IRACST – International Journal of Computer Networks and Wireless Communications (IJCNWC), ISSN: 2250-3501
Vol.5, No.1, February 2015

Applying Android Program in Helping Blind People Using Ultra-Sonic Sensors

Mohammad Shkoukani
Software Engineering Department
Applied Science University
Amman, Jordan
m.shkokani@asu.edu.jo

Abstract **Blind people often rely on others in their moving every day. This paper aims to describe and develop a prototype application in order to help people with special needs such as blind people to walk and travel more independently and safely in their environment, and helping them to know the right paths. This application will be done by using an Ultra-Sonic sensor connected to an Arduino board. The application and its interfaces will be programmed using Android programming language and Quick-basic. The sensor senses the object according to a specific distance ranging from 0 to 255 inches which is equivalent to (0 to 6.4 m). It will start reading from 11 inches in our prototype system. When the sensor senses an object it will produce a voice sound specifying that object's location according to the standing blind user, the sensor also produces a beeping sound as the user goes closer to that recognized object.**
Furthermore the application will consist of "MYMAP" application technology that helps users by informing them about their location.

Keywords-Blind People; Ultra-Sonic Sensors; Arduino

I. INTRODUCTION

Many blind people face some difficulties in finding their way, or sometimes they get hit by some objects from the surrounding environment [1, 2].
They can have difficulty interacting with their environment. Because it can become hard to recognize where one is, to move from one place to another, transit can become restricted, leading to having little contact with the surrounding world, it is also very difficult to locate items and objects. While other senses can be enhanced, this can be offset by a tendency toward over-protection [3, 4].

Many applications and approaches have been identified such as: The vOICe which is an android application that provides blind people with information about their environment, this application depends on translating images in the environment into sound by taking snapshots of objects using a camera and then translates these snapshots into sound. This application can also help the blind people to know where they are by telling them the street names and the intersection using GPS [5].

VizWiz is another application that helps blind people to locate objects in their environment, this application merge remotely human worker with computer vision. It consists of three components which are IPhone application that is used to take pictures for the items and objects then these pictures are sent to the second component which is a remote server that ask the human workers to describe the pictures that have been sent to them, finally the third component is an interface built in the IPhone application received the audio from the remote server and provide it to the blind users which can help them to locate their objects and items [6].

The final application is LookTel which uses the smart phones camera to provide blind people with information about any object in front of it, this application works as taking picture of any object using the camera then send the picture to

will be made between the picture which has been sent to the

the information about the picture is sent back to the smart phone [7].

Because of the importance of this subject we thought to develop a mobile application that is suitable for the blind people in order to help them to move and locate their location easily and safely, our application consists of an Ultra-Sonic sensor connected to an Arduino board, and to a smart phone. The sensor will send a frequency of 5 volte to the Arduino board when it faces an object, then when the Arduino board

file on the desktop client application, after that the result will be transformed the smart phone over Bluetooth.

Finally the Android application will read that result and perform the appropriate operations depending on the readings results. As the blind user walks in the environment the application will keep sending him the readings for distances between him and surrounding objects, but when the user gets too close to some kind of objects the application produce a beeping sound alarm, to warn him that he is probably going to get hit by that object.

inform the blind user about his location to help him recognize his place and never get lost.

II. SYSTEM ANALYSIS AND DESIGN

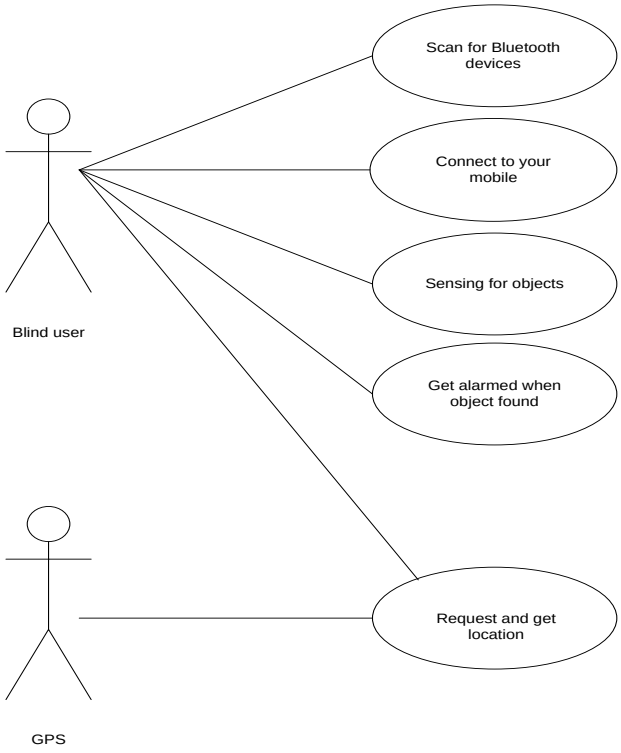
A. *Functional and non-functional requirements*

The main functional requirements of the application are: the system should be able to help blind users to recognize their location, the systems should be able to save the blind user from getting hit or bumped by surrounding objects, with additional alarming beeping sound provided, and the system

There are many non-functional requirements of the application some of them are: the system should be reliable that means the system must give a trustful result to users so they can consider the application and use it, usability which means that the system intends to provide the best result for the user, and the system should be easy to use and user friendly which is the usability.

B. *System's Use-Case Diagram*

As shown in figure1 there is an interaction between the user and the system and between the system and the GPS. So the user can scan for Bluetooth devices, can connect to the mobile and sensing for objects, also the user get alarmed when object is found. Finally the user has the ability of requesting to find his location from the system based on the interaction between the system and GPS which provide the location for the user.



-Case Diagram

C. *System's Activity Diagram*

Figure 2 describes the activities and the operations that done in the system and also shows the condition that activates each operation.

The user starts the server and waits for the sensor to find an object, after that the system return a beeping sound and alarm to the user if an object found. When the user sends a request to the system to know his location, then the system will send the request to the GPS, after that the GPS will inform the user about his location through the system.

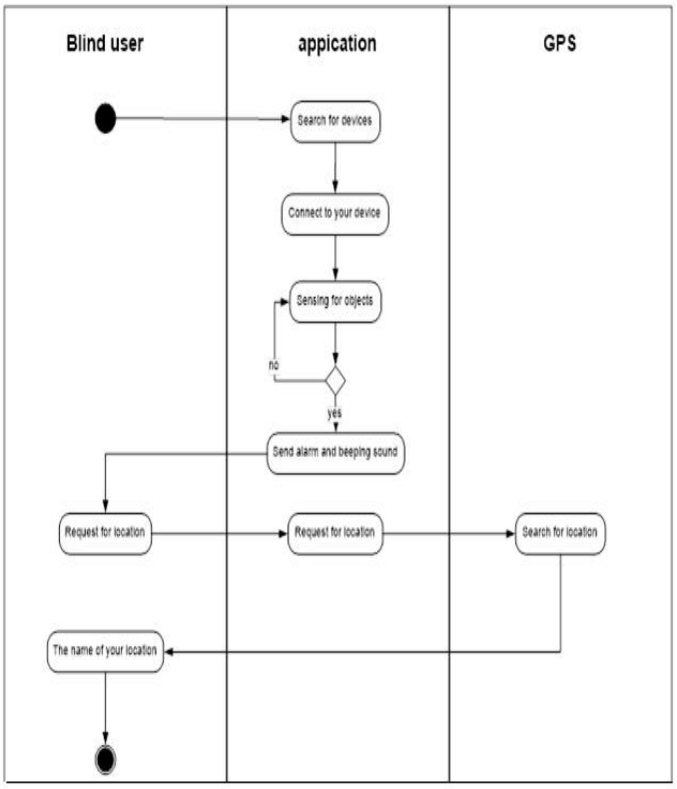


Figure. 2 Activity Diagram

D. *System's Sequence Diagram*

In this part we will describe four sequence diagrams for the application, as shown in figure 3 the user starts the desktop client and he sends a request to open Bluetooth, therefore the client starts searching for Bluetooth availability, and asks the

that have been installed in the application, after that the client returns the address, and name of Bluetooth devices that have been discovered.

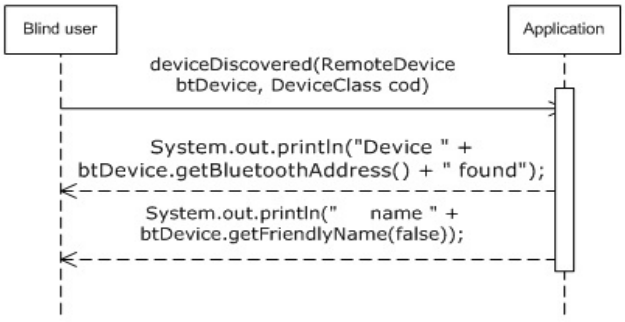


Figure. 3 Sequence Diagram of Bluetooth Availability

According to figure 4 the user connects to the mobile application that has the same UUID and then starts connectivity.

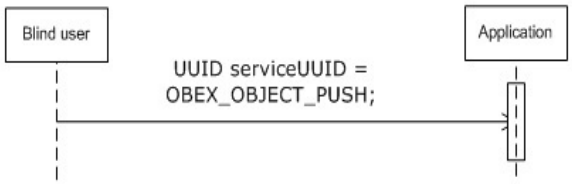


Figure. 4 Sequence Diagram of Connectivity Process

o receive and

the specific close distance is found the application goes to

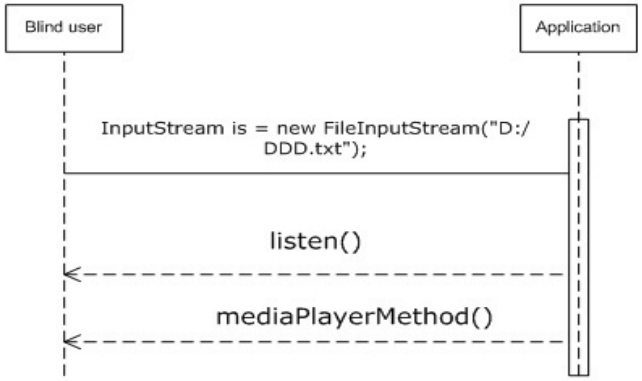


Figure. 5 Sequence Diagram of Beeping Sound Display

As shown in figure 6 the user can request his location clicks a specific button, the application calls the current location. The GPS returns a Sound voice saying the method as the user changes his location in order to tell the user

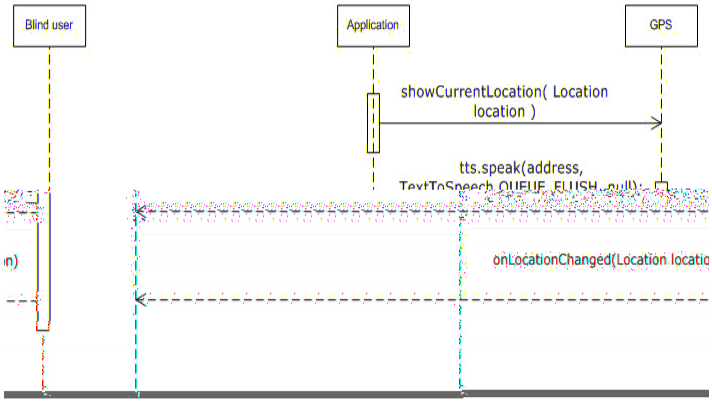


Figure. 6 Sequence Diagram of

III. SYSTEM IMPLEMENTATION

In this part we will describe some screenshots of the system, we will start with the screenshot that is used to run the Bluetooth. Figure 7 shows the requesting permission to turn the Bluetooth on and to make the device visible to the other devices.

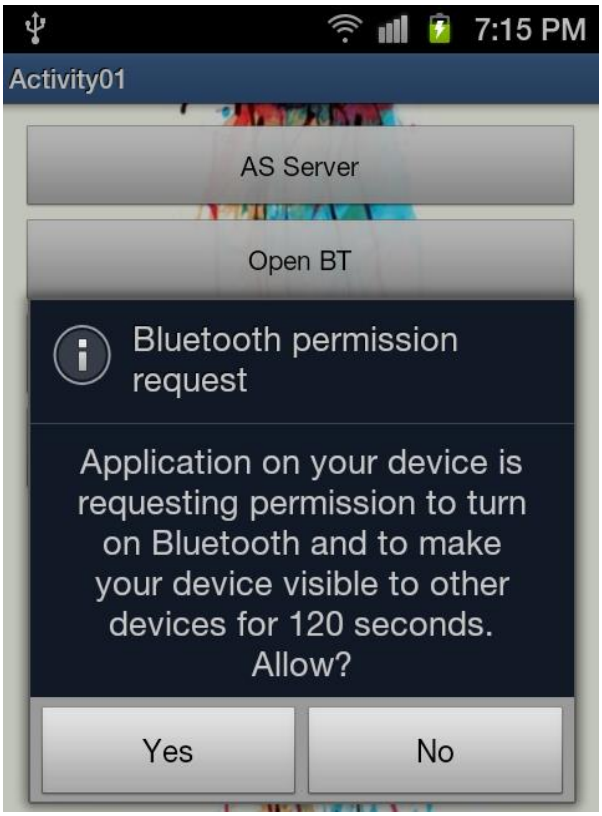


Figure. 7 Bluetooth Permission Request

Figure 8 shows that the server is waiting for the data to be sent from the client using ultra-sonic sensors.

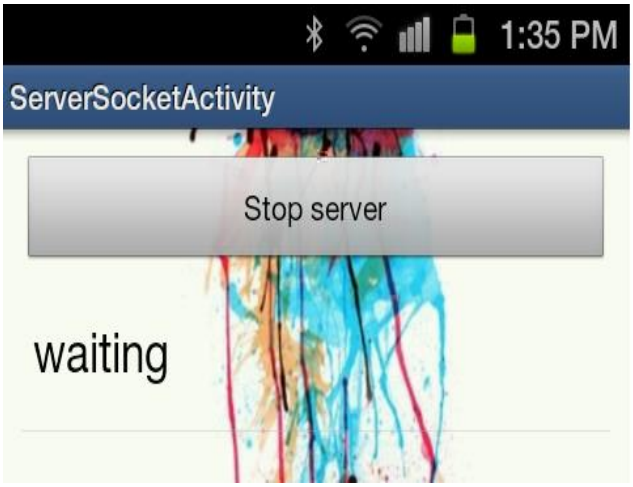


Figure. 8 Server waiting for Data

As shown in figure 9 the server has received the data from the user and starts displaying the data.

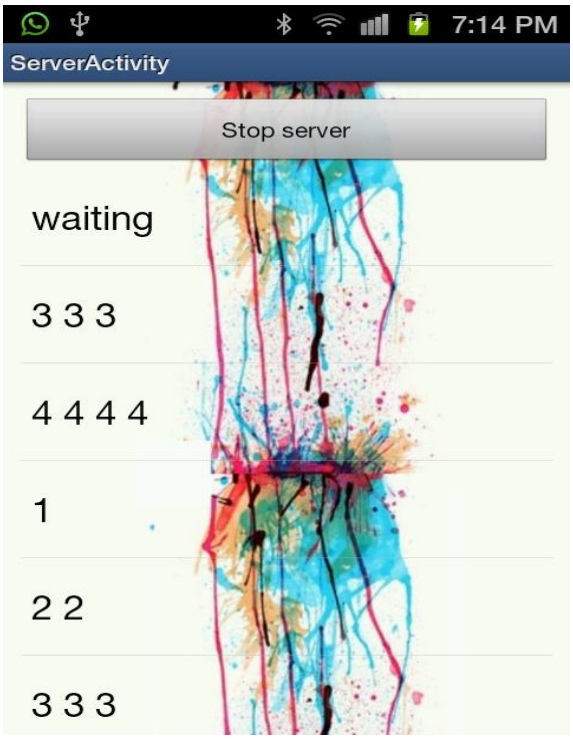


Figure. 9 Server displaying received data

request his location.

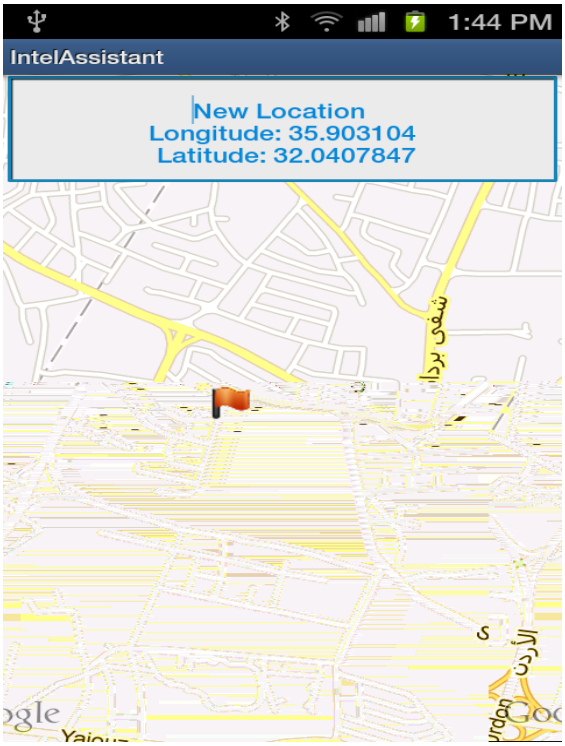


Figure. 10 MYMAP Application

IV. CONCLUSION

Finally the main goal of this paper is for humanity purposes

synchronized distance reading to the user to make his life better, to prevent him from getting hit by objects, and to let him e seen by him. Furthermore the application

the mobile that will tell the blind user about his location using Google maps. In the future we will use a web cam equipped with the sensor to study facing objects, by capturing images for different kinds of objects, and save them into an already defined library. This way the application could recognize objects and could describe them to the user by processing the

ACKNOWLEDGMENT

The author is grateful to the Applied Science Private University, Amman, Jordan, for the full financial support granted to cover the publication fee of this research article.

REFERENCES

[1] An interface to virtual environments for people who are blind using WII technology - menta Journal of Assistive Technologies, Vol. 3, issue 2, pp. 26-34, 2009.

[2] blind people using auditory virtual reality for the construction of spatial ternational Journal of Human-Computer Studies, Vol. 72, issue 4, pp. 393-407, April 2014.

[3] Interactive Tactile Maps for Blind People using Smartphones Proceedings of the Ninth ACM International Conference on Interactive Tabletops and Surfaces, USA, pp. 381-385, 2014.

[4] Usability of a Multimodal Video Game to Transactions on Accessible Computing, Vol. 3, issue 2, Article No. 7, November 2011.

[5] Peter Me http://www.seeingwithsound.com/android.htm, 2015.

[6] - Enabling Blind People To Locate Objects In Thier Envairom http://www.vizwiz.org, http://hci.cs.rochester.edu/pubs/pdfs/vizwizlocateit.pdf, 2015.

[7] - Computer Vision Applications for the Visually .

AUTHORS PROFILE

Dr. Mohammad Shkoukani is currently working as an associate professor in Applied Science University. He received his B.Sc. degree from Applied Science University, Amman, Jordan in 2002, M.Sc. and Ph.D. degrees from The Arab Academy for Banking and Financial Sciences, Amman, Jordan, in 2004, and 2009 respectively, all in Computer Information Systems. His research interests include Agent Oriented Software Engineering, System Analysis and Design, and Electronic Commerce Applications.