ABSTRACT

As smart phones appeared with their elegant, easy and exciting touch functionality, the use of touch screen devices has been spreading very fast. Beside the previous advantages, smart phones addresses some new challenges for people with disabilities. Most of visually impaired people don't prefer using touch-screen devices, as these lack the tactile feedback and are visually demanding. However, there have been some solutions to come over these problems, but they were not enough. Some of these solutions is to connect a special equipment to a smart phone to allow the visually impaired user to enter the required input. Other applications help visually impaired people to use the smart phones and read whatever on the screen by hovering their finger tips on the text. Visually impaired people who use smart phones have to memorize QWERTY keyboard which have a large number of targets with small locations specified for each target which will lead to a high proportion of error occurrence. In this paper, the authors propose ABTKA- Arabic Braille Touch Keyboard for Android Users. This application is the first application for Arabic language that uses Braille language for visually impaired who are using smart phones or intended to do so. ABTKA facilitates text-entry functionality by supporting Braille writing on touch screens. The used approach in the proposed system can be easily adapted to other languages. The main advantages of the used approach are that it does not need any extra equipment to be connected to the smart phone; it is dynamic (no fixed positions for the touch points), simple to use, one entry for each character, supported by voice and respond promptly to the input. ABTKA involves various algorithms to achieve its objectives. It starts with entering the user standard locations of finger tips, then the user can enter any Braille character which has to be reindexed to be in the same order of Perkins Brailler's buttons. Any inserted character is converted to Arabic character. Any converted character will have a voice feedback. Words and full sentences will also have voice feedback. ABTKA has been tested by various visually impaired people and proved that it is easy to learn and simple to use.

Keywords: Arabic Braille, Smart Phone, Text-Entry, Touch-Screen, Visually Impaired

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INTRODUCTION

Smart phones have become an important part of our life. These are not just communication devices, yet, they now allow us to store and manage important data, like contacts and personal notes. This requires appropriate input method to input data. However, this task is visually demanding both considering the keypad layout and the screen output. This made it inconsistent with blind user’s capabilities because such tasks need a high visual and cognitive load. As a consequence, many visually impaired users can’t use a smart phone even for simple tasks like making or receiving a call. The worst could be writing an SMS or a text. There is no specific information available about inputs (letters, numbers or special characters) or any of the inputs displacement on the keypad. Screen readers partially deal with this problem by reading the information on the screen. However, the feedback offered is restricted to the output as no information is obtained on input displacement. This approach forces the user to try to find the desired letter committing several errors in the process, possibly leading to situations where the user simply quits trying.

Smooth surface of mobile devices brought up the challenges of difficult access for the blind. In phones with Physical buttons, users feel the buttons and over time they will learn buttons’ locations and later they will be able to interact with devices without looking. The touch screen mobile phones create more difficulty for visually impaired people due to none existence of the physical buttons. This fact greatly increases the demand of vision in order to run this kind of mobile.

The device feedbacks tell the users if their action was sensed, and also whether their entered text was accurate. Sighted people simply look at the device and get the feedback, but blind and visually impaired people can only get sensory feedback through their hearing and tactile sense.

Blind people, who are using technologies that support touch based technologies, are having difficulties to memorize the locations of all letters, numbers and special characters. In addition to that, smart phones are having variant sizes, which means that the touch keyboard layout differ from one smart phone to another. This again will make it more difficult for visually impaired people. In fact, small keyboard layout is difficult to use even for normal people.

Other problems, smart phones have small size of buttons and each button is about 0.2 inches, where the size of a normal finger tip is about 0.3-0.4. This means that a finger can cover two or three buttons, and this requires higher accuracy and results in lower speed. Also there is no feedback to tell the users if their action was sensed except through text to speech and many android phones do not support Arabic text to speech (Ghodosi et al. 2011).

Braille language is a language meant for visually impaired people to help them to read and write. It is usually written with embossed paper. Each character is represented in 6 dots arranged in a rectangular. Each dot is called a cell. The number of the used cells and their positions differ from one character to another. Figure 1 shows some English characters written in Braille language.

Arabic language consists of 28 letters, these letters are used to write words and sentences, punctuation marks are also used. Arabic
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