International Journal of Research in Engineering
www.engineeringpaper.net
Online ISSN: 2664-8784; Print ISSN: 2664-8776
Received: 04-05-2019; Accepted: 05-06-2019; Published: 12-06-2019
Volume 1; Issue 3; 2019; Page No. 14-16

Third eye for the blind: An IOT application

Sudha VS[1], Dr. Shivaprakash T[2], Manjunath Managuli[3], Sharada M Kori[4], Sharada G Kulkarni[5], Shubda S Kulkarni[6]
[1, 3-6] Department of CSE, GIT, Belagavi, Karnataka, India
[2] Professor, department of CSE, VVIT, Bangalore, Karnataka, India

Abstract
Vision for the blind is an innovation which will help the visually impaired people to move around and go from one place to another with speed and confidence by becoming aware of nearby obstacles. This device is circuited with the Arduino board and includes sensors, LEDs and buzzers. The LEDs and the buzzer are connected to the Arduino and similarly the ultrasonic sensors are also connected to the Arduino board. When the sensors detects the obstacles the device will notify the user through vibration and sound beeps. Using this, visually impaired can detect the objects around them and can travel easily.

Keywords: LEDs, Arduino board, sensor and detector

1.1 Introduction

With the improvement of the living standards of the people, we have become so materialistic that we have forgotten how the physically disabled people live a tough life. They undergo rigorous, apathetic and indifferent behavior towards them for being physically disabled. They become dependent on other people in a way for their day to day routine chores. Eyes are prime sense of organ in perceiving the outside environment; dysfunction of such prime sense organ severely affects the knowledge perceiving capability of the outside environment. Therefore, going around to places in such environment is a very big challenge because the blind people cannot depend on their own eyes and thus face many difficulties. Thus the aim of the project Third eye for the Blind is to develop a cheap, affordable and more efficient way to help the blind people to navigate with greater comfort, speed and confidence. One of the main peculiarities of this innovation is, it is affordable for everyone, the total cost being less than 1500 INR. There are no such devices available in the market that can be worn like a cloth and having such a low cost and simplicity. This device is light, portable but limited to its size and it is not used for dynamic obstacle detection.

1.2 Objectives

The main objectives are: [1] To detect obstacle and calculate its adaptive distance from the person [2]. To collect the information from the environment, process the information and give the output based on the program [3]. To be able to notify the visually impaired of an obstacle with the help of a vibrator and buzzer.

1.3 Methodology

The motivation to select the topic 'Vision for the Blind' is to give the blind the ability to feel the presence of an object without using the sense of touch and smell and the use of white cane and devices as such can be avoided. The blind can make use of this device to navigate without holding a stick which can be a bit annoying.

Vision for the Blind project is an innovation which will assist the visually impaired people to navigate nearby places by becoming aware of nearby obstacles. This is a fully automated device and can be worn as a band or cloth. It is able to scan and detect the obstacles in the areas like left, right, and in front of the blind person regardless of its height or depth. It is quite simple, efficient and easy to use and wear. The proposed system helps the visually impaired to navigate with speed and confidence by detecting the nearby obstacles using the help of ultrasonic waves and notify them with buzzer sound or vibration. It functions very accurately and very little training is required to use it. It is also available at an affordable price.

Literature Review and Research Gap

2.1 Literature survey

In today's world of innovations, there are many innovations for the visually impaired people like the white cane with the cane with a red tip for helping the movements of the blind people. There are many different types of canes used in today's world with growing technologies such as the white cane, the smart cane, and the laser cane. The cost of the trained dogs is also very high and is not affordable option. A survey found that the remote guidance system is very difficult to carry and thus the wearable band will be more optimized version. Various techniques of aiding the visually impaired persons have evolved over the years, thus, toward attaining their self-independent by freely moving around their environment without guidance from others. Some of these are:

2.1.1 Smart walking stick by Mohammed H. Rana and Sayemil (2013)

This is based on ping sensor for detecting obstacle, wet electrode, vibration motor and the buzzer. The obstacle is detects by the ping sensor and the obstacle distance is communicates to the visually impaired by the vibration of the motor.

2.1.2 The electronic travelling aid for blind navigation and monitoring by Mohan M.S Madulika (2013)
This is ARM7 controller based that used ultrasonic technology for detecting the obstacle and inform the obstacle distance to the visually impaired, and also used the GPS and GSM technologies for localization of the visually impaired.

2.1.3 3D ultrasonic stick for the blind by the Osama Bader Al-Barm (2014)
The system uses ultrasonic sensor for detecting the obstacle in three directions (i.e., front, left and the right sides of the visually impaired), and the vibration motor which vibrate with the intensity depending on the obstacle's distance. It also uses GPS and GSM for localization of the visually impaired.

Problem definition, Initial Design using Design Thinking approach, Experimentation / Design calculations / Flowcharts / Algorithms

3. Problem definition
According to the statistics of World Health Organization, there are approximately 40 million people suffering from visually impairment all over the world. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages. Another way is, having a pet animal such as a dog, but it is really expensive. So the aim of the project is to develop a cheap and more efficient way to help visually impaired to navigate with greater comfort, speed and confidence. The system should work in both day and night time and should have a high reliability. Such a system would increase the mobility of the blind people.

3.1 Initial Design using Design Thinking approach
In order to overcome the problems of the traditional white cane we came up with the device" Vision for the blind". The features of this device will help the visually impaired people in many ways: [1] By wearing this device, they can fully avoid the use of the white cane and such other devices. [2] They can wear the device as a band or like a cloth and it can function very accurately [3]. They only need a very little training to use it as it is quite simple, efficient and easy to operate and wear.

3.2 Experimentation
The core components include arduino, ultrasonic sensor, buzzer, vibrator, Gsm module and gps. All these components are integrated together to make a whole working device. The ultrasonic sensor emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. The HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo. The Ground and the VCC pins of the module needs to be connected to the Ground and the 5 volts pins on the Arduino Board respectively and the trig and echo pins to any Digital I/O pin on the Arduino Board.In the loop first you have to make sure that the trigPin is clear so you have to set that pin on a LOW State for just 2 µs. Now for generating the Ultra sound wave we have to set the trigPin on HIGH State for 10 µs. Using the pulseIn() function you have to read the travel time and put that value into the variable "duration". This function has 2 parameters, the first one is the name of the echo pin and for the second one you can write either HIGH or LOW. In this case, HIGH means that the pulsIn() function will wait for the pin to go HIGH caused by the bounced sound wave and it will start timing, then it will wait for the pin to go LOW when the sound wave will end which will stop the timing. At the end the function will return the length of the pulse in microseconds. For getting the distance we will multiply the duration by 0.034 and divide it by 2 as we explained this equation previously. At the end if the distance of the object is within 30 cms of range then the ultrasonic sensor will trigger the buzzer and vibrator with the help pf ultrasonic sensor. For safety purpose the device also includes a panic button. When this panic button is pressed the users location will be sent to any of the 3 emergency contacts thus ensuring the safety of the user.

3.3 Design calculations
The ultrasonic sensor emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance.

3.4 Flowcharts

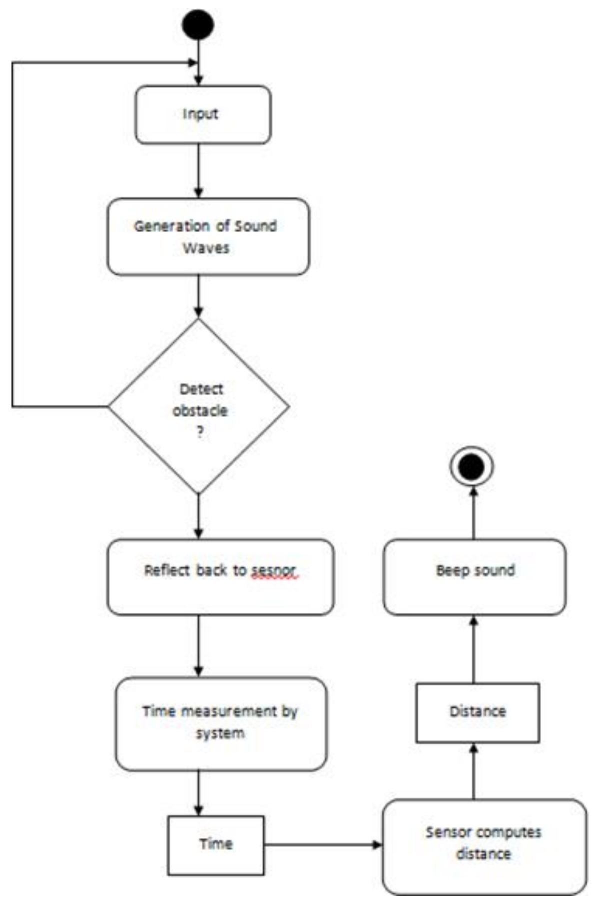

Fig 1: Flow for detecting the object

3.5 Algorithms
Algorithm: Detects the object distance and notifies the user.

Data: distance of the object
Result: buzzer beeps to notify the user
if distanceInch¡=30 and distanceInch¿=20 then
Serial. Println (”caution”); analog Write (buzzer,70);
Else if distanceInch¡ =19 and distanceInch¿=10 then

Serial. Println (”object near”); analog Write (buzzer, 150);
Else if distance Inch¡=9 and distance Inch ¿=0 then Serial. Println (”attention”); analog Write (buzzer, 255);
End if

Results and discussion

4.1 Results

Suppose the object is 10 cm away from the sensor, and the speed of the sound is 340 m/s or
0.034 cm/µs the sound wave will need to travel about 294 u seconds. But what you will get from the Echo pin will be double that number because the sound wave needs to travel forward and bounce backward. So in order to get the distance in cm we need to multiply the received travel time value from the echo pin by 0.034 and divide it by 2. We will get the appropriate distance as 10cms. Since the object is within the range of 30 cms the buzzer and the vibrator will be triggered.

4.1.1 Results and snapshots

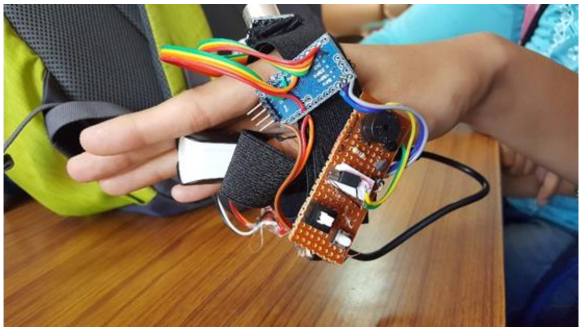

Fig 2: Working module

Discussion

When the ultrasonic sensor detects obstacle the device will notify the user through vibrations and sound beeps. The intensity of vibration and rate of beeping increases with decrease in distance and this is a fully automated device.

Conclusion and Scope for future work

Conclusion

Vision for the Blind project is an innovation which will assist the visually impaired people to move around and go from one place to another with speed and confidence by becoming aware of nearby obstacles. This device will be a wearable technology for the blind which can be worn like a cloth. Using the sensor, visually impaired can detect the objects around them and can travel easily. Thus this is an automated device and will be of a great use for the blinds. Furthermore this device is simple, cheap, efficient, easy to carry, configurable, easy to handle electronic guidance system with many more amazing properties and advantages proposed in order to provide constructive assistance and support for the blind and visually impaired persons.

Scope for future work

The future work will include voice recognition system and traffic signal detection

References

1. Alberts B, Johnson A, Lewis J. *et al*, “Molecular Biology of the Cell”, 4th edition. New York: Garland Science, 2002.
2. Black Paul E. “Finite State Machine. Dictionary of Algorithms and Data Structures”, U.S. National Institute of Standards and Technology, 12 May 2008.
3. Lonnie D. Bentley, “Systems Analysis and Design for the Global Enterprise”, 160 7th edition
4. Klein EA, Yin L, Kothapalli D, Castagnino P, Byfield FJ, *et al*, “Cell-cycle control by physiological matrix elasticity and in vivo tissue stiffening”, Current Biology. 2009; 19:1511–1518.
5. Ulrich TA, de Juan Pardo EM, Kumar S. “The mechanical rigidity of the extracellular matrix regulates the structure, motility, and proliferation of glioma cells”, Cancer research. 2009; 69:4167–4174.