

Under graduate
Raspberry pi based Project

Smart Stick for Blind

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1. INTRODUCTION

Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The 2011 statistics by the World Health Organization (WHO) estimates that there are 285 billion people in world with visual impairment, 39 billion of which are blind and 246 with low vision. Presently, blind people use a white stick as a tool for directing them when they move or walk. Here, we develop a tool which can serve as a blind stick being more efficient and helpful than the conventional one. This will assist the blind persons during the walk and provides an alarm if any hurdle is detected within the set range [3].

MOTIVATION

This project is motivated by various application of smart stick for blind people as they find difficulties detecting obstacles in front of them, during walking in the street, which makes it dangerous. The smart stick comes as a proposed solution to enable them to identify the world around. This project will make a prototype of a less advanced form of a smart stick which in advanced form can suitably serve human purpose.

2. LITERATURE REVIEW

In sensor assisted stick for the blind people describes about a wearable equipment which consists of a light weight blind stick and the obstacle detection circuit based on a sensor. It is mainly developed to help the blind person to move alone safely from one place to another and to avoid any obstacles that may be encountered. The device detects the fixed as well as moving objects and thus it may help to avoid accidents. The main component for the working of this system is the infrared sensor which is used to scan a predetermined area around the blind person by emitting-reflecting waves [3].

3. COMPONENTS REQUIRED

- A Raspberry pi.
- An Ultrasonic sensor (HCSR04).
- A 9-volt battery.
- Some Jumper wire.

4. CIRCUIT DIAGRAM

The system consists of a walking stick including an Ultrasonic sensor, Raspberry pi and a head phone attached to it. The raspberry pi is the central controller of the system. 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 ultrasonic waves to reach and reflect from the obstacle. If the obstacle is within 50 meter range, then the ultrasonic sensor sends signal to the raspberry pi [1].

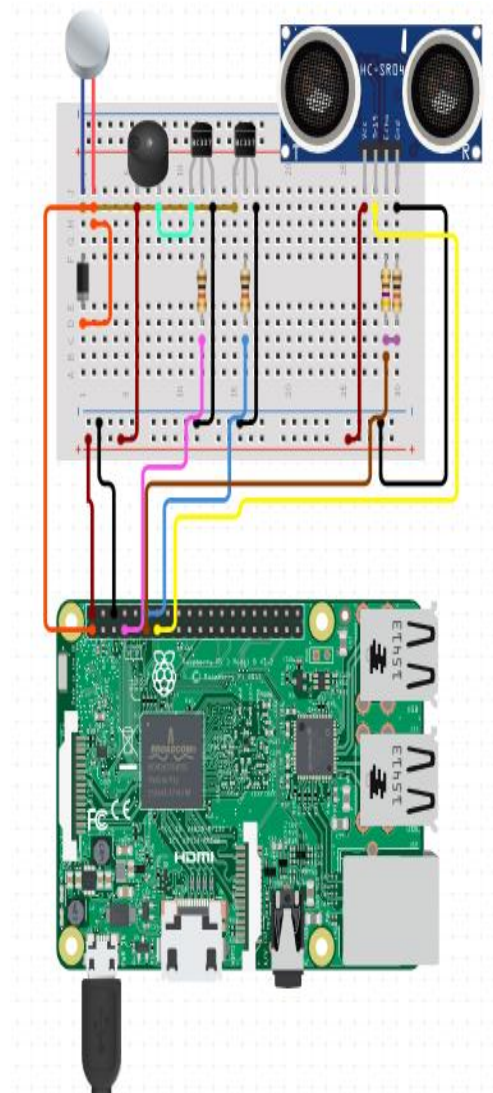


Figure 1: Connections of various modules [1]

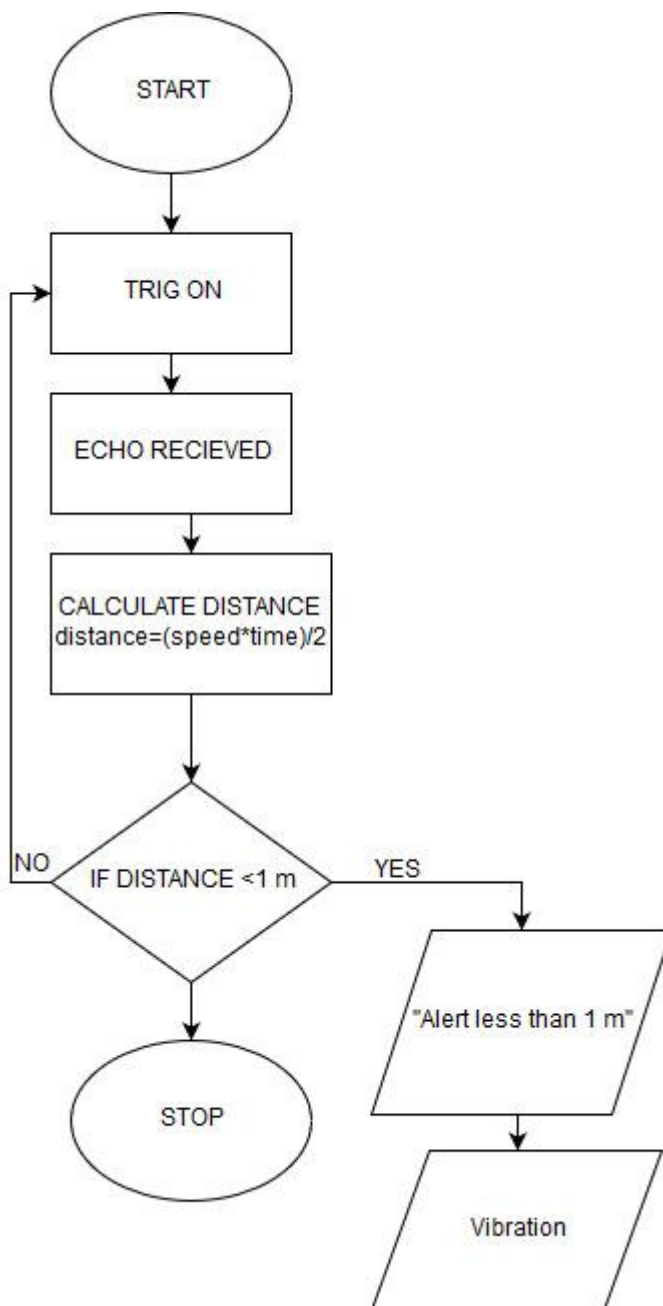


Figure 2: Flow chart [1]

5. SOFTWARE AND HARDWARE

5.1 Hardware:

Raspberry Pi: 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 [2].

Ultrasonic Sensor: An ultrasonic sensor is a device that uses high-frequency sound to measure distance. These sensors are also known as transceivers, and operate similar to sonar. While sonar is primarily used underwater, ultrasonic transceivers can be used in air [1].

5.2 Software:

Python: Python is a multi-paradigm programming language. Object-oriented programming and structured programming are fully supported, and many of its features support functional programming and aspect-oriented programming. Many other paradigms are supported via extensions, including design by contract and logic programming. Python uses dynamic typing, and a combination of reference counting and a cycle-detecting garbage collector for memory management [1].

6. HARDWARE ANALYSIS

Male/Female Jumper Wires for Arduino:

Features of Male/Female Jumper Wires

- Ease to use.
- Ease of interfacing.
- Long life.

Applications of Male/Male Jumper Wires

- It is used in Raspberry boards.
- It can also use in any AVR/8051/PIC/ARM/Robotics based projects.

Ultrasonic Sensor Module HC-SR04 for Raspberry-Pi

Table 1: Specifications

Working Voltage	DC 5 V
Working Current	15mA
Working Frequency	40Hz

Max Range	4m
Min Range	2cm
Measuring Angle	15 degree
Trigger Input Signal	10uS TTL pulse
Echo Output Signal	Input TTL lever signal and the range in proportion

Micro Vibrating Motor (1.5V - 3V)

This Micro Vibration Motor is a simple and easy way to add vibration to your projects. Just hook up each of the attached wires to 1.5 - 3 V DC and ground like you'd get from 1 or 2 standard batteries (button cell, AA, AAA, C, D batteries). Comes in a Black Rubber Housing for easy mounting and working with. Vibration motors such as this one, use an offset weight attached to the shaft of a DC motor to generate vibration [2].

Specifications:

- Operating Voltage: 1.5 - 3 V DC
- Dimensions: 6mm x 6mm x 16mm
- Terminals: 1/2" Wire Leads
- Housing: Rubber
- Max Current: 70mA
- Starting Current: 90mA
- Speed: 10000 +/- 2000 rpm Min

7. CONSTRUCTION AND WORKING

7.1 Assembly Instructions

- Collecting the parts.
- Uploading the code in raspberry pi using python programming language.
- Make the connections according to the schematics given.
- Power up the smart stick.
- Now the smart stick is ready to operate.

7.2) Working

Working is very simple as we all know the speed formula is Distance divided by time.

- The speed of the sound is approximately around 343 meters/ sec.
- The time between the transmitter and the receiver is measured by the sensor.
- Thus applying this formula distance is measured by the microcontroller.

Here we are giving the time values to our raspberry pi and depending on the values of the time it calculates the value of the distance of the obstacle.

There are 4 outputs in the Ultrasonic Sensor module:

2 for the power supply and remaining 2 are Trigger and Echo:

Trigger:

As the name indicates it will trigger the transmitter of the module for certain time intervals.

Echo:

Echo pin will receive the reflected sound wave and give it to the controller (here raspberry pi in this case)

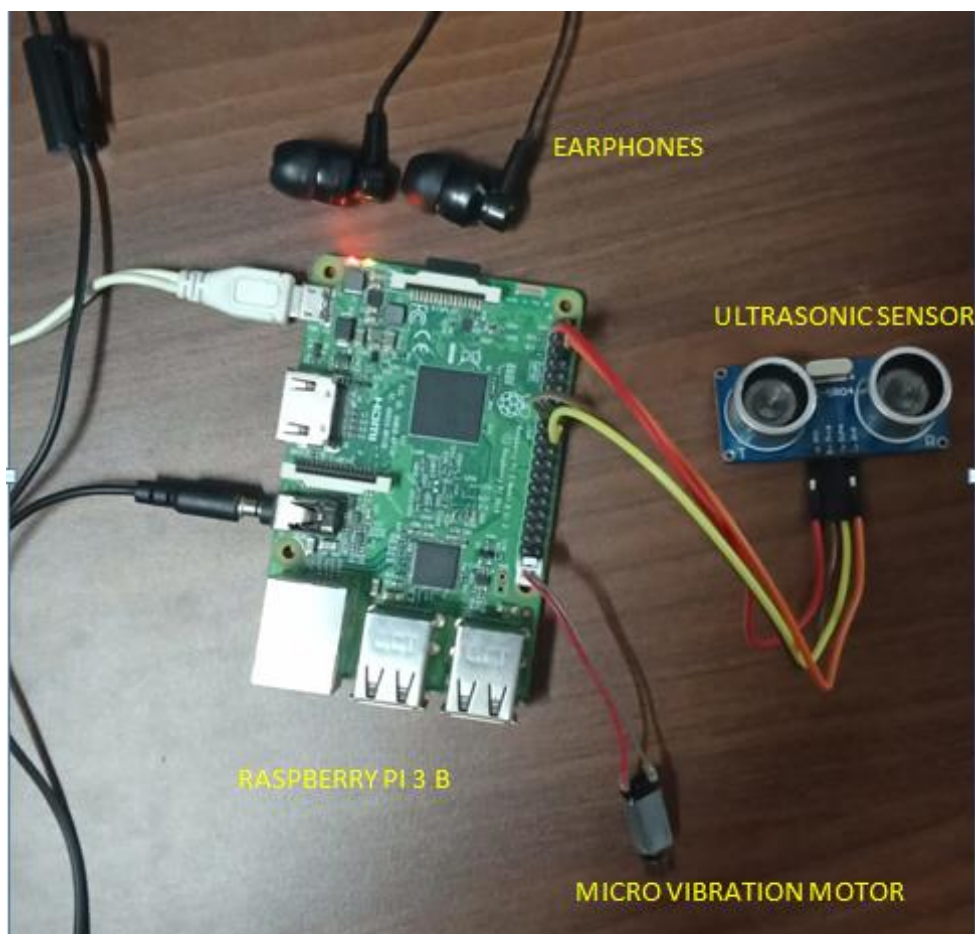


Figure 3: Setup

9. WORK PLAN

Delivery					
Testing					
Integration with board					
Coding					
Hardware Analysis					
Problem Identified					
Literature Survey					
Modules	Jan-15 to Jan-31	Feb-1 to Feb 15	Feb-16 to Feb-28	Mar-1 to Mar-15	Mar-15 to Mar-30

10. REFERENCES

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