Embedded Based Supporting System for Visually Impaired Person

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Abstract— Blind cane stick is an innovative cane stick designed for visually disabled people for improved navigation. We here propose an advanced blind cane stick that allows visually challenged people to navigate with ease using advanced technology. The blind cane stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. One more feature is that it allows the blind to detect if there is light or darkness in the room. The system has one more advanced feature integrated to help the blind find their cane stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the cane stick which helps the blind person to find their cane stick. Thus this system allows for obstacle detection as well as finding cane stick if misplaced by visually disabled people.

Key words: RF, PIC Microcontroller, Ultrasonic Sensor

I. INTRODUCTION

According to the World Health Organization (WHO) statistics, around 30 billion people are blind on the earth. This project proposes to design and develop a portable unit (cane stick) for them for easy usage and navigation in public places. The blind cane stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it detects water and alerts the blind. One more feature is that it allows the blind to detect if there is light or darkness in the room. The system has one more advanced feature integrated to help the blind find their cane stick if they forget where they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the cane stick which helps the blind person to find their cane stick. Thus this system allows for obstacle detection as well as finding cane stick if misplaced by visually disabled person.

II. LITERATURE SURVEY

[1] Voice Based Guidance and Location Indication System for the Blind Using GSM, GPS and Optical Device Indicator. International Journal of Engineering Trends and Technology (IJETT) - Volume4 Issue7- July 2013.

This paper presents a theoretical model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures –object detection and realtime assistance via Global Positioning System(GPS).The system consist of ultrasonic sensor, GPS Module, GSM Module and vibratory circuit(speakers or head phones). This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This paper proposed the design and architecture of a new concept of Smart Electronic Travel Aid Cane stick for blind people. The advantage of the system lies in the fact that it can prove to be a very low cost solution to millions of blind person worldwide.

[2] "Smart Bus Alert System for Easy Navigation of Blind" International Journal of Advanced Networking & Applications (IJANA)

ZigBee system is used for indicating the presence of blind person in the bus station. Voice module and APR9600 audio playback systems are used to update and inform the blind person about the bus arriving and reaching destinations and to guide him as to what he has to do next. Microcontroller analysis the information provided and generates the corresponding bus number. ZigBee transceiver sends the bus number and announced in the microphone attached with the system. The system is connected with GPS which indicates the destination given. Audio output is generated by the voice synthesizer.

[3] GPS Based Voice Alert System for the Blind , International Journal of Scientific & Engineering Research, Volume 2, Issue 1, January-2011

The system designed consists of a GPS receiver and a voice circuit which is interfaced to the microcontroller. The microcontroller is programmed in such a way that depending on the satellite information of location the predefined location name will be announced. The only major disadvantage of this system is the time taken by the GPS to receive its initial signal from the satellite, i.e, when it is switched ON. The above disadvantage can be removed by using a higher efficiency GPS receiver.

III. OBJECTIVE

The main objective is to help visually challenged people to navigate with ease using advance technology. In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic cane stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

IV. METHODOLOGY

In this system the ultrasonic sensors are used to sense the obstacle (if there is any). The sensors are set a threshold limit if any obstacle is found within that range it gives beep speech through speaker. Obstacles found in different directions are indicated with different pattern beep and speech (Top, Middle, Pit and Water) to identify them easily.which is inaudible to human ears. The sound waves hits the obstacle and bounces back to detectors. The ultrasonic sensor is used for detecting objects/obstacles which are in front whereas the two ultrasonic sensors are used to detect the obstacles on the sides.

Once the distance of the obstacle is calculated then the conditions are checked. The signal is then send to microcontroller to operate a buzzer.

The microcontroller reads the distance of the obstacle using sensor and also commands the buzzer. The buzzer beeps once for left side obstacle, twice for front obstacles and thrice for right obstacles. The vibrator is also connected in parallel with the buzzer for vibration sensation.

V. PROBLEM FORMULATION

There are over 284 million people who are visually impaired and there are over 39million people who are totally blind. The lack of visual capabilities has limited these individuals from completely perceiving their immediate surroundings which has potential safety concerns and also lowers their quality of life since they must rely on some sort of aid to get around. Currently, in order for visually impaired individuals to get around, they rely on walking cane sticks, guide, and/or personal human aids for assistance. While these walking cane sticks and guide may allow the individual to get around independently, they each have a common drawback. These aids lack the intelligence to provide directions to unvisited locations and cannot completely warn individuals of obstruent objects in their vicinity. A human aid provides this intelligence but makes the visually impaired individual very dependent on the human aid. A good solution will be a device that is portable and is able to provide directions to new locations and alert the user of obstacles in their path when the user is walking. For the purpose of this project, we streamlined the problem defined above to assisting blind individuals with getting around outdoors. By smarter we mean that the device is able to provide directions to unvisited locations, while ensuring safe navigation. Additionally, the device is not intended to replace the use of walking cane stick.

A. Problem Definition

Design a portable device for visually impaired individuals that will provide direction to new locations and alert the user of obstacles in their path during outdoor navigation.

VI. BLOCK DIAGRAM

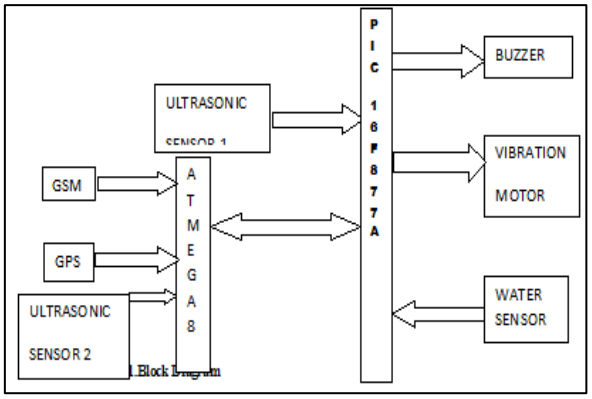

Fig. 3:.Block diagram

VII. SOFTWARE AND HARDWARE IMPLEMENTATION

There were two tasks involved in developing the smart cane stick. It started with code development, and physical installation. The source code was complied on MPLAB IDE.

A. Source Code Developments

Fig. 4.1: Source Code Developments

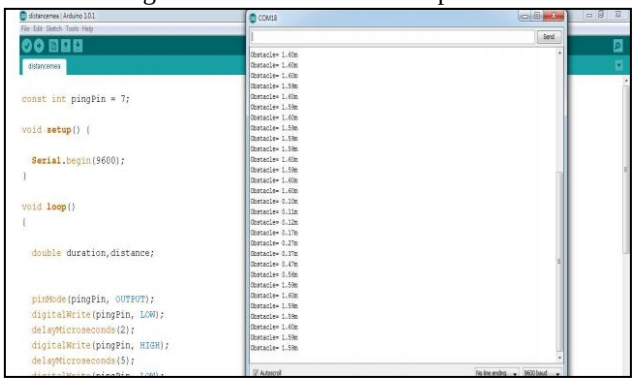

Fig. 4.2: Aurdino output for distance measure

This involves creating the assembly language, based on prepared flow chart. Assembly (.asm) file is the source code written by the user. After creating the assembly file, MPLAB can transfer the assembly file into machine language i.e. the Hexa(.hex) file. In particular, Hex file is the machine language to fuse the PIC microcontroller. Hex file will not be able to produce if there are errors detected by the compiler in the assemble file. Fig. shows a fraction of the source code for the ADC. The source code in Fig. explains when the sensor

detected the object in closed range, the voice message is triggered, LED is on and the vibrator is on. When the sensor detected the object in medium range, the voice message is triggered, LED is on and the vibrator is on. Finally when the sensor detected the object in far range, the voice message is triggered, LED is on and the vibrator is off.

VIII. HARDWARE IMPLEMENTATION

Fig. 4.3: ultrasonic sensor

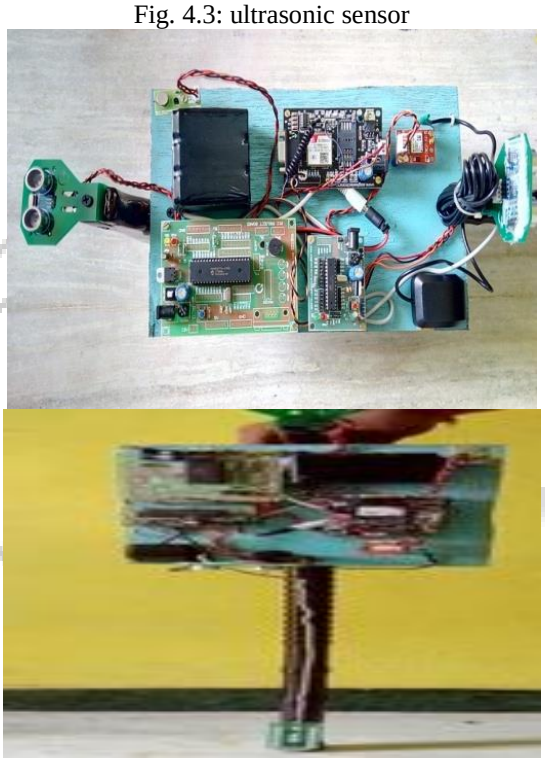

Fig. 4.3: Hardware module PIC Microcontroller and Ultrasonic sensor

IX. ADVANTAGES

- The system can be used both indoor and outdoor navigation. Blind person's location can be tracked whenever needed which will ensure additional safety.
- Detects obstacles and alerts the blind person through vibration alert and speech output.

X. APPLICATIONS

- Some more applications like vehicle detection, slippery floor, on-coming vehicle detection and fire or smoke alarm can also be included.
- One more application is for the family members to gain access to the blind person's location through the server whenever needed.
- Also, use of RFID tags will transmit the location information automatically to the PCB unit when the intelligent cane stick is in its range.

XI. RESULTS AND ANALYSIS

This study has experimented on how well the Smart cane stick functions. To analyse that, this details the analysis into different modules. Result of analysing the water sensor and ultrasonic sensor. There were few details that had been obtained when analysing the water sensor as listed below

1) Buzzer produces beep sound to alert the blind person.
2) Vibration motor produces vibration to the blind person, in case if they are deaf, it is easily to identify the obstacles.
3) GPS helps to track the location of the blind person through the website whatsmygps.com.
4) The water sensor fully functions
5) The water sensor can detect if only the water is over 0.5 cm deep.
6) The water sensor buzzer cannot be stopped unless the water sensor is dry, so it needs to be wiped to stop the buzzer.

XII. CONCLUSION

The Smart Waking Cane stick for blind is an embedded system which is to be implemented with an aim to reduce the complexities of the blind people. With this system, the blind people will be able to move from one place to another place without the help from others. It will act as a basic platform for the generation of more such devices for visually impaired and it will be real boon for the blind. The developed system gives good results in detecting obstacles in front of the user. In this system the sensors play an important key role to detect the objects in front of the blind to make free to walk for the blind people .Due to these features it is best equipment for the blind and visually impaired people for walking on the road. Hence the system can solve the problems faced by the blind in their daily life. The system also takes measures to ensure their safety.

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