AraMedReader: An Arabic Medicine Identifier Using Barcodes

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Abstract. AraMedScanner is a prototype application that mainly helps the visually impaired to identify medicines by scanning their barcode and retrieving their information from a medical database. This paper presents an overview of AraMedScanner's features and shows preliminary evaluations conducted with blind people. The results of the evaluations revealed the application limitations and leaded to new future improvements.

Keywords: Medicine Identification, Barcode, Mobile computing, Assistive Technology, Visually Impaired.

1 Introduction

Nearly one million people in Saudi Arabia have visual impairment [1]. Visually impaired people confront a lot of difficulties in their daily life including the challenge in identifying medicines and reading their facts. As the process of medicines use is often considered a daily task, blind people always find it difficult to continually ask for sighted people help [2].

Various technologies (such as smartphone, phone line system, RFID and barcode scanners) have been utilized in order to help blind people and to get deeper understanding of their needs. All the developed systems aimed to assist blind people in different aspects of their life like: shopping, object recognition, face recognition, etc.

Still, there exist systems with new technologies that have not reached the level of delivering all their needs, either due to the requirement of special hardware and external devices or as a result of their high costs, e.g. barcode scanner devices.

Nowadays, with the growing trend of ubiquitous technologies; mobile devices are being considered a useful tool to support daily life needs. Many applications have been developed to facilitate daily life activities. But still the wide spread of these applications is not enough; since it rarely target blind people as the main users.

Our suggested solution is a smartphone application that aims to assist Arabic speaking blind and visually impaired people to identify medicines by scanning their barcode, get the medicines' information and manage their schedule.

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In this paper, we present a prototype application that mainly gives blind people the ability to scan medicines' barcode and retrieve their information from a medical database. As well, the paper shows the results of two preliminary evaluations carried out on blind people and the concluded suggestions and improvements to our application.

2 Related Work

Many systems and applications have been developed in order to get better understanding of visually impaired people needs. Technologies used in these systems vary from one to another and the systems differ in their use and purpose.

Many of the systems were concerned about shopping accessibility. Trinetra is an example of using an external device (barcode scanner) to help blind people in identifying products [3]. BlindShopping is another example of an application that is dedicated to help blind people navigate and identify products independently using RFID for navigation and QR code or Barcode through the smartphone camera for identifying products [4]. A similar smartphone application is an application that enables visually impaired users to find and read products barcode in real-time. The find and read process of the application passes two levels, the determination of barcode position and identification of the barcode and the retrieving of the corresponding product information from the database [5].

Another technology used in shopping accessibility is ShelfScanner, a real-time detection system of products in shelf store. This application depends on GroZi-120 dataset as products reference. The dataset is an available set of 120 grocery products that have been captured in different conditions [6].

For object identification, an application developed, based on Speeded Up Robust Features (SURF), which is a detector and descriptor algorithm that accelerates the interest point localization process, which maintains images' properties. The application helps blind people to find missing personal items through wearable camera connected to a computer [7].

In the medical field, an existing system in Hungary has been built and called Medicine Line system, which helps visually impaired people to reach medicines information easily through their mobile phones. The system consists of a speech recognizer for medicines' names, database and Speech Synthesizer [8]. Another system in the medical field, which is closest to our proposed system, is a system to help visually impaired people identify medicines based on their box visual features such as shape, color, etc. The experiment of this system was done on Windows OS using static webcam. Detection process passed the SURF features and in order to reduce processing time the Oveated model proposed by Gomes has been used [9].

As shown previously, the existing systems aimed to assist blind people in different ways and in different aspects of life. Yet, no portable system is found that is dedicated for identifying medicines in real-time and present their facts in an accurate way. And most importantly, no system was found that supports Arabic language. Our solution, unlike existing systems, is a portable smartphone application mainly targeting Arabic Speaking blind and visually impaired people. Developed to assist blind people to

know exactly which medicine box they are holding, what its facts and give them the ability to add furthermore information as needed. In addition, blind users will have the ability to manage the medicine they currently take and set reminders.

3 Proposed System

The proposed system is a prototype Android application developed to help blind people identify medicines through barcode tags that are placed on medicines' boxes.

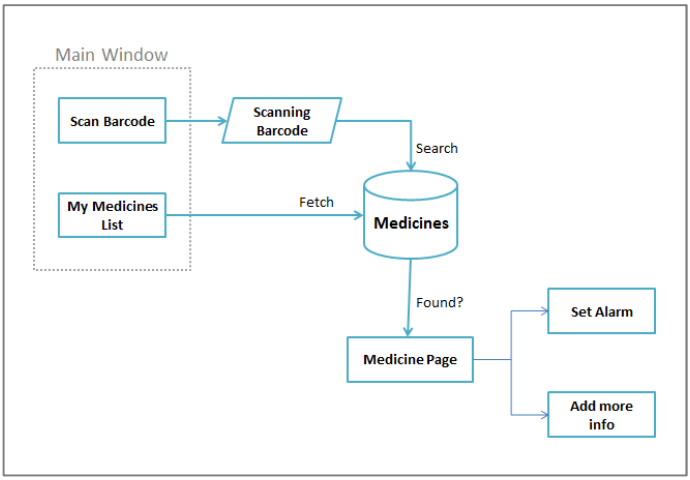

Fig. 1. Application Architecture

All the application's controls are accessible through Android screen reader, thus whenever the blind user presses on a control in the application it will be read by the screen reader. In some cases, like the instructions, the application fires an accessibility event that makes the TTS (Text-To-Speech) feature reads a specific sentence.

As shown in figure 1, the application starts with two options in the main window. First is the scanning of medicines' barcode option, which access device's camera to give the blind user the ability to scan the medicines barcode in real-time. The function starts with two instructions to the user: (1) "Try to point the camera correctly to the barcode tag" and (2) "Put a distance between the camera and the medicine box". When the barcode is detected, the medicine's information will be obtained, only if it exists in the application's medicine database. The database of medicines is obtained from the Saudi Food and Drugs Authority website, which includes all registered medicines' list in Saudi Arabia market [11]. The scanner feature in the application is built from Scandit [10], a barcode scanner API that accesses device's camera and starts real-time barcode detection.

The second option in the application is to display a list of medicines that the user currently takes. Moreover, if the medicine is on the user's list; the user will have the ability to set an alarm for the medicine and add further information about it.

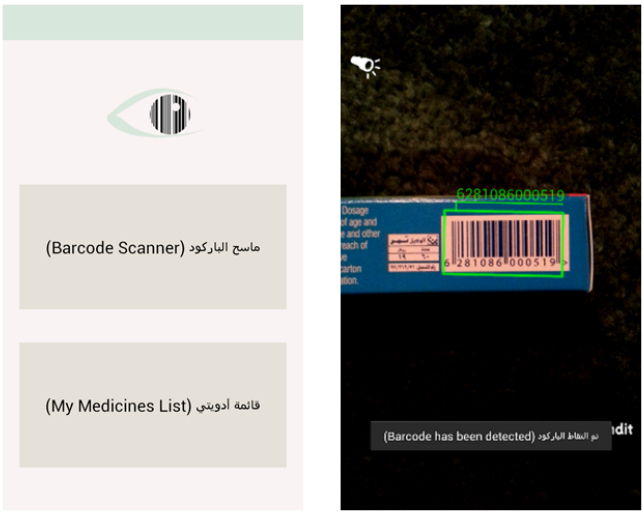

Fig. 1. AraMedReader main window (left) and scan barcode function (right)

The application is tested on Galaxy S3 mobile phone and for accessibility feature, TalkBack; a pre-installed screen reader service provided by Android has been used. However, since the screen reader depends on the default TTS engine of android which does not support the Arabic language directly; we have manually installed Vocalizer, another TTS engine. Vocalizer is a commercial TTS engine with high quality speech synthesizer that supports Arabic language, the Arabic voices packages have been downloaded from Vocalizer website [12].

4 Preliminary Evaluation

A visit to a blind organization has been conducted, and two blind people were chosen to perform the first evaluation of this application. They were asked to perform the following tasks: Scan Medicine's barcode, Add medicines to 'My Medicines List' and Set an alarm for the added medicines.

Both blind users have struggled in the first task, faced difficulties in pointing the camera correctly in order to detect the barcode. We found out that while the user is trying to point the camera she cannot determine whether the barcode has been detected or not yet, as there is no cues to indicate barcode's position. As a solution for the problem, we suggest to include an audio sound that starts playing once the user starts scanning the barcode, and stops once the barcode is detected.

After adding the suggested modifications to the application, another evaluation session has been carried out with a third blind user. A group of medicines boxes have been picked randomly from the user's medicines, three out of ten boxes only found containing barcode tags; this means not all medicines in the Saudi market contain barcode tags.

As a starter task, the blind user was asked to scan the barcode of the three boxes. In this evaluation session we tried to provide some verbal hints to the blind user regarding the preferable distance that should be between the camera and the box and where the barcode is likely found.

The results were as the follows: the first box took two minutes from the blind user to scan the barcode, the second box took five minutes and the third one took eight minutes. The difficulty in pointing the camera depends on barcode's position in the box, as it has no standard position for it.

The blind also was asked to perform other tasks such as opening the medicines list and setting the alarm, but she was confused and was not sure how to perform them.

From the previous evaluation and based on our observations we can find some limitation of our system. First, as was previously mentioned, not all the medicines boxes found in the market have a barcode tag; which means as long as the blind user cannot know if the box has barcode or not the application will be useless. Second, the problem of pointing the camera correctly to the barcode, which is considered one of the most known obstacles that blind people face in order to use the camera [13]. This issue was studied as part of a qualitative study to support blind people take pictures using mobile applications. The survey indicated that the most common problems with general photography-related activities are the problems of aiming, focusing and positioning and framing while taking a photo [13].

Therefore, the limitations of our application are not new and considered one of the common problems in blind people technologies. However, the application still in progress and there will be a next version that holds modifications to simplify the application to blind people and make it more accessible. The suggested solution that solves the problem of finding the barcode tag and solve the fact that not all Saudi medicines boxes contain barcode tag, is to use another technology beside barcode scanning like augmented reality and object recognition.

5 Conclusion and Future Work

This paper is an attempt to develop a smartphone application that helps the Arabic Speaking blind people identify medicines through their barcode tags. The barcode detection feature is built based on Scandit, a real-time barcode detection APIs. The prototype application offered a medicine's barcode scanner; a display of the list of medicines that the blind currently takes and a medicine's reminder function. In order to evaluate the prototype and determine the application's accessibility and the usefulness of its features, two preliminary evaluations have been conducted. The first evaluation obtained results that leaded to the suggestion of new improvement of the application. The second evaluation revealed the application major limitations. Firstly, as the result showed, not all medicine boxes in Saudi Arabia contain barcode tags. Secondly, as there is no standardized position for the barcode tag in the boxes; the blind takes a long time before reaching the barcode position correctly. Thirdly, blind people were confused during navigating the application.

However, the application still in progress; thus, as a future work there will be a next version of the application that holds new improvements that simplify the application for blind people. And as a solution for the boxes that misses barcode tags, augmented reality and object recognition will be used alongside with barcode detection. Finally, the beta version of the application is available for download from [14].

References

1. Al-Hamid, N.: Nearly 1 million in KSA are visually impaired" Arab News, http://www.arabnews.com/news/463054 (accessed: September 30, 2013)
2. Erin, B., Meredith, R.M., Yu, Z., Samuel, W., Jeffrey, P.B.: Visual challenges in the everyday lives of blind people. In: CHI 2013 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, pp. 2117–2126 (2013)
3. Lanigan, P.E., Paulos, A.M., Williams, A.W., Rossi, D., Narasimhan, P.: Trinetra: Assistive Technologies for Grocery Shopping for the Blind. In: 2006 10th IEEE International Symposium on Wearable Computers, Montreux, pp. 147–148 (2006)
4. López-de-Ipiña, D., Lorido, T., López, U.: BlindShopping: Enabling Accessible Shopping forVisually Impaired People through Mobile Technologies. In: The 9th International Conference on Smart Homes and Health Telematics, Montreal, Canada, pp. 266–270 (2011)
5. Tekin, E., Coughlan, J.M.: A Mobile Phone Application Enabling Visually Impaired Users to Find and Read Product Barcodes. In: Miesenberger, K., Klaus, J., Zagler, W., Karshmer, A. (eds.) ICCHP 2010, Part II. LNCS, vol. 6180, pp. 290–295. Springer, Heidelberg (2010)
6. Winlock, T., Christiansen, E., Belongie, S.: Toward real-time grocery detection for the visually impaired. In: The Computer Vision Applications for the Visually Impaired Workshop (CVAVI), San Francisco (2010)
7. Chincha, R., Tian, Y.: Finding objects for blind people based on SURF features. In: BIBM Workshops: IEEE, pp. 526–527 (2011)
8. Németh, G., Olaszy, G., Bartalis, M., Kiss, G., Zainkó, C., Mihajlik, P., Haraszti, C.: Automated Drug Information System for Aged and Visually Impaired Persons. In: Miesenberger, K., Klaus, J., Zagler, W.L., Karshmer, A.I. (eds.) ICCHP 2008. LNCS, vol. 5105, pp. 238–241. Springer, Heidelberg (2008)
9. Benjamim, X.C., Gomes, R.B., Burlamaqui, A.M.F., Gonçalves, L.M.G.: Visual identification of medicine boxes using features matching. Paper presented at the meeting of the VECIMS (2012)
10. Barcode Scanner Scandit SDK, https://ssl.scandit.com/account/sdk (accessed: September 29, 2013)
11. Saudi Food and Drug Authority, http://www.sfda.gov.sa/ar/Pages/default.aspx (accessed: October 10, 2013)
12. Vocalizer for NVDA, https://vocalizer-nvda.com/ (accessed: January 24, 2014)
13. Dustin, A., Lourdes, M., Sri, K.: A Qualitative Study to Support a Blind Photography Mobile Application. In: Proceedings of the 6th International Conference on PErvasive Technologies Related to Assistive Environments, PETRA 2013, Rhodes Island, Greece (2013)
14. AraMdScanner, https://play.google.com/store/apps/details?id=com.med.reader