobile phone controlling it from any other device including not only PDAs and notebooks but also Assistive Technology devices such as communicators and wheelchair controllers" (Abascal & Civit, 2000, p. 264).

Common problems of existing mobile phones arise from small print on mobile phone controls and screens, hard-to-press buttons, complexity of use, no audio battery limit indicator, no caller identification, and no specially designed keys for emergency and easy access to specific functions (Lee, 2003). Another problem is the limitation of some software programs that only work on specific phone brands and operating systems. Also, there is no standardization between mobile phone companies in terms of design and functionality. Furthermore, as stated by Baker and Bellordre (2004), the barriers to access/use of mobile phones can be classified into three factors: awareness and proficiency factors, economic barriers, and incompatible technologies. Therefore, the lack of standardization imposes the proposal of strict rules and regulations for designing accessible telecommunication devices by the Federal Communications Commission (FCC); these rules are called "Telecommunications Act of 1996, Section 255" (Chen, 1999; Telecommunications Act of 1996[1]). The FCC has rules requiring telecommunications manufacturers and service providers to make their products and services accessible to people with disabilities, if readily achievable. These rules implement Section 255 of the Communications Act. Where it is not readily achievable to provide access, Section 255 requires manufacturers and providers to make their devices and services compatible with peripheral devices and specialized customer premises equipment that are commonly used by people with disabilities, if such compatibility is readily achievable.

Finally, many disability-centered organizations worldwide perform regular reviews and tests on the latest mobile phones in the market and publish the result online for free. As an example, *Accessworld,* a publication of AFB (American Foundation for the Blind), is carrying out regular mobile phone reviews and evaluations to test the accessibility and usability of several off-the-shelf cellular telephones and add-on software applications. These reviews can be accessed online at http://www.afb.org/.

TECHNOLOGIES, SERVICES, RESEARCH, AND PROJECTS

Using mobile phones is challenging for the movement impaired and physically challenged, the blind and visually impaired, the elderly and arthritic, and those with any of many immune and neuromuscular disorders. In order to make mobile phone technology accessible for those people, this may require augmentative communication devices with expensive customized hardware and software interfaces to support their interaction with mobile phones. Moreover, there is a need for a standard universal design of cell phones that includes features such as infrared ports, volume range, speakerphones, matrix displays, EZ buttons, voice dialing, and messaging (Bryen, 2004). Also, there are many services and much research currently taking place to bridge the gap of the mobile divide. In this section, we will present the various trends and technologies that are developed to help people with special needs cope with the new stream.

Figure 1. Owasys 22C mobile phone

Figure 2. ALVA MPO

Technologies

Technologies used in mobile phones can be classified into three types: software technologies, which will handle all aspects of integrating software functionality into a mobile phone; hardware technologies, which will focus on the different devices that can be added to a mobile phone to make it more accessible and the variant kinds of newly designed mobile phones devoted for the use by people with special needs; and hybrid technology, which combines both software and hardware into a single device.

Software Technologies

Most mobile phones that operate using the Symbian operating system can easily install third-party software like screen readers and screen magnifiers, which provide further accessibility to mobile phones. On the other hand, off-the-shelf mobile phones have limited speech output capabilities (Burton, 2005). In this subsection, we provide the reader with accessible software applications that work on Symbian-based mobile phones.

SpeechPAK TALKS is a product from ScanSoft[2] Company. It converts the display text of a cellular handset into speech, making the phone accessible for visually impaired people. SpeechPAK TALKS runs on Symbian-powered mobile phones. It speaks to the user either in English, German, or another language. The user can change ring tones for different callers, check who dialed the number, hear spoken voice messages, write and send an e-mail or a fax, and manage PDA functions. A portable Braille display can also be attached.

Mobile Speak[3] is another screen reading software that can be installed on a mobile phone. It is available in many languages including Arabic.

Talks[4] is also a screen reader for mobile phones. It supports Arabic and English languages. A trial version of this software is available through the Internet.

Mobile Magnifier[5] is language-independent software that enlarges and enhances all items of the mobile phone display. It provides six different color schemes (from black and white up to 4096 colors). Mobile Magnifier automatically detects and magnifies the area of interest as the user navigates through the phone's user interface. It supports a range of mobile phone brands like Nokia and Siemens.

The vOICe MIDlet for Mobile Camera Phones[6] is seeing-with-sound technology for the totally blind. It is available for most camera phones and PDAs. The vOICe MIDlet software runs on both Symbian and non-Symbian devices, and it is free of charge and can be downloaded from the Internet.

Mobile Color Recognizer (MCR)[7] is software that was developed to work with Mobile Speak and Mobile Accessibility. It can be installed in camera phones that are Symbian complaint. MCR can be used to determine the color (or different colors) of an object by taking its picture. MCR also can be used to know the level of light.

Hardware Technologies

Many major telecommunication players in the market have a department devoted to accessibility research. Nokia, Sony Ericsson, and Samsung, to name just a few, are all working on making their products more accessible for various types of disabilities. In this subsection, we provide the reader with accessible hardware technologies that can be used as a replacement/companion to a mobile phone and are tailored to the needs of a person with a disability (i.e., blindness, deafness, or motion impairments).

Owasys 22C phone[8] (Figure 1) is a cell phone that is designed specifically for blind and partially sighted people. The phone does not include a visual display; instead it uses speech synthesis technology to read everything that would normally appear on the screen. It has an ergonomic design with tactile keys. It also has a dedicated key to access the phonebook and an information key that verbalizes the user position within the phone's menu system. It gives audio feedback from the press of a button.

ALVA MPO[9] (Figure 2) is a Braille-based mobile phone. Besides making calls using the phone, it also has many integrated functionalities like a text-to-speech engine, organizer, and note-taker.

Mobile Screen Magnifier[10] (Figure 3) is a piece of a magnifier lens that is placed on top of a mobile display to magnify the text displayed on the screen up to 100%.

Voice activation/recognition is built into most mobile phones. A blind person can activate the mobile phone by dictating commands. Yet, a major disadvantage of this