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Smart Ultrasonic Walking Stick for Visually Impaired People

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Abstract: *The study focus on a simple method of detecting the obstacle and route by using an ultrasonic sensor that can detect a hole or stair with maximum range about 2 meter. As we can see Blind people is having their trouble to do their life routines because they can't see even a single things. With our idea, we want to help this kind of people to live their life freely. This ultrasonic blind stick have a several feature that surely can help this blind people to navigate routes and detect an obstacle that surely can make their life routines easier. The user just need to use the blind the normal blind stick , the different is , blind people can detect a hole or stair more faster and easily. Besides that, guardian or user of the blind waking stick can find their stick by remote if they misplaced them.*

Keywords: Ultrasonic Sensor, Blind People , Ultrasonic Blind Walking Stick, Obstacle

I. INTRODUCTION

Nowadays, visually impaired person suffer from serious visual impairments preventing them from travelling independently. Accordingly, they need to use a wide range of tools and techniques to help them in their mobility. One of these techniques is orientation and mobility specialist who helps the visually impaired and blind people and trains them to move on their own independently and safely depending on their other remaining senses. Recently, many techniques have been developed to enhance the mobility of blind people that rely on signal processing and sensor technology. According to the literature, the mainly classified into two major aspects: sonar input (infrared signals, or ultrasonic signals). The way these devices operate just like the radar system that uses ultrasonic fascicle or sonar to detect the obstacle of fixed and moving objects.

The distance between the person and the obstacles is measured by the time of the wave travel. However, all existing systems inform the blind of the presence of an object at a specific distance in front of or near to him. Information about the object characteristics can create additional knowledge to enhance space manifestation and memory of the blind.

II. LITERATURE SURVEY

This project was developed by (M.H. Mahmud, R. Saha and S. Islam). The author proposes a function of a microcontroller that have code protected so its security bridge cannot be override except the vendor or owner. It produces different Pulse Width Modulation (PWM) based on the sensors output to operate pager motor. The author focused on the easy way to use the stick and it's maintain, cheap and it is very comfortable to use for blind people. The author approach with subsystems fundamentally sensor based with integral scheme is designed with a circuitry fundament on a PIC microcontroller. The power consumption is low and can be operated easily.

The stick is very economic over the conventional one. The Smart Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to navigate safely both indoor and outdoor. It is effective and affordable. It leads to good results in detecting the obstacles on the path of the user in a range of three meters. This system offers a low-cost, reliable, portable, low power consumption and robust solution for navigation with obvious short response time.[1]

M.H. Mahmud, R. Saha and S. Islam (February 2015)

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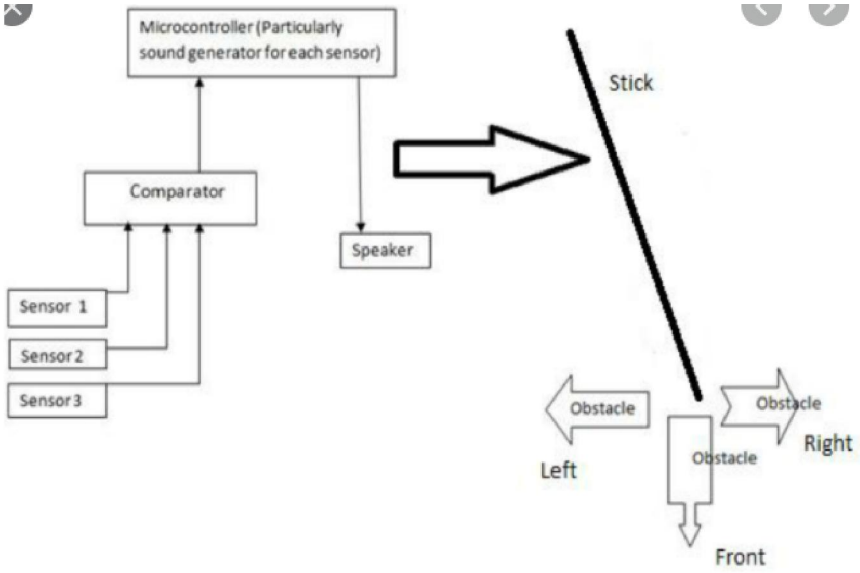

Figure 1: Basic Working of Stick

2.1 Goal

In ensuring the Modern Blind Stick can be done appropriately, a project planning by using Gantt charts has been prepared. In this Gantt chart, schedule of plan and subsequently report progress within the project environment has been stated clearly. Initially, in this project, the scope is defined with the appropriate methods for completing the project are determined.

3.3 GANTT CHART

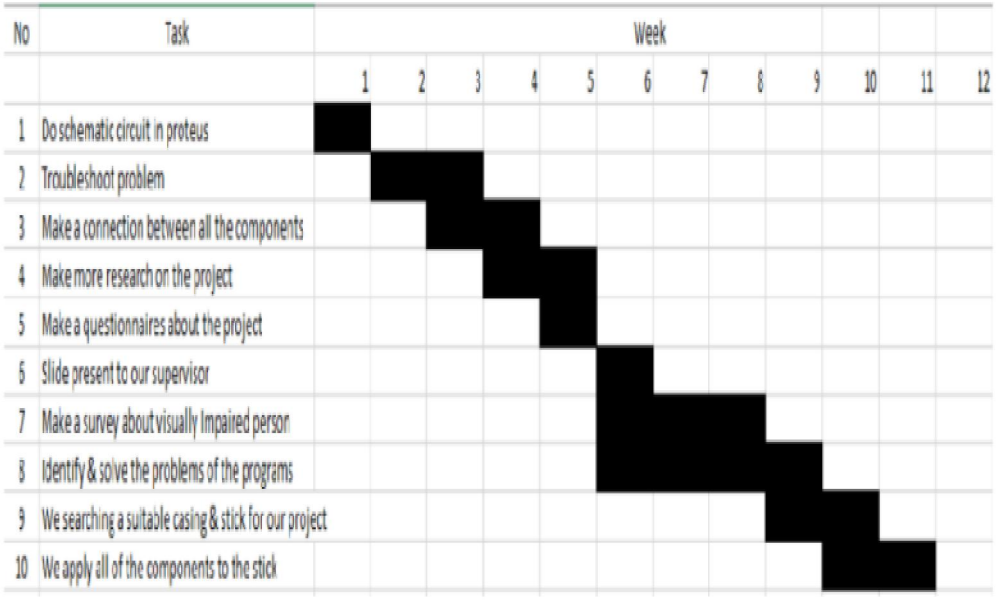

Table : Gantt chart

Above Gantt chart shows the research for various aspects need for the ultrasonic blind stick project. In this we research for troubleshoot problem and to make connection between all the components that we required for the project

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like at mega microcontroller arduino uno , jumpers, ultrasonic sensor etc. Make a survey about visually impaired people and try to identify and solve the problems they faced indoor and outdoor also.

III. Problem Statement

Blind people can't easily recognize obstacles or stairs while using normal blind stick. The blind traveler should depend on any other guide like blind cane , people information , trained dogs, etc. About the 90% of the worlds visually impaired live in developing countries. No safety features on the normal blind stick.

IV. Implementation Details

4.1 Hardware Requirements

- Atmega series microcontroller
- Micro switch
- Light Sensor
- Buzzer
- Ultrasonic sensor
- RF Rx-Tx

4.2 Software Requirements

- Aurdino Compiler
- MC Programming Language
- Embedded C

Before moving onto the actual implementation let us get introduced to the hardware that we will be using in this project.

A Arduino UNO

Figure 2: Arduino UNO

The Arduino UNO R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be use as PWM outputs and 6 can be used as computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third and latest revision of the Arduino UNO.

B. Atmega Series Microcontroller

Figure 3: Atmega 328 Microcontroller

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The ATmega328 is single chip microcontroller created by an Atmel in megaAVR family. It has a modified Harvard architecture 8 bit RISC processor core. ATmega328 microcontroller is used in basic Arduino board.

C. Ultrasonic Sensor

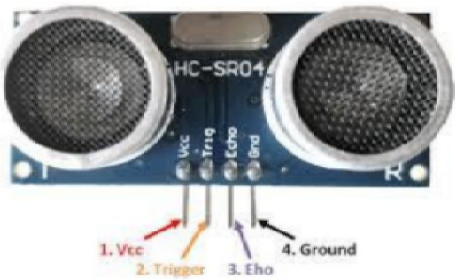

Figure 4: Ultrasonic Sensor

The HC-SR04 ultrasonic sensor uses SONAR to determine the distance of an object just like the bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 400 cm or 1" to 13 feet. The operation is not affected by sunlight or black material, although acoustically, soft materials like cloth can be difficult to detect. It comes complete with ultrasonic transmitter and receiver module.

D. Buzzer

Figure 5: Buzzer

This Buzzer can be used by simply powering it using DC power supply ranging from 4V to 9Vsimple 9Vbattery can also be used, but it is recommended to use a regulated +5V or +6V DC supply.

E. Relay

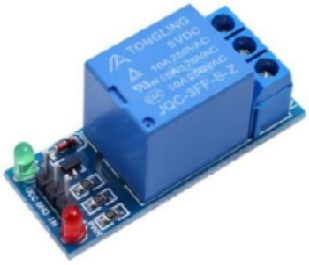

Figure 6: Relay Module

Relay Module is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins. Controlling a relay module with the Arduino is as simple as controlling any other output.

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F. LDR Module

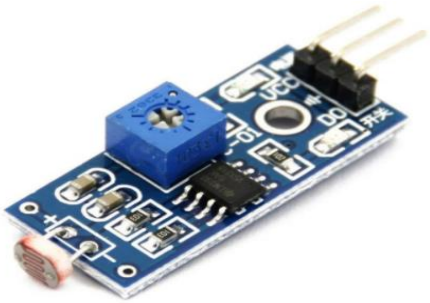
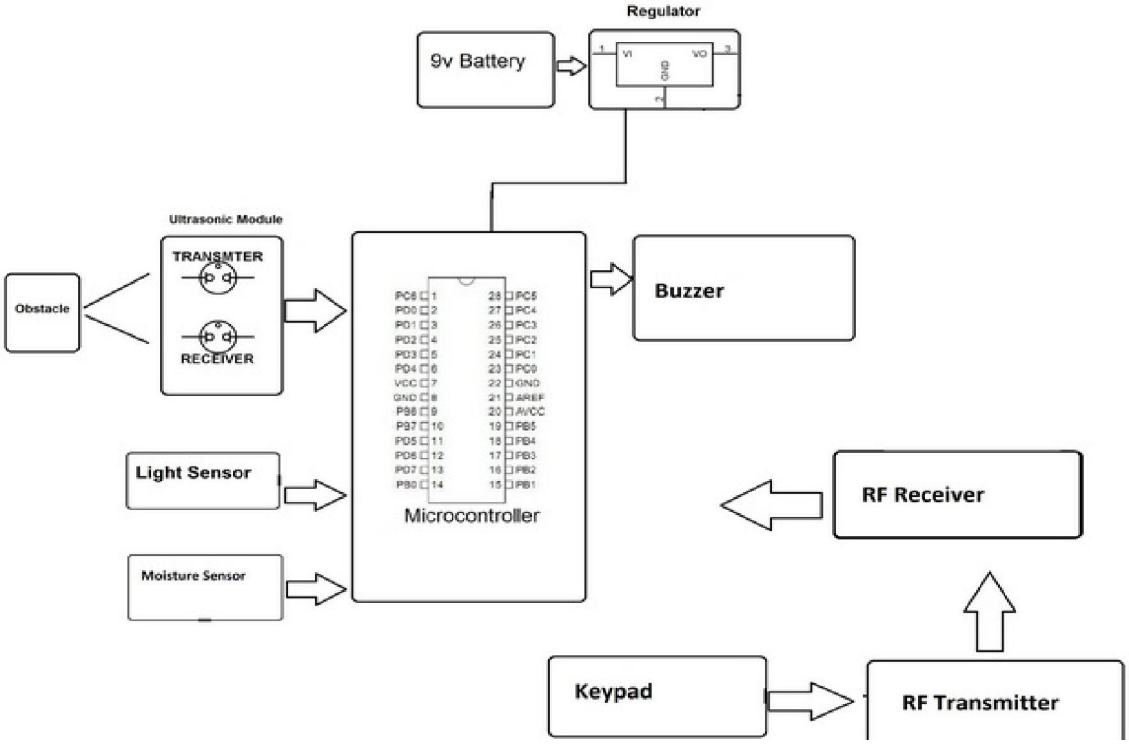


Figure 7: LDR Module

The LDR Sensor Module is used to detect the presence of light / measuring the intensity of light. The output of the module goes high in the presence of light and it becomes low in the absence of light. The sensitivity of the signal detection can be adjusted using potentiometer.

V. ACTUAL IMPLEMENTATION



The ultrasonic sensors emit sound scapes with frequency lying in ultrasonic spectrum (>20kHz), 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 IR sensors are used to detect the obstacles on the sides. After the collection of data the calculations are done according to the formula :uS / 58 = centimeters or uS /148 =inch. 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.

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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. The light sensor is gives a feedback about the environment. That is it informs the user if it's day or night or if a particular place is dark or bright. The moisture sensor is used to detect water pits or any puddles if present. All these signals are then sent to the microcontroller which in turn sends signal to the buzzer.

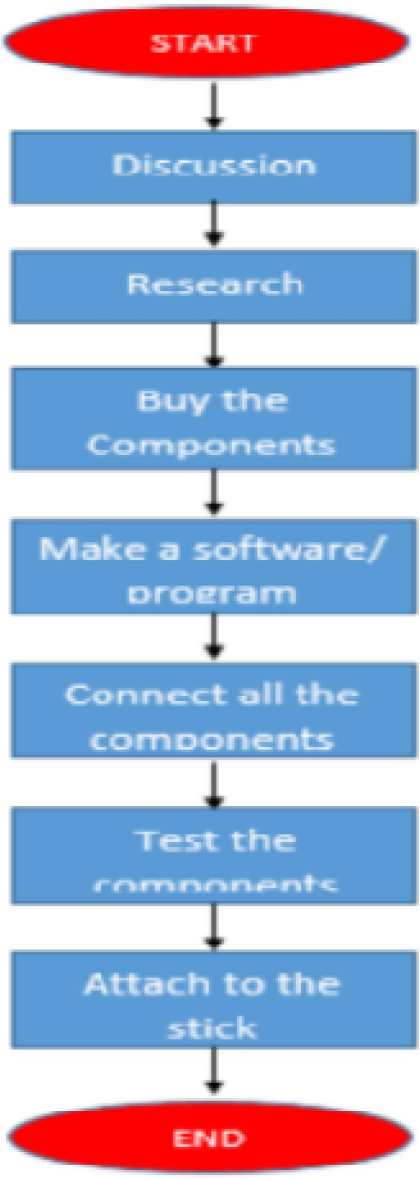

Figure 8: Flow chart of process to develop a ultrasonic blind stick

Above fig shows the flow of work to develop a ultrasonic blind stick as we get through this we will understand the steps as first is discussion about the project then the research and the further process as mentioned in the chart.

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VI. EXPERIMENTAL RESULT

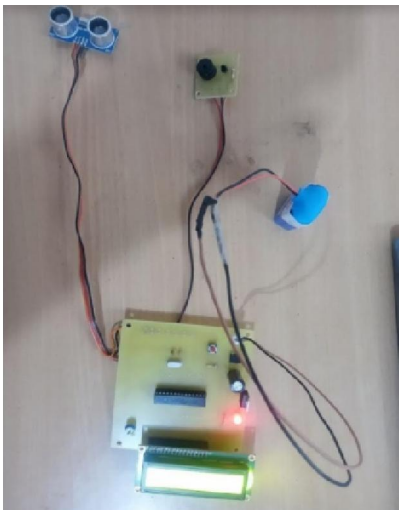

Figure 9: Components Connection

It shows the connection of the components we required like ultrasonic sensor , at mega 328 microcontroller along with 9v battery and LDR module.

Figure 10: Working of the Components

Above image shows the working of the components and the stick as we can now detect the obstacle by using this as ultrasonic sensor detects the obstacle and inform the user of the stick.

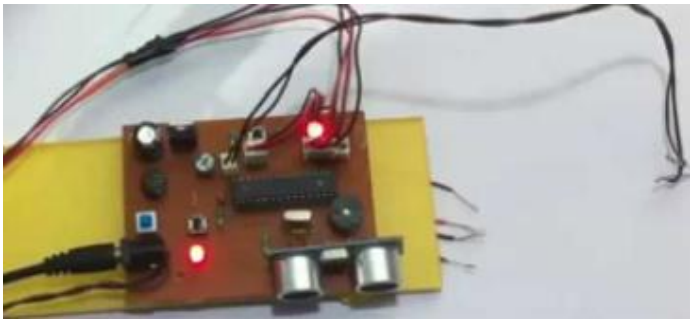

Figure 11: Mounting of the Components on Stick

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VII. ADVANTAGES

1. The system enables the blind people to move with the same ease and confidence as sighted people.
2. Avoid the obstacle based on ultrasonic sensor.
3. Facilates the easier communication in case of emergency.
4. Auto detection.
5. Simple to use.

VIII. CONCLUSION

In the end of our project, we can conclude that our project can reduce the number of risk and injuries for the visually impaired person when walking at public. Nowadays, even at young age experience the visually impairment. This thing cannot be taken so lightly as they know how much risk could it be. If the number of risk and injuries increasing rapidly, the kid or the person will loss their spirit to walk independently.

The Blind Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to navigate safely both indoor and outdoor. It is effective and affordable. It leads to good results in detecting the obstacles on the path of the user in a range of two meters. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles.

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