INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATIONS AND ROBOTICS
ISSN 2320-7345

SMART NAVIGATION SYSTEM FOR VISUALLY IMPAIRED PEOPLE

S. DICKENS LEONOT[1], Dr. A.V. SENTHIL KUMAR[2]

[1]PG and Research Department of Computer Applications, Hindusthan College of Arts and Science, Coimbatore, India
dickensleonot1997@gmail.com
[2]Professor and Director, PG and Research Department of Computer Applications, Hindusthan College of Arts and Science
Coimbatore, India
avsenthilkumar@yahoo.com

Abstract: - Blind mobility is one of the major challenges encountered by visually impaired persons in their daily lives. Their life and activities are greatly restricted by loss of eyesight. They normally travel using blind navigation system or by their accumulated memories in their long term exploration. The main objective of the present work is to develop a low cost, reliable, portable, user friendly, low power and robust solution for smooth navigation. This project (Smart Gloves for Blind People), as meant are the gloves are for visually impaired people. The system utilizes four types of devices including PIR sensor, ultrasonic sensor, buzzer and audio jack. A microcontroller processes the reflected signals from all devices in order to classify front obstacle. As soon as the obstacle is detected, the sensor detects it and sends it to the device which generates an automated voice in the earphone connected to the person's ear.

Keywords*:* Microcontroller, PIR sensor, Audio output

1. Introduction

On an approximation 285 million people are visually impaired across the globe, among which 39 million are blind and 246 have low vision according to WHO statistics of 2011. About 90% of the worlds visually impaired live in low-income settings where as 82% of people living with blindness are aged 50 and above. India is now home to the world's largest number of blinds.

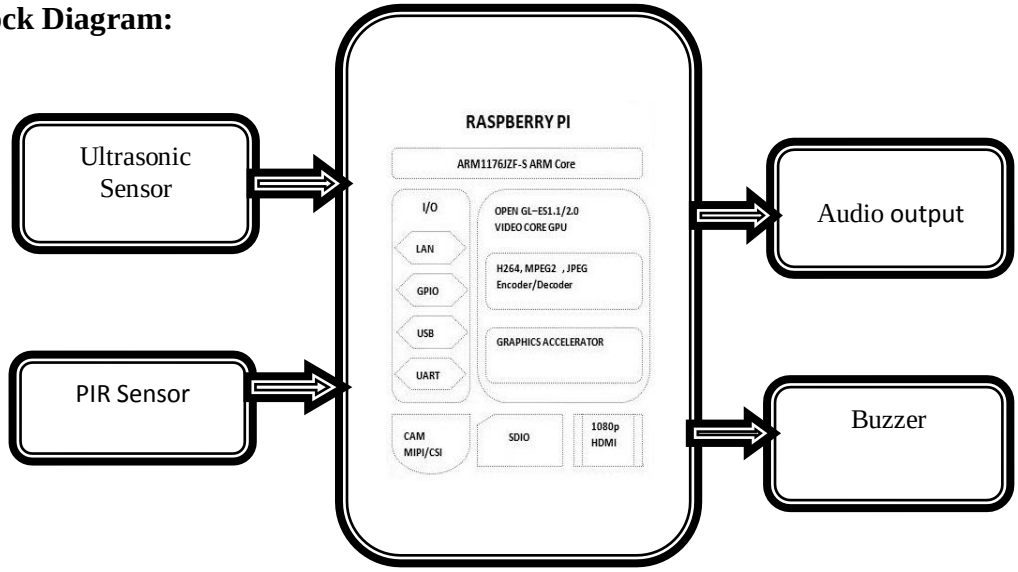
Out of the 37 million blind people worldwide, over 15 million are from India. The worst thing is that 75% of these are cases of avoidable blindness. India has an acute shortage of optometrists and donated eyes for the treatment of corneal blindness. While India needs 40,000 optometrists, it has only 8,000. Blind people are usually dependent on assistance from others.

The assistance can be from human beings, dogs or some special electronic devices. There are already many existing devices which help a blind person in walking. The most common is the simple walking stick or cane. The blind man uses it to detect the obstacles by sweeping the cane back and forth but unfortunately sometimes the blind man gets aware about the obstacle too late.

With the recent advances in technology normal walking cane has been modified to a blind smart gloves artificial eye for blind with an ultrasonic sensor and PIR sensor and audio output using convert text into voice speech attached to it. It has several limitations. Therefore, the solution that has been portrayed in this project is

cost effective, reliable, robust and portable device which would help a blind person to walk on the streets almost like any other pedestrian.

2. Block Diagram:



3. Component Used:

- Raspberry Pi 3
- Ultrasonic Sensor
- PIR Sensor
- Buzzer
- Audio Jack Output

3.1 Raspberry Pi 3:

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. The printed circuit board (PCB) houses the input and output connectors as well as the computer hardware itself.

Fig 1: Raspberry Pi 3

3.2Ultrasonic Sensor:

Ultrasonic sensor is a device that can measure the distance to an object using sound waves. It emits the sound wave at a specific frequency and the sensor waits for that wave to bounce back from the object. By perceiving the time interval between emission and receiving, it calculates the distance between the ultrasonic sensor and the object. Ultrasonic sensor is show in figure.

Fig 2: Ultrasonic Sensor

3.3 PIR Sensor:

Passive Infrareds sensors (PIRs) are electronic devices which are used in some security alarm systems to detect motion of an infrared emitting source, usually a human body. The pyroelectric sensor is made of a crystalline material that generates a surface electric charge when exposed to heat in the form of infrared radiation. When the amount of radiation striking the crystal changes, the amount of charge also changes and can then be measured with a sensitive FET device built into the sensor. This radiation (energy) is invisible to the human eye but can be detected by electronic devices designed for such a purpose.

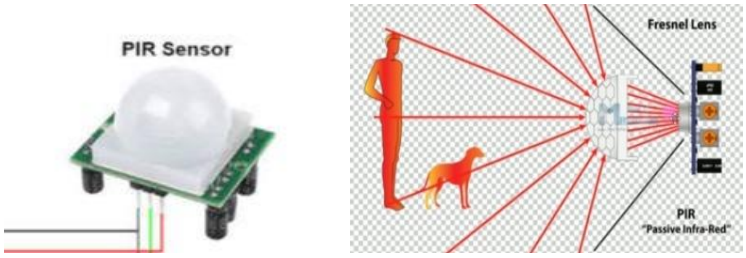


Fig 3: PIR Sensor

3.4 Buzzer:

There are two types are buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beep sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application. This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V.

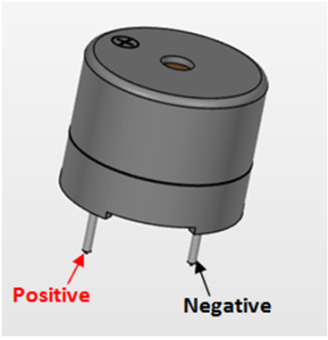


Fig 4: Buzzer

3.5 Audio Jack output:

In that Espeak library is used. So that first we check the Espeak library is available in computer or not. If the espeak library is not available then we can get the error. Comparing the input string with espeak string. Extract the voice and Initialize the wave player for convert the text into speech. Finally we can get the output .Python software is installed in raspberry pi. This software is used to convert the text file to voice audio file ny extract the text.

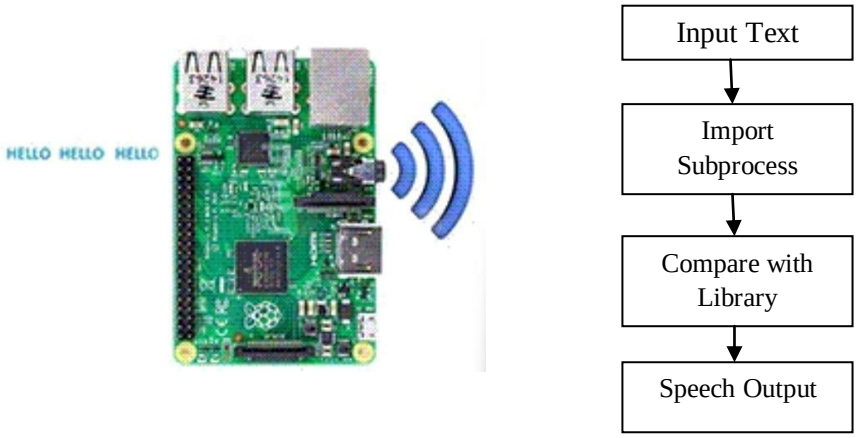


Fig 5: Audio jack Output

4. Working Procedure:

The System working consists of Raspberry Pi 3, Ultrasonic sensor, PIR sensor, buzzer and audio jack output. The Raspberry Pi is the central microcontroller of the system. In this smart gloves project board connecting the Raspberry Pi allows the ultrasonic sensor to continuously measure the distance of the obstacles appearing across it. The ultrasonic sensor calculates the distance by using the time taken for the ultrasonic waves to reach and reflect from the obstacle. If the obstacle is within range then the ultrasonic sensor sends the signal to the Raspberry Pi.
When obstacle is detected, the Raspberry Pi enables the buzzer alert sound waves components attached to it. When text to audio voice connecting sensors is object detected to audio speech this sensor is also send to the Raspberry Pi at the same time.
Then PIR sensor radiation (energy) is invisible to the human eye but can be sensor is detecting humans an alert audio output is connected to the Raspberry Pi to give the voice based communication to the user. It gives the output of the voice through the headphone to the user.

5. System Input and Output Implementation:

5.1 Input Design:

The ultrasonic sensors are well placed on the spectacle to sense move all directions and smart gloves device detecting obstacles. It requires board contains a single 40-pin-outs and input from raspberry Pi 3 to be interfaced with them.

This sensor waves cannot be heared by humans because the normal human frequency is 20Hz the ultrasonic sensor produces above 20 KHz frequency. To measure distance using speed and time

The terminals of a sensor are as follows: 1.Vcc, 2.Trigger, 2.Echo, 4.Ground, among which Vcc and Ground can be common to all sensors and hence prevents of GPIO pins connecting trigger 23, echo 24 and output pin 21 using a raspberry Pi 3 and to make room for other components to be interfaced into the single board the sensors.

The PIR sensor pin connecting GPIO. BCM mode set connecting pin number 2 and another pin connecting ground Raspberry Pi 3 has a configuration pin set Vcc & Ground each in the self-made so that only Trigger and Echo pin of each separate sensor needs to be directly interfaced to raspberry Pi 3.

This general purpose input and output pin setup connect to working input pin configuration set mode then sensor detecting object and humans audio voice produce blind person can hear. The Audio of the espeak file compare the file system can be received by a headphone through the self-made 3.5mm audio received in text to speech and audio output through raspberry Pi 3 board connected to the audio jack.

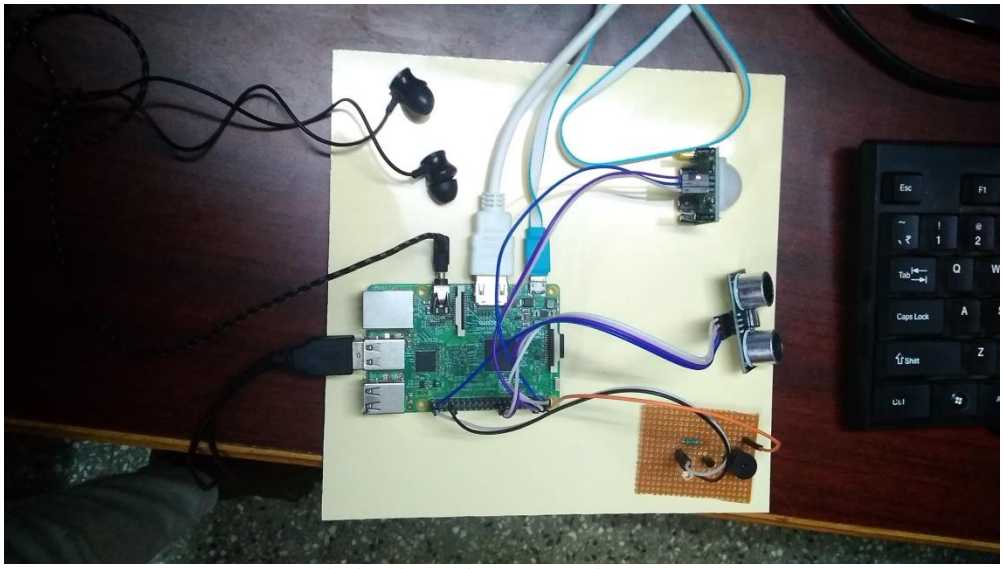


Fig 6: GPIO pin Connecting Components

5.2 Output Design:

The distance below 15Cm the buzzer will be produced sound waves and text to speech audio output is heared blind person using headphone audio jack. The PIR sensor detect human to produce audio output is obstacle detected.

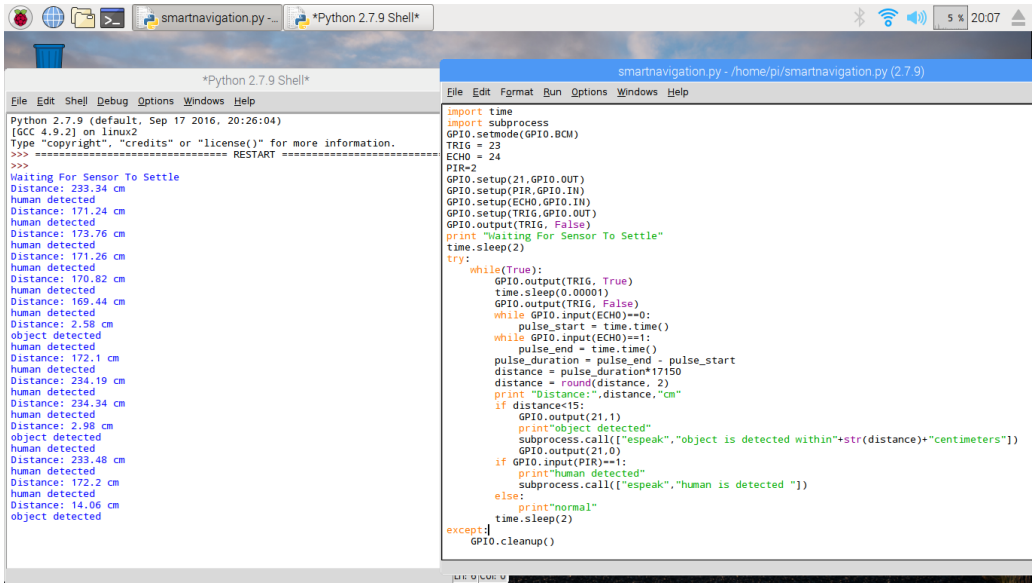


Fig 7: Detected Object & Human

6. Conclusion:

This system is smart navigation system for visually impaired person. This will help user for outdoor navigation using audio output, indoor navigation and obstacle detection by ultrasonic sensor and PIR sensor by giving audio instruction. This system will work according to text to speech audio output. It will be used specially in big industries, offices, shopping mall or college campus which is unknown to VIP. This system can either use for VIP or normal person who is unknown for location. There are five location saved in this system. If

user want to add more location then it can be possible. In future the camera can use for movable obstacle detection. It is considered to be a low cost solution to millions of blind person worldwide is one of the major advantages. Blind person easy way identify the objects

References:

[1] *Yamini D. Patil, Nandkishore C. Patil,* "Optical Character Recognition Based Text to Speech Synthesis", JEITR vol.2, Issue 7, July 2015.

[2] *MrunmayeePatil and Ramesh Kagalkar,* "A Review on Conversion of Image to Text as well as Speech using Edge detection and Image Segmentation", IJSR vol.3, Issue 11, November 2014.

[3] *Pratik MadhukarManwatkar and Dr. Kavita R. Singh* "Text Recognition from Images: A Review" IJARCSSE, vol.4, no.11, November 2014.

[4] *Y.Ramadevi, T.Sridevi, B.Poornima, B.Kalyani* "Segmentation and Object Recognition Using Edge Detection Techniques" vol.2, no.6, December 2010.

[5] *A.Anitha, J.Gayatri, Ashwini.k* "Automatic Recognition of Object Detection Using Matlab", IJARECE vol.2, no.9, September 2013.

[6] *G.Gayathri, M.Vishnupriya, R.Nandhini, Ms.M.Banupriya* "Smart Walking stick For Visually Impaired" IJECS vol.3, no.3, March 2014