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Read for me: developing a mobile based application for both visually impaired and illiterate users to tackle reading challenge

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Abstract: In recent years, there have been several attempts to help visually impaired and illiterate people to overcome their reading limitations through developing different applications. However, most of these applications are based on physical button interaction and avoid the use of touchscreen devices. This research mainly aims to find a solution that helps both visually impaired and illiterate people to read texts present in their surroundings through a touchscreen-based application. The study also attempts to discover the possibility of building one application that could be used by both type of users and find out whether they would use it in the same efficiency. Therefore, a requirements elicitation study was conducted to identify the users' requirements and their preferences and so build an interactive interface for both visually impaired and illiterate users. The study resulted in several design considerations, such as using voice instructions, focusing on verbal feedback, and eliminating buttons. Then, the reader mobile application was designed and built based on these design preferences. Finally, an evaluation study was conducted to measure the usability of the developed application. The results revealed that both sight impaired and illiterate users could benefit from the same mobile application, as they were satisfied with using it and found it efficient and effective. However, the measures from the evaluation sessions also reported that illiterate users had used the develop app more efficiently and effectively. Moreover, they were more satisfied, especially with the application's ease of use.

1 Introduction

Worldwide, there are still over 750 illiterate adults [1] and more than 300 million people who are blind or have moderate-to-severe visual impairment [2]. These people are facing daily challenges to do basic tasks, such as recognizing objects, navigating places, and reading texts that can be found in books, street signs, restaurant menus, and grocery products. However, the advancements in technology, especially the revolution of mobile devices and their applications, play a huge role in tackling some of these problems and can enhance the way these groups of people communicate with society and the world. For example, with mobile-based applications, visually impaired and illiterate people can make phone calls, receive and send messages, play games [3], and learn from mobile-based applications (apps) [4]. This confirms that people who have a visual handicap or are illiterate could use modern technology more efficiently by utilizing a variety of applications. They could also benefit from smartphones' advanced functions rather than only making phone calls and sending text messages.

As a result, several researchers were encouraged to adapt different technologies and develop information and communication technology (ICT)-based applications that help visually impaired and illiterate people to overcome their reading limitations. For example [5], presented Raspberry Pi and a camera system to help Bangla-speaking people to read documents, whereas [11] proposed a system built from Raspberry Pi, the phone's camera, a push switch, and earphones to help blind people to read text in their surroundings, and finally [8], developed a software application to help illiterate and visually impaired people to fill in banking forms without assistance using optical character recognition (OCR) technology and a speech interface.

Obviously, most of these studies avoid using smartphones when building a system for the blind in particular because of the difficulties that blind people face while

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