

Dedicated Graphical User Interface System for the Visually Impaired Users in Learning Al-Quran

F. Razaly, N.H. Ajizan, S. Mad Saad, M.S. Yaacob, M.Z. Md Zain, M. Hussein, M.Y. Abdullah and A.R. Musa
Department of Applied Mechanics, Faculty of Mechanical Engineering,
Universiti Teknologi Malaysia,
81300 UTM Skudai,
Johor, MALAYSIA
faizahrazaly@yahoo.com.my, shafiek@fkm.utm.my

Abstract: – This study presents a method to enable the Muslim’s blind user to read the Al-Quran using Braille Display with software help. The software reads the database which contains all verses of Al-Quran and user will need to select the verse and ayah to read. The data will be transmitted to the Braille Display for blind people to touch and read the display. A user friendly Graphical User Interface (GUI) will be used to fulfill the ergonomics for the visually impaired user’s physical capabilities. Several approaches are used to design and implement interface for blind users like speech or sound output and Braille display. The Braille codes can be displayed using the Braille panel. The design interface system for the visually impaired users in learning Al_Quran is presented.

Key-words: - Visually Impaired People, Graphical User Interface (GUI), Screen Reader

1 Introduction

Graphical user interface (GUI) is one of the user interfaces that facilitate user to interact with the programs or application in many ways. Besides that, GUI represents the information and actions available in the application for the user. The main objectives of the GUI are to enhance the efficiency of the application, to make the user contented and comfortable while using it, and to meet usability specifications [1]. The GUI developer needs to fulfill these objectives and analyze the group target of users that will use the application software. The GUI developed and discussed in this paper is targeted for the visually impaired users. They will be using this application software together with a specially designed electronic Braille panel that will serve as a tactile display of the screen monitor. It is crucial that we consider the ergonomics and limitations of the visually impaired users on accessing the computer and the Braille panel simultaneously. This paper presents a discussion on a dedicated GUI for the visually impaired users in learning the verses from Al-Quran.

The use of the paper embossed Al-Quran Braille presents many great challenges even though it provides those who are visually impaired to read the Al-Quran in their own way. A complete set of the paper embossed Al-Quran Braille has a vast amount of characters which

caused it to be too thick and need to be printed in several volumes. These factors bring difficulties and limitations to the teaching and learning sessions. In addition, the paper embossed Braille dots can easily wear out after repeated use and this causes difficulties in identifying Braille characters. Besides that, the teaching sessions took place in a slow pace as the teachers needed to focus on each student individually in identifying Braille characters.

In order to overcome these problems, a dedicated Electronic Braille Al-Quran Software (eBraille) is developed. It is to facilitate the visually impaired to read the Quran easily without using the existing paper embossed Braille AL-Quran. The eBraille system should be used together with the Braille Panel provided with this software. The Braille Panel is designed such that it can be used in clusters or standalone. The main advantages of this system are that no screen reader is needed and the accessibility features are built inside the application.

2 GUI Issues

Practically it is unfeasible for visually impaired people to use any applications if the GUI design is not dedicated for them. For example, a specially designed GUI was developed for people with severely impaired vision in mathematics class [2]. Visually impaired people need a screen reader to indicate every character they type but only textual components in the application can be read by the screen reader [7]. Therefore, the eBraille system was developed by taking into account the limitation faced by the visually impaired people and the appropriate method to facilitate them in using this software. The interface information must be structured to enable blind users to manipulate the interface efficiently and it must have similar advantages enjoyed by the sighted users.

In developing the GUI for the visually impaired people, it is imperative to understand how information is represented in Braille system. Braille is a technique to enable blind and visually impaired to read and write. It is a series of raised dots that can be read with finger by people who are blind and incapable to read printed material [3]. Braille symbols are not a language but it is a code. Braille symbols are formed within units of space known as Braille cell. A full Braille cell consists of six raised dots arranged in two parallel columns each having three dots. The dot position being universally numbered one through three from top to bottom on the left and four through six from top to bottom on the right [4]. Fig. 1 represents Braille dot positions. Sixty-four permutations are possible for each Braille cell by altering the presence of the six dots [6]. A single cell can be used to represent an alphabet letter, number, punctuation mark or any type of character. In this system, the keyboard keys that represent the dots are f as dot one, d as dot two, s as dot three, j as dot four, k as dot five and l as dot six. The SDFJKL keys are chosen because there are tiny notches at the F and J key on the keyboard. The tiny notches are the reference for the user to place their index finger for both hands at the F and J key without need to look at the keyboard. Other fingers are put respectively which the third finger on left hand at S key and third finger of right hand at L key.

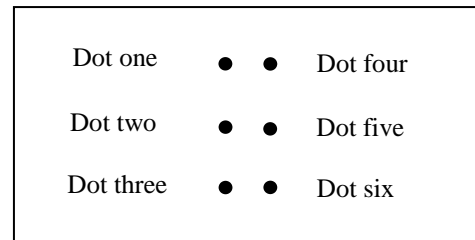


Fig. 1: Braille dot position

There are a few software applications in the market which are specially developed for the visually impaired users like Duxbury and WinBraille. Unfortunately, the main focus of these applications is for typing Braille documents and they need to be used together with screen reader software to help the visually impaired users. The users are able to type Braille codes using the keyboard and these applications can also translate normal text into the Braille code.

By introducing and building this proposed software, many visually impaired Muslims will be able to learn and recite Al-Quran easily without the need to have the printed Braille Al-Quran. There are some issues need to be resolved in developing the GUI for this application. These issues are:

- What module will be developed for this application
- Would the menu will be displayed in Braille or voice or combine display of Braille and voice.
- What will be the name of the menu to be displayed
- What shortcut key will be used for the menu
- What keys on the keyboard to be used for the Braille codes
- How to display the list of option of the Al-Quran verse
- How to display chosen verse of Al-Quran

The proposed components for this application are menu, list box, edit box, button and window. It is useful to create dual interface, used by both visually impaired and sighted users.

3 Software Proposed Design

The eBraille software is developed to help visually impaired Muslims in learning and reciting the Al-Quran in a simpler and more effective way. This software is divided into two modules which are teaching module and reciting Al-Quran module. The selection of modules can be made by pressing the up and down keys. In the teaching module, user can use the real time mode in which the instructor can type the Arabic character or the kalimah and the data will be transmitted directly to the Braille Panel. Alternatively, the instructor can prepare the document for teaching before the class and save the document. The instructor only needs to open the document while they are in the class through the Teaching Module in eBraille software.

The available menu in teaching module is open, save and create new document. Menu can also be selected using a shortcut key. The shortcut keys for menu are Ctrl+S (Save), Ctrl+O (Open) and Ctrl+N (New). We designed the eBraille software with user friendly interface that can be easily accessed by visually impaired and sighted people. This software is developed with minimal use of buttons to facilitate the user.

In reciting Al-Quran module, user only needs to press the up and down key buttons to make selection of the verse of Al-Quran and ayah. Every chosen button will produce a sound when pressed in order for the visually impaired user to identify their choices. They need to press the Enter button once they have found the verse or ayah that they want to read.

In the reciting Al-Quran module, the list of Al-Quran verse will be loaded into a list box as in Fig. 2. This method is used to facilitate the visually impaired user to make selection. User only needs to press left arrow key button or right arrow key buttons to move the highlighted selection up or down. Every key press will produce a sound to indicate the highlighted selection. Once they have found the verse or ayah that they want to read, user needs to press enter button and the software will display on the computer screen the selected ayah simultaneously with the display on the Braille Panel. The sound of the selected ayah will also be played.



Fig. 2: Menu for Reciting Al-Quran Module

The selected ayah from the Al-Quran verse will be displayed in the screen as shown in Fig. 3. However, the Braille Panel limits the characters to be displayed up to 36 characters only. For the ayah that contains more than 36 characters, the ayah will be split to several lines and every line cannot exceed more than 36 characters. To move to the next line, user needs to press right arrow key button and press left arrow key button to move backward. The current line that is displayed in the Braille Panel will be highlighted on the screen computer.

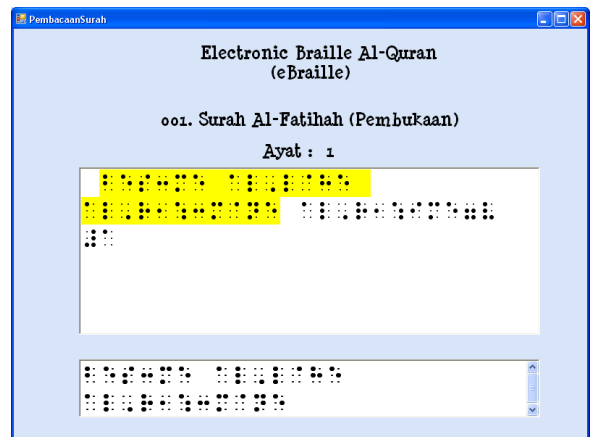


Fig. 3: Reciting Al-Quran Screen

4 Sound Help for User

As we review the Braille software available in the market like Duxbury and WinBraille, the software house only provide and develop a software that facilitate visually impaired user to type document. Furthermore, users need to install third party software for screen reader to make them recognize the texts that appear in the screen easily [5]. If there is no screen reader installed in the computer, the software will be meaningless for them as they will not know what they are typing [8]. With this eBraille software, every menu that the used select produces sound to indicate the menu. This function will facilitate the visually impaired user as they do not need to purchase the third party software to enable them to use this software properly.

5 Feedback from Users

The proposed eBraille software differs from the paper embossed Al-Quran Braille. According to the visually impaired users that had been used the eBraille software prototype, they are satisfied with the flow and process of the software. This eBraille make them easy to learn and recite Al-Quran. Every buttons and menus in the eBraille software are embedded with sound to indicate the buttons and menus. This approach make user easy to know their selection as we know their limitations as visually impaired user. Besides that, sound that used by the software to indicate every menus and selection are clear and understandable by the users. The minimal used of buttons and a very user friendly GUI is suitable not only for visually impaired users but also for the sighted users.

6 Conclusion

We can conclude from this study that the dedicated GUI for learning Al-Quran can help visually impaired users to learn Al-Quran in an easier way. Furthermore, the eBraille software developed had considered all the limitations and capabilities of those users to make them feel comfortable to use the software and make full use of all features available in the application. The user friendly GUI and the minimal used of buttons in the eBraille

software make it easy to handle by the visually impaired users with their abilities.

7 Acknowledgement

Electronic Braille Al-Quran (eBraille) is a project funded by MOSTI (Ministry Of Science, Technology and Inovation) for the period 2009 – 2011. It is organized by iCA (Intelligent Control and Automation), Faculty of Mechanical, Universiti Teknologi Malaysia.

References:

- [1] Ian Sommerville, *Software Engineering Seventh Edition*, Addison Wesley 2004.
- [2] Sribunruangrit, N., C. Marque, C. Lenay, and O. Gapenne, 'Graphic-User-Interface System for People with Severely Impaired Vision in Mathematics Class,' in *Proc. 26th Annual Int'l Conf. of the IEEE-EMBS*, San Francisco, USA, 2004, pp. 5145-5148.
- [3] What is Braille? – American Foundation for the Blind
<http://www.afb.org/Section.asp?SectionID=6&ToPicID=199>
- [4] What is Braille? -
<http://www.brailleenterprises.com/whatis.htm>
- [5] Paul Blenkhom & Gareth Evans, 'Architecture and requirements for a Windows screen reader', *Institution of Electrical Engineers*, 2000
- [6] Ramiro Velázquez, Enrique Preza and Hermes Hernández, 'Making eBooks Accessible to Blind Braille Readers', in *IEEE International Workshop on Haptic Audio Visual Environments and their Applications*, Ottawa, Canada, 2008, pp. 25 – 29.
- [7] Bigham, J.P., Prince, C.M. & Ladner, R.E., 'Addressing Performance and Security in a Screen Reading Web Application that Enables Accessibility Anywhere', in *Eighth International Conference on Web Engineering*, 2008, pp. 273-284.
- [8] Tomaž Šef and Matjaž Gams, 'SoundHint System For Blind and Partially Sightless People', in *Proc. ICECS 1999, the 6th IEEE International Conference on Electronics, Circuits and Systems*, pp. 1577-1580.