

Ultrasonic Blind Walking Stick

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ABSTRACT: The blindness is frequently used to describe severe visual impairments with or without residual vision. The application of ultrasonic ranging scheme for producing residual vision electronic walking stick for the blind is technological advancement. There is a great dependency for any type of movement walking within area or out of a particular area; they use only their natural sense such as touch or sound of identification on walking. To overcome all these problems of blind people, we are developing a project by using simple available technologies. The walking stick with sensor with the help of which it has been possible to enhance more features to the walking stick. The features are to detect the obstacle for collision avoidance, it detects the object in directions up, down and front. The other sensor placed near bottom tip of the walking cane to find the pits on the ground. We integrate these sensors to the voice record and play chip. In this project, sensors play a key role to detect the objects in all directions and thus help blind people to be independent.

KEYWORDS: Arduino, Ultrasonic sensor, Buzzer, LCD.

1. 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 (stick) for them for easy usage and navigation in public places. The blind 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 micro controller. Then the microcontroller 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 micro controller 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 stick if they forget where they kept it. A wireless RF based remote is used for purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled person.

1.1 Objectives

There are some objectives need to be achieved in order to accomplish the work. These objectives will act as a guide and will restrict the system to be implemented for certain situations. To develop a model of ULTRASONIC BLIND WALKING STICK by using the ultrasonic sensor detect the objects. To use Arduino (IDE) software to generate a computer program for the arduino.

1.2 Significance:

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 stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

2. SELECTION OF ULTRASONIC SENSOR

There are numerous types of ultrasonic range sensors available with key differences in frequency and power consumptions. Ultrasonic sensor with high frequency will have a sharper beam width and can detect obstacles in longer range. Also some of the new sensors have similar range detection as previous models but with less power consumption. In this project, the ultrasonic sensor must be able to detect obstacles or objects from 2cm to 400cm. Since the whole system power supply will be taken from battery supply, the less current consumption is crucial and must be able to operate at low voltage. HC-SR04 meets the criteria of this project to detect the obstacles in a short period after the long research was done between the HC-SR04 and others Ultrasonic sensors.

3. ARDUINO

Arduino is a software company, project, and user community that designs and manufactures computer open - source hardware, open source, and microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/ O pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interface, including universal serial bus (USB) on some models, for loading programming from personal computers. Arduino are used in automatically controlled devices such as control systems, office machines, automobile engines, power tools and so on. By reducing the size, cost and power consumption, arduino makes it economical to electronically control more and more processes.

4. BLOCK DIAGRAM

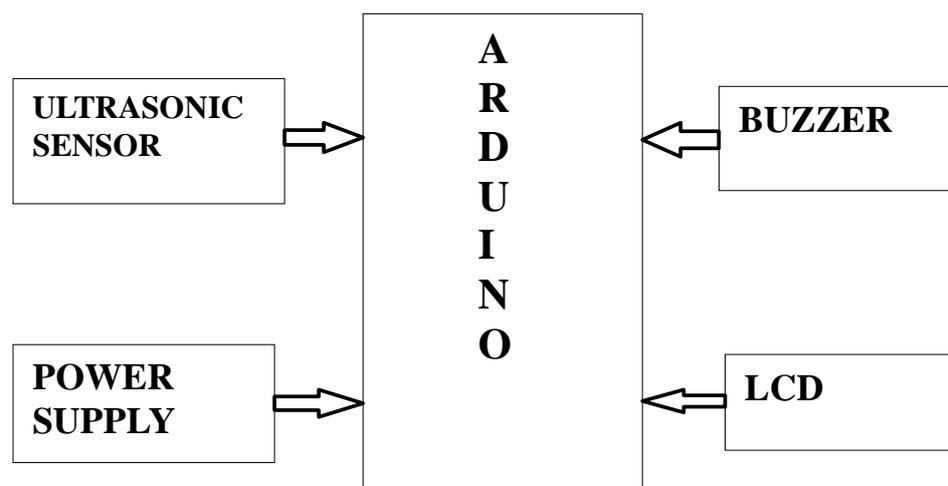


Fig1: Block Diagram

4.1 The HC-SR04 Ultrasonic Sensors:

The ultrasonic sensor must be able to detect obstacles and objects from 2cm to 400cm. Since the whole system power supply will be taken from battery pack, the less power consumption is crucial and must be able to operate at low voltage. SR04 meets the criteria of 16 this standard to detect the obstacles in a short period after the long research work was done to select between the SR04 and others Ultrasonic sensors.

4.2 HC - SR04 features:

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principles of work are:

- Using IO trigger for at least 10 μ s high level signal,
- The Module automatically sends eight 40 kHz signals and detect whether there is a pulse signal back.
- IF the signal comes back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Wire connecting direct as following:

- 5V power supply
- Trigger Pulse Input
- Echo Pulse Output
- 0V Ground

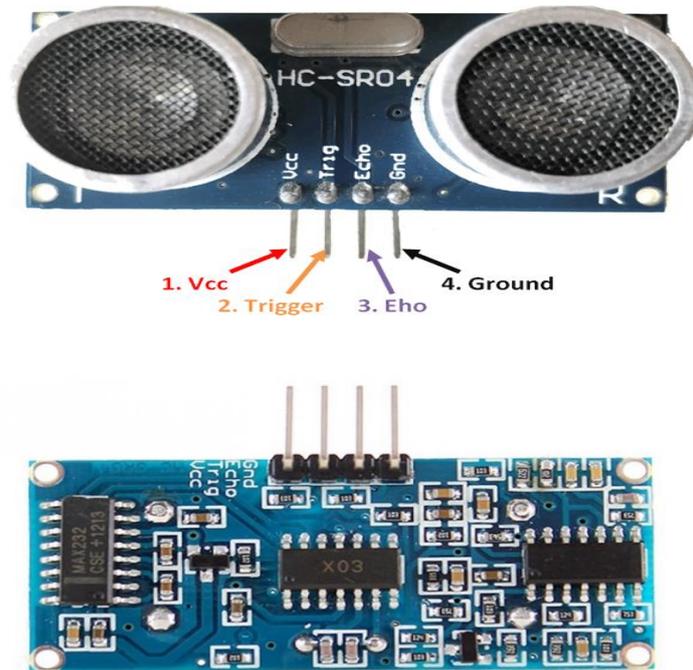


Fig 2: HC-SR04 ultrasonic sensor

4.3 Arduino UNO:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it

features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino moving forward.

5. PROGRAMMING

The Arduino Uno can be programmed with the Arduino software. The ATmega328 on the Arduino Uno comes pre burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

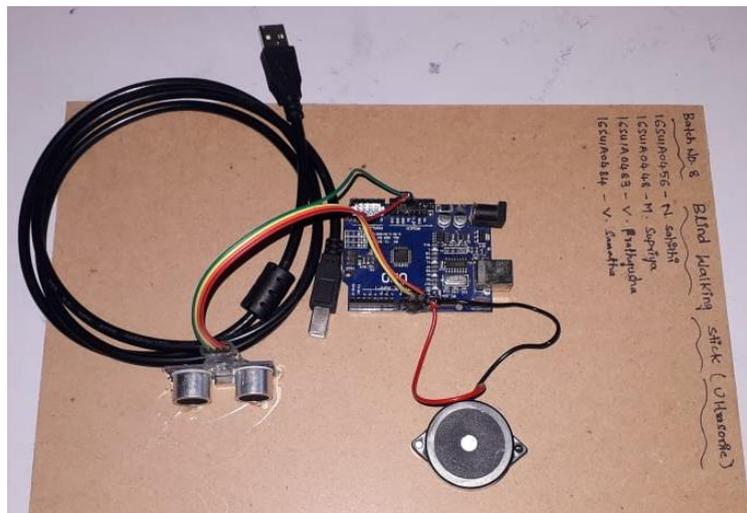


Fig 3: Hardware implementation

7. CONCLUSION

All the studies which had been reviewed show that, there are a number of techniques for making a ultrasonic blind walking stick for blind people. The advantage of the system lies in fact that it can be prove to be a very low cost solution to millions of blind persons world wide. The smart white can is a practically feasible product and convenient to carry around like any other walking sticks. This could also be considered a crude way of giving the blind a sense of vision. The system can be supplemented with actual GPS MODULE used in cars and we can provide a vibrator for the partially deaf person. It can be further enhanced by using VLSI technology to design the PCB unit. This makes the system further more compact. A wall following function can also be added so that the user can walk straight along a corridor in an indoor environment.

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