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Voice Maps for Visually Impaired with Obstacle Detection

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***Abstract*—** The paper presents the architecture and implementation of a system that will help the visually impaired people to navigate using GPS technology. The system provides artificial guidance to the visually impaired through known paths, that is the path for navigation has to be already stored in the microcontroller. The current latitude and longitude values of the user are obtained using GPS. These values are continuously compared with the already stored value in the microcontroller. Thus helps the blind in navigation. The goal is to create a portable, simple and less costly system that will allow user to travel through familiar and unfamiliar environments without the aid of guides. Also it provides voice recognition to detect obstacles. The obstacles are detected using three ultrasonic sensors, which are placed on the left, right, and front positions of the blind. The commands and messages are played back to the blind via APR9600 voice playback IC. The keypad used in system allows the user to select the desired locations to which he/she wishes to go. Keypad consists of 12 keys where each key represents a location. Blind selects the key using Braille language. The paper focuses on the development and evaluation of a Navigation system that makes use of Global Positioning System, voice and ultrasonic sensor for obstacle detection.

Keywords- *GPS, Blind, Navigation, Impaired Vision, Braille*

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I. INTRODUCTION

According to the survey, India is now home to the world's largest number of blind people. Of the 37 million people across the globe who are blind, over 15 million are from India. People who have impaired vision commonly use white canes and/or guide dogs to assist in obstacle avoidance. Guide dogs have a lot of limitations as it won't support navigation to remote locations. Our goal is to create a portable, self-dependent system that will allow visually impaired to navigate independently. The paper described here develops a system for providing navigation to blind or visually impaired by making use of GPS technology [1].

The system utilizes the GPS technology for finding the current latitude and longitude values of the user. The latitude and longitude values of different locations between the source and destination are to be preprogrammed in the microcontroller. Microcontroller then compares the current GPS readings with the stored values. According to these values, voice will be played back and makes the navigation possible. Ultrasonic sensors are used to detect the obstacles. Sensors are placed at the left, right and front positions of the blind's head. APR9600 is used as voice recorder and play back IC in which 8 different commands/messages can be stored. Based on the position of obstacle detected, voice messages are played back.

II. METHODOLOGY

The block diagram of main board is shown in Figure 1. Microcontroller is the heart of this project. GPS receiver is used to get the current location in the form of longitude and latitude. The output of GPS receiver is given to the processor using serial communication. In this system output is in the form of voice hence speaker/headphones are used.

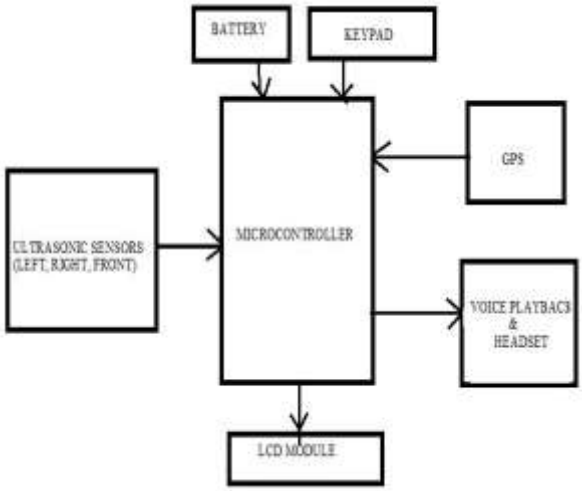

Fig-1: Block diagram

The voice recorded and playback IC used here is APR 9600. It make use of proprietary analogue storage technique using flash non-volatile memory process in which each cell is capable of storing up to 256 voltage levels. This technology enables the APR9600 to reproduce voice signals in their natural form. The APR9600 is a playback IC with non-volatile storage and playback capability for 32-60 seconds. It can record and play multiple messages in a random or sequential mode. For providing power, 12v battery is used and it is regulated to 5v using a voltage regulator.

Global positioning system is a space based satellite routing system. GPS has a cluster of 24 satellites in each orbit that sends accurate GPS signals and permits the receiver to give data such as displaying precise locations. By getting the GPS signals from 3 or more satellites among the availability of 24 GPS satellites, GPS receivers has the ability to triangulate the

information and identify latitudes and longitudes. The human ear can hear sound frequency of around 20 Hz-20 kHz and ultrasonic is the sound wave beyond the ability of which human can hear and are not harmful for human being. The ultrasonic transmitter will send a signal into its surrounding area. The ultrasonic receiver will detect this signal once it bounces off from an object or obstacles. Ultrasonic sensors are used to measure the distance between the object and the sensor. The ultrasonic sensor is based on the principle of Doppler Effect.

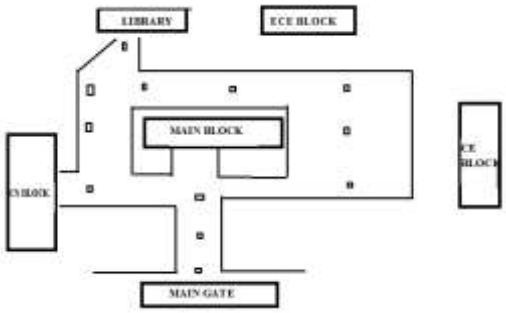

Fig-2: Map of Ammini College

LCD (Liquid Crystal Display) screen is an electronic display module. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. This LCD has two registers, namely, Command and Data. It is used to display user required locations. A 4x3 matrix keypad is used to choose the user target locations. If a person wants to go particular place means he/she has to press the key in keypad. GPS receiver guides the person by giving voice instruction to the person. It plays back to turn left/turn right and provide obstacle information. Using GPS, the current latitude and longitude values of the path for navigation will be continuously provided to the microcontroller. The map of our college for navigation is given in Fig-2. We had measured latitude and longitude values of different locations in the path for navigation and stored in the microcontroller.

III. IMPLEMENTATION

It works by emitting a short ultrasonic burst of sound and then listens for the echo. The map of the path to navigate has to be stored in the microcontroller that is the latitude and longitude values of the locations. These values are obtained continuously received using GPS. Here GPS is used to find the current location of the user. Three ultrasonic sensors are placed on left, front and right positions of the blind.

Fig-3: Prototype

A short 10us pulse is applied to the trigger input to start the ranging, and then the module will sent out an 8 cycle burst of ultrasound at 40 KHz and raise its echo. The module sends the signal and detect whether there is any pulse reflected back. The time interval between sending trigger signal and received echo signal determines the distance between obstacle and the blind. This information is provided to the microcontroller. Here, keypad is used to reach the target locations and each key represents a target location. The blind should be aware of all the information's about the locations that are already stored. If a key is pressed, then the GPS will capture the current latitude and longitude values using TX pin and are given to the RX pin of microcontroller. The play back IC is used to provide directions to the blind in the form of voice. It consist of 8 input channels and each channel stores one message so that a maximum of 8 messages can be recorded using on-board MIC present on the voice module board. The microcontroller compares the current value with the value that is already stored and provides the control signals to the playback IC as per the requirement and make the navigation possible. The blind can receive the voice signals played back by the voice module such as turn left, turn right etc through headset mounted on the head and it makes the navigation easier. The developed prototype is shown in Figure 3.

IV. RESULTS & CONCLUSIONS

Six of the eight locations used in the project are different blocks of Ammini College of Engineering and rest was outside the campus. Ultrasonic sensors aided the feature of obstacle detection in the path. The three sensors find any obstacle to the left, right and front of the user. The sensor gives accurate results within a range of 5m.

Earlier majority of the blind people uses white canes or trained dogs for guidance and not preferred to use electronic travelling devices because of more cost and less accuracy.

The future scope is that the project can be extended by using a wireless camera which can provide remote guidance for the blind people by transmitting the video to his/her relatives or a remote operator for providing real time assistance during emergency. The wireless camera has a wide video transmission range and can be extended by IoT. The transmitted video stream is coded using Indeo Video 4.5 and then stacked into TCP/IP packets and transmits over the GSM network with an internet. Then, 2-way voice communication is established between the remote operator and the user, with the audio coded using Pulse Code Modulation. Both, the voice messages and the GPS readouts are to be sent via UDP packets and we can use more accurate DGPS receivers to provide navigation

REFERENCES

[1] Kiers, M. Ways4all: Indoor navigation for visually impaired and blind people. Retrieved April 18, 2012.

[2] Lighthouse International. Lighthouse International - Use of Assistive Retrieved Le, Saragas Webb. (2009, October 22)

[3] Indoor Navigation System for Handheld Devices Indoor Navigation System for Handheld Devices.

[4] Roberti, M. the History of RFID Technology - RFID Journal. Retrieved April 17, 2012, from RFID Journal.

[5] Andrzej Stepnowski and Jerzy Demkowicz, The system for navigation of blind in urban area,Faculty of Electronics and Telecommunications ,Gdansk(2010).

[6] Łukasz Kamiński, Zbigniew Łubniewski1,Andrzej Stepnowski ,Portable, Dedicated GIS For Supporting The Street Navigation and self-dependent movement of blinds, Gdansk University of Technology (2008).

[7] Ultrasonic and voice based stick for the blind, Department Of Electronics and Communication Engineering, Gokaraju Rangaraju Institute Of Engineering And Technology (2010).

[8] Punwilai, J. Noji, T. Kitamura, "The design of a voice navigation system for the blind in Negative Feelings Environment", Communications and Information Technology, ISCIT 2009.

[9] Helal, A. Moore, S.E. Ramachandran, "Drishti: an integrated navigation system for visually impaired and disabled", Wearable Computers, 2001.

[10] Marsh, A. May, M. Saarelainen, "Pharos: coupling GSM and GPS TALK technologies to provide orientation, navigation and location based services for the blind", Information Technology Applications in Biomedicine, 2000.