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Ultrasonic Navigation and Location Detection for the Blind

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ABSTRACT

The aim of the project is to enable the visually impaired people to smoothly navigate with the help of buzzers. Ultrasonic Navigation for Visually Impaired is the multidisciplinary project with computer science, electronics engineering and health science which helps the blind people to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with a buzzer sound. It allows visually impaired individuals to travel through familiar and unfamiliar environments without the assistance of guides or a stick. One of the main peculiarities of this device is that it will be affordable. It will be equipped with ultrasonic sensors, consisting of a module. Using the sensor, visually impaired can detect the objects around them and can travel easily. When the sensor detects any object, it will notify the user by a beep sound. The device also contains a heartbeat sensor which keeps a track of the blind person's heartbeat. In case the heartbeat crosses the threshold value, the caretakers will be notified with an SMS on their phone about the person's location. The caretakers can also receive a notification about the person's location and can track them if required using an android application. The android application also lets the blind person to receive the messages on his/her phone in the form of audio. This is an automated device. Thus, this device will be of a great use for the blinds and help them travel different places.

Keywords: Visually impaired, ultrasonic sensors, heartbeat sensor, buzzer, track, threshold value, android application.

I. INTRODUCTION

Advancing through the 21st century, people have always been in the quest of developing technologies that help to improve the quality of human life but in this expedition hardly anything could be done for the handicapped people.According to WHO 39 million people are estimated as blinds worldwide. They are suffering a lot of hardships in their daily life. The affected ones have been using the traditional white cane for many years which although being effective,still has a lot of disadvantages.The people who are visually impaired are confronted with numerous difficulties in their daily life, one of which isnavigating through an environment that is completely alien to them.

In the existing scenario blind people make use of stick to move around. They will not be aware of what

is present around them. They need to move their stickaround every time while walking. This causes too much of trouble for the blind and they will also not be confident enough to go around on their own.Thedevelopment and application of technology for orientation and mobility has a long history covering the post-war period. Although some early endeavours envisaged systems that might replace the cane or dog guide, more recent efforts have focussed on devices and systems designed to supplement and provide a support system for these basic mobility tools. Mobility aids like walking stick and guide dogs are still used by the blind even today. With the advances of technology, some different types of electronic travel aid have been developed to support the mobility of the blind. Most of the commonly used electronic travel aids use ultrasound. All such devices use the principle of reflection of the high frequency ultrasonic beam and are available in different models. Sonic Pathfinder,Mowat- Sensor, and Guide-Caneare called clear path indicators or obstacle detectors since the blind can only know whether there is an obstacle in the path ahead. These devices are used to search for obstacles in front of the blind person. The motivation of this project was to develop a portable navigation aid for blind pedestrians. The most widely used primary mobility aid today is the long cane. This has several limitations such as a range limited to the length of the cane, typically one pace ahead of the user, difficulties detecting overhanging obstacles, and difficulties storing in public places. In addition, to help blind or visually impaired travellers to navigate safely and quickly among obstacles and other hazards faced by blind pedestrians, an obstacle detection system using ultrasonic sensors and vibrators has been added to this aid.

II. IMPLEMENTATION

2.1 Proposed System

This device helps the blind people to navigate by detecting nearby obstacles using the help of ultrasonic waves and notify them with buzzer sound. This device is equipped with two ultrasonic sensors. When the ultrasonic sensor detects obstacle, the device will notify the user through sound beeps. The rate of beeping increases with decrease in the distance and this is a fully automated device. A heartbeat sensor is attached to the device. Whenever the user's heart beat rate drops down the device alerts the caretaker of the user with an emergency message along with location. The caretakers can track the person if they wish to using map. Also, the messages received by the visually impaired is converted to audio.

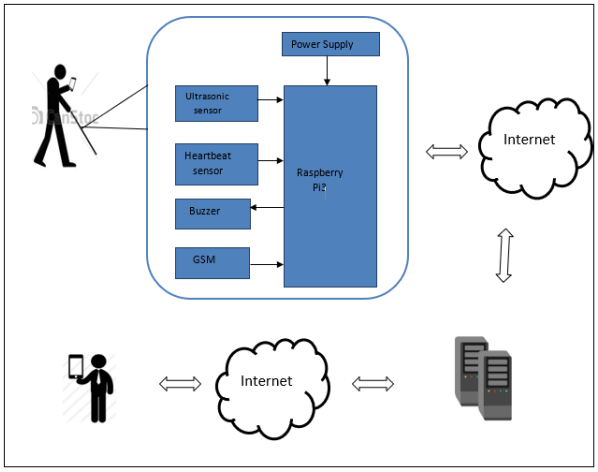

Fig 1. Block diagram of System Architecture

The device has the following features,

Obstacle Detection: This device detects obstacle by sending out ultrasonic waves and informs the user about the obstacle using either beeper or buzzer.

Navigation: The advantage of the proposed system is that it provides notifications to the user in the form of buzzer, which can assist a blind person to pass a busy road. Moreover, this system is an auditory

guidance system for the visually impaired people using ultrasonic-to-audio signal transformation.

Heartbeat Sensor: This device measures change in volume of the blood of the user through any organ which causes a change in the light intensity. The flow of blood volume is determined by the rate of heart pulses. Since light is absorbed by blood, the signal pulses are equivalent to the heartbeat pulses.

Tracking: The device also notifies the caretaker about the person's location in case of emergency. Based on the location the caretaker can also track the person if needed using the android application.

Text-To-Speech: The messages being sent to the visually impaired person can be received by him in the form of audio using the android application.

III. RESULTS

3.1 Hardware

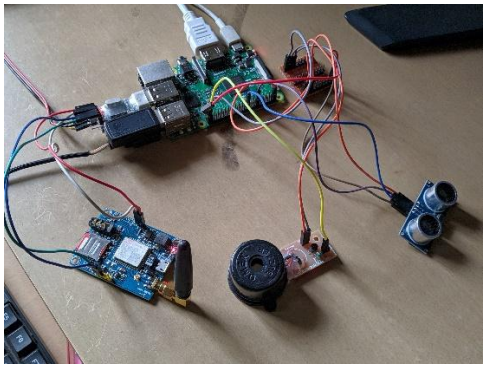

Fig 2. Hardware implementation of the system

3.2 Software

3.2.1 Care Taker Registration

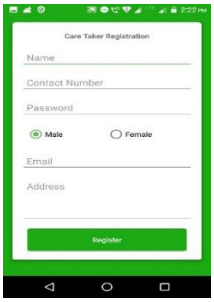

Fig 3. Care Taker Registration

The first activity allows the caretaker of the blind person to register on the application. The caretaker has to provide details such as name, contact number, password, gender, email id and address. On registering, the app displays a toast indicating successful registration. This activity allows multiple caretakers to register.

3.2.2 Care Taker Login

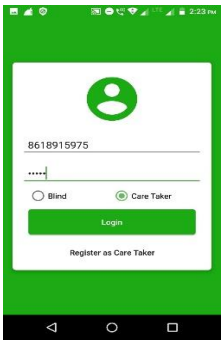

Fig 4. Care Taker Login

The login activity allows an already registered caretaker to login to the app as per their requirements. The caretaker has to provide details such as phone number, password and select the option of caretaker to login.

3.2.3 Add Blind People

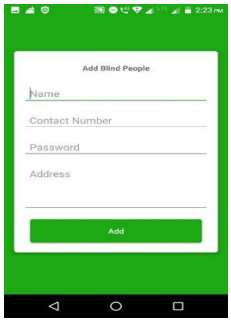

Fig5.Add Blind People

This activity allows to add the blind person to the application. The details of the blind person such as name, contact number, password and address need to be provided. Upon addition, the application displays a toast indicating successful addition.

3.2.4 Blind Stick Activity

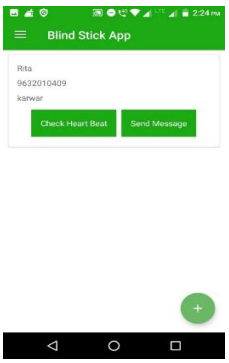

Fig6.Blind stick Activity

This activity provides the caretaker with options such as checking the heartbeat of the blind person and being able to send message if required.

IV. CONCLUSION

Ultrasonic navigation device enables a visually impaired person to move aroundeasily. The main concept of this project is to provide an electronic aid as guidance to overcome the lacking of visualization power by proposing a simple, efficient, configurable electronic guidance system for the visually impaired people. Ultrasonic sensor is the proposed electronic aid which senses the obstacles in its path bycontinuously transmitting the ultrasonic waves. When an obstacle appears in its vicinity then the ultrasonic waves gets reflected to the system immediately. The ultrasonic receiver senses the ultrasonic waves. Then the device alerts the blind person through buzzer notification and alerts. Theheartbeat sensor keeps a track of the blind person's heartbeat and the caretakers will be notified with an SMS on their phone about the person's location during emergency. The caretaker can track the blind person using android application. The android application lets the blind person to receive the messages on his/her phone in the form of audio. This can help any blind person navigate easily with confidence.

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