1. INTRODUCTION

One of the most precious gifts to a human being is an ability to see, listen, speak and respond according to the situations. But there are some unfortunate ones who are deprived of this. One of them are blind people when it comes to travel alone. For a normal human being only obstacles create huge problems. Thus to avoid such things for blind people we have designed an obstacle detection using ultrasonic sensors by using this it will help them to travel all alone without anyone's help.It has often been observed that the stick blind people use to detect obstacles, becomes useless when obstacle is raised over the ground by some means or obstacle is not directly infront of the people. In this case our device will help the people to detect the obstacles So we have intended to do is to create a device which visually impaired people can wear and then walk without having any worry about obstacles. So considering all these conditions we have implemented our device in cap so it becomes very easy for the blind people to wear it. The cap basically consist of the ultrasonic sensors, arduino nano , vibrating motor, lipo battery(3.7 V).

Moreover we have connected the vibrating motor with Ultrasonic sensor. When objects come in range of ultrasonic sensor then cap will vibrate. The vibration increases if the object comes toward the stick and vibration decreases when object goes far from the cap.

Ultrasonic Sensors this sends a ultra sound wave from it's sender mechanism. The wave gets reflected when it hits the obstacle and is received by the onboard receiver. When there is object in front of the user , the vibrator motor will start and the person will get to know there is object ahead or not

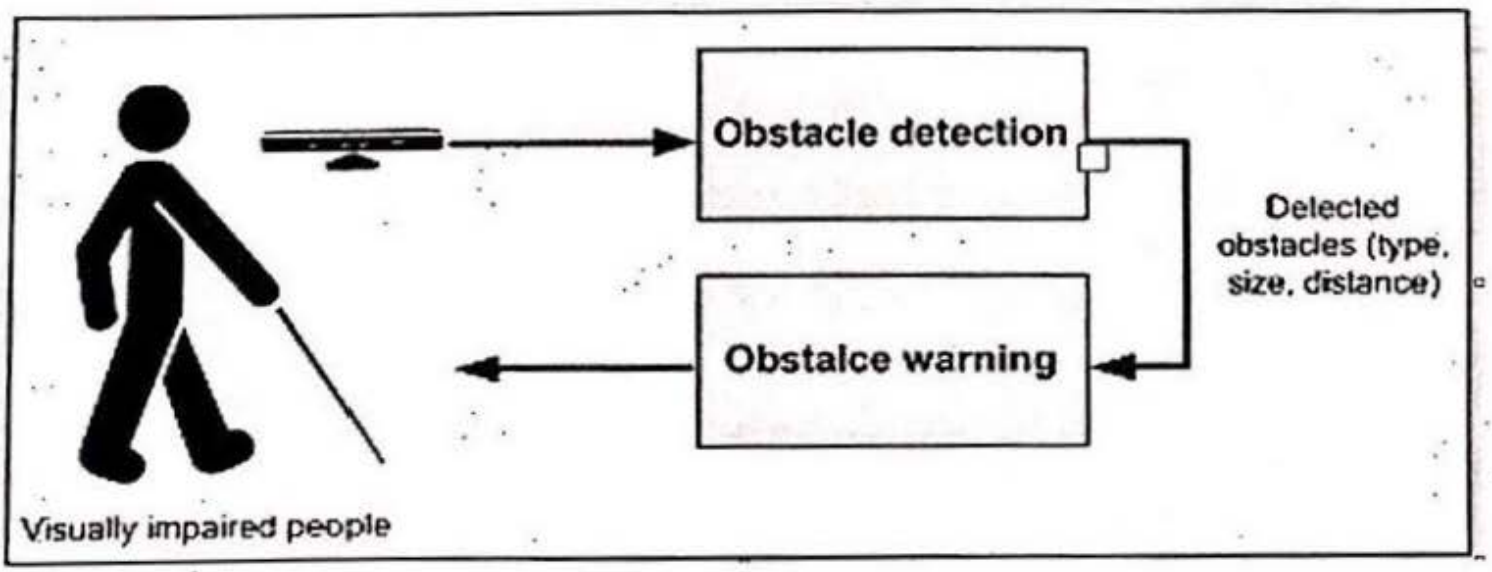


Fig 1: OBSTACLE DETECTION USING ULTRASONIC SENSORS.

Abstract

In our project. we intend to create a device that will help vision impaired people to better avoid obstacles. It has often been observed that the stick blind people use to detect obstacles,becomes useless when obstacle is raised over the ground by some means or obstacle is not directly infront of the people. In that case, the stick doesn't make the user aware that there is a obstacle here.
So what we intend to do is create a device which vision impaired people can wear and then walk without having to worry about obstacles. The device will vibrate when an obstacle is ahead of the user and thus avoid it.

We implemented a wearable system for visually impaired users which allows them to detect and avoid obstacles. This is based on ultrasound sensors which can acquire range data from objects in the environment by estimating the time-of-flight of the ultrasound signal. Using a hemispherical sensor array, we can detect obstacles and determine which directions should be avoided. However, the ultrasound sensors are only used to detect whether obstacles are present in front of users. We determine unimpeded directions by analyzing patterns of the range values from consecutive frames. Feedback is presented to users in the form of vibration patterns.

Visually impaired people typically depend on a stick for walking outdoors. Although a stick is a simple device, it has a disadvantage that it can only detect obstacles through making contact with them. However, it is not safe, and that can be challenging and inconvenient for a visually impaired person to look after. To solve these problems, researchers have devised a variety of methods and systems to help visually impaired people.

Thus for helping visually impaired people we have designed a cap which the bind person can wear and the cap consist of ultrasonic sensors which will help to detect the obstacles.

2. Problem Definition

It is been widely observed that the physically challenged people find it difficulty in various situations. Like visually impaired people find difficulty in travelling alone . In the era of technology and modern advancements, with the help of technological aids these difficulties can be overcome easily. Using Ultrasonic Sensors Device, we are implementing a system that can help blind people to overcome obstacle. For every certain things the blind person can identify the obstacles somehow. Using this ultrasonic sensors the persons will get to know where the obstacle is. The ultrasonic sensors is fitted in a cap which is very easy to wear for a person and to travel all alone anywhere with this device. With ultrasonic sensors the arduino nano is used . Arduino nano is a very useful device that comes with a wide range of applications and covers less space as compared to other Arduino board. Breadboard friendly nature makes it stand out from other board. Ultrasonic distance sensor determines the distance to an object by measuring the time taken by the sound to reflect back from that object. The frequency of the sound is somewhere in the range of ultrasound, this ensures more concentrated direction of the sound wave because sound at higher frequency dissipates less in the environment.

Using these ultrasonic sensors the blind people can walk freely without any worry of obstacles. The system is implemented using Arduino Nano. Ultrasonic Sensors. Vibrating Motor, Connecting Wires. Lipo Battery (3.7 V).

3. Design Methodology

3.1 Components Required

1. Arduino Nano - It is a Microcontroller board developed by Arduino.cc and based on Atmega328p / Atmega168. Arduino Nano is a small, compatible, flexible and breadboard friendly Microcontroller board, developed by Arduino.cc in Italy, based on ATmega328p (Arduino Nano V3.x) / Atmega168 (Arduino Nano V3.x). It comes with exactly the same functionality as in Arduino UNO but quite in small size.It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V.

2. Ultrasonic Sensor – An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

3. Lipo Battery (3.7 V) – Lipo Rechargeable Battery also known as Lipo or Lipoly batteries are thin, light and powerful. This battery has a capacity of 500mAH. These Batteries are widely used in GPS, DVD, ipod, Tablet PC, MP4 Player, Power Bank, Mobile Backup Power Supply, Bluetooth Speaker, IOT and other DIY and Industrial applications.

4. Vibrator Motor - A vibrator is a mechanical device to generate vibrations. The vibration is often generated by an electric motor with an unbalanced mass on its driveshaft .

3.2 Circuit Connections

The relay circuit, gesture sensor, and the Sound Recorder (ISD 1820) are interfaced with the Arduino board. The Arduino UNO controls and operates the different interfaced sensor, actuators and modules. The circuit connections are as follows –

Power Supply – In the circuit, Arduino board needs a 5V regulated DC while APDS 9960 and ISD 1820 need 3.3V regulated DC for their operation. The AC mains is used as the primary source of power. The rectified output is regulated to 5V and 3.3V. The respective voltage outputs are drawn from pin 3 of the respective voltage regulator ICs. A LED along with a 10K Ω pull-up resistor is also connected between common ground and output pin to get a visual hint of supply continuity.

DEVICE	ARDUINO PIN No.
VCC	4
GND	GND
Echo	3
Trig	2
Motor Positive	5
Motor Negative	GND

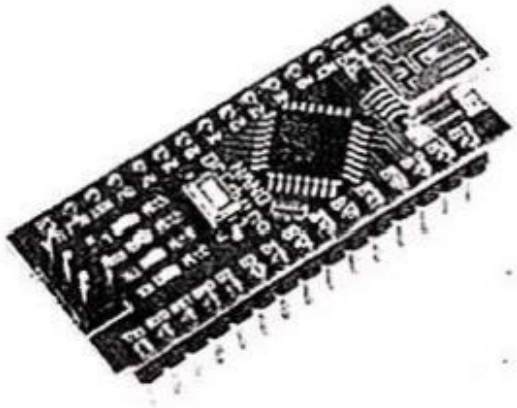


Fig 1:- Arduino Nano

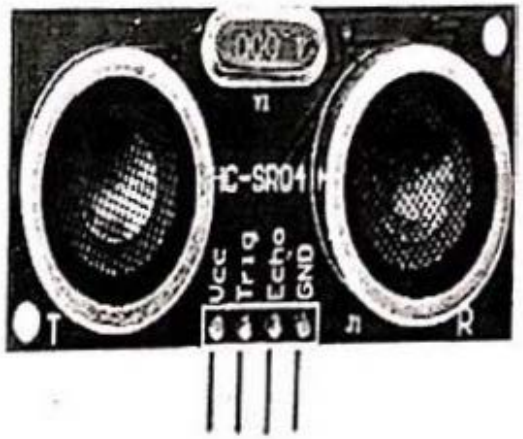


Fig 2:- Ultrasonic Sensor (HCSR04)

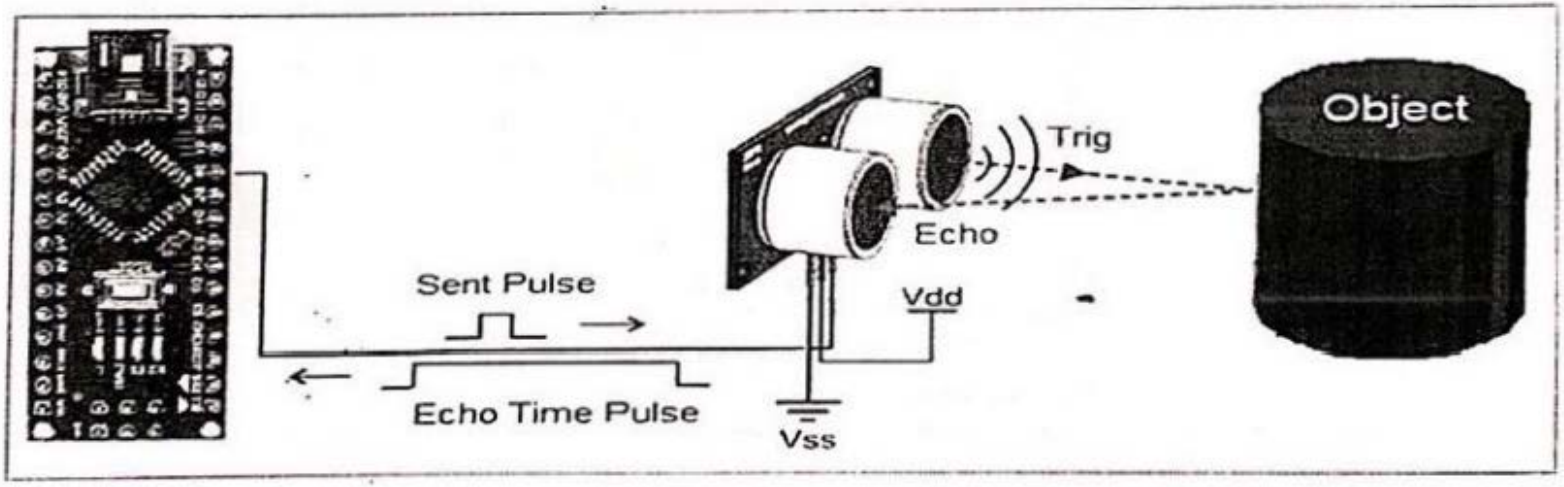


Fig 3:- Working of ultrasonic sensor

Circuit Diagram

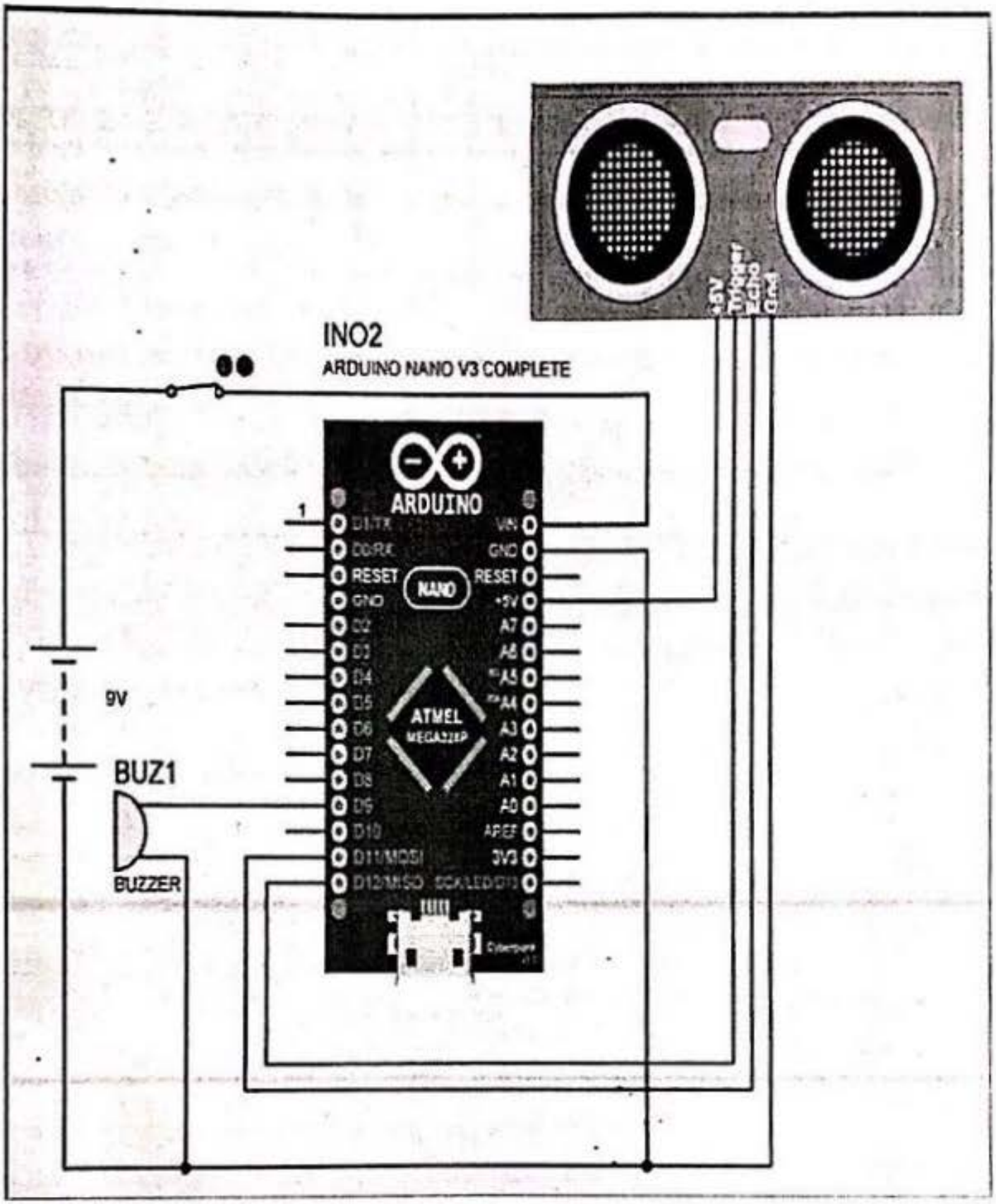


Fig 4:-Connection Diagram

3.3 Circuit Working :-

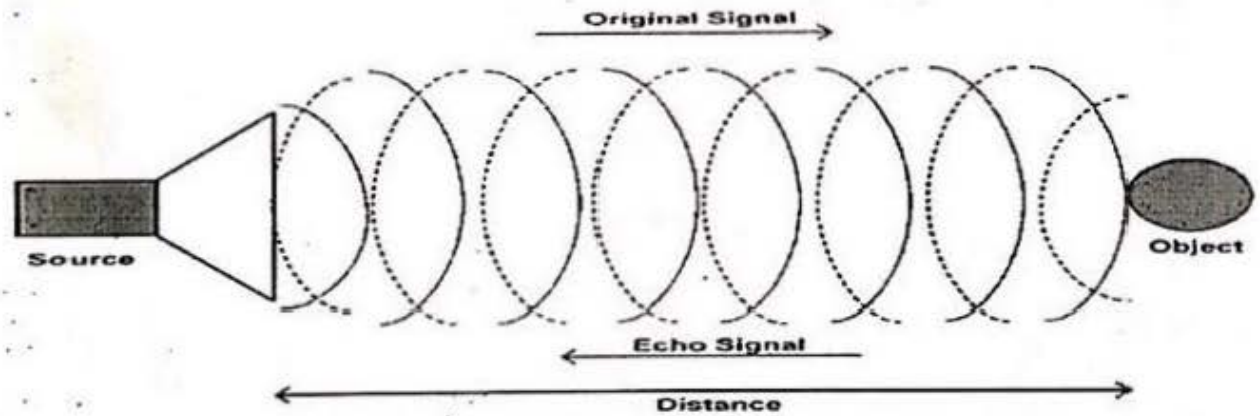
When the Arduino is powered on, ultrasonic sends a small pulse of ultrasound for 10ms. It then waits for the pulse to reflect from a obstacle. This is done by echo pin on ultrasound sensor. If it receives a signal, it starts a counter and counts the time for which it is high.

Using this time, we can calculate the distance between obstacle and user. After we get the time, we then check if distance is less than 200cm. When distance is less than 200 cm we send a high signal to motor pin, which starts the vibration motor. Thus the user is alerted that there is a obstacle is infront of the user.

As stated earlier, most practical pattern recognition systems are composed of multiple modules. In this Project we will be using the An Arduino nano as the processing unit, Ultrasonic Sensors, Connecting wires, Lipo Battery (3.7 V).

The project is built on Arduino Nano and has an ultrasonic Sensor for the user.

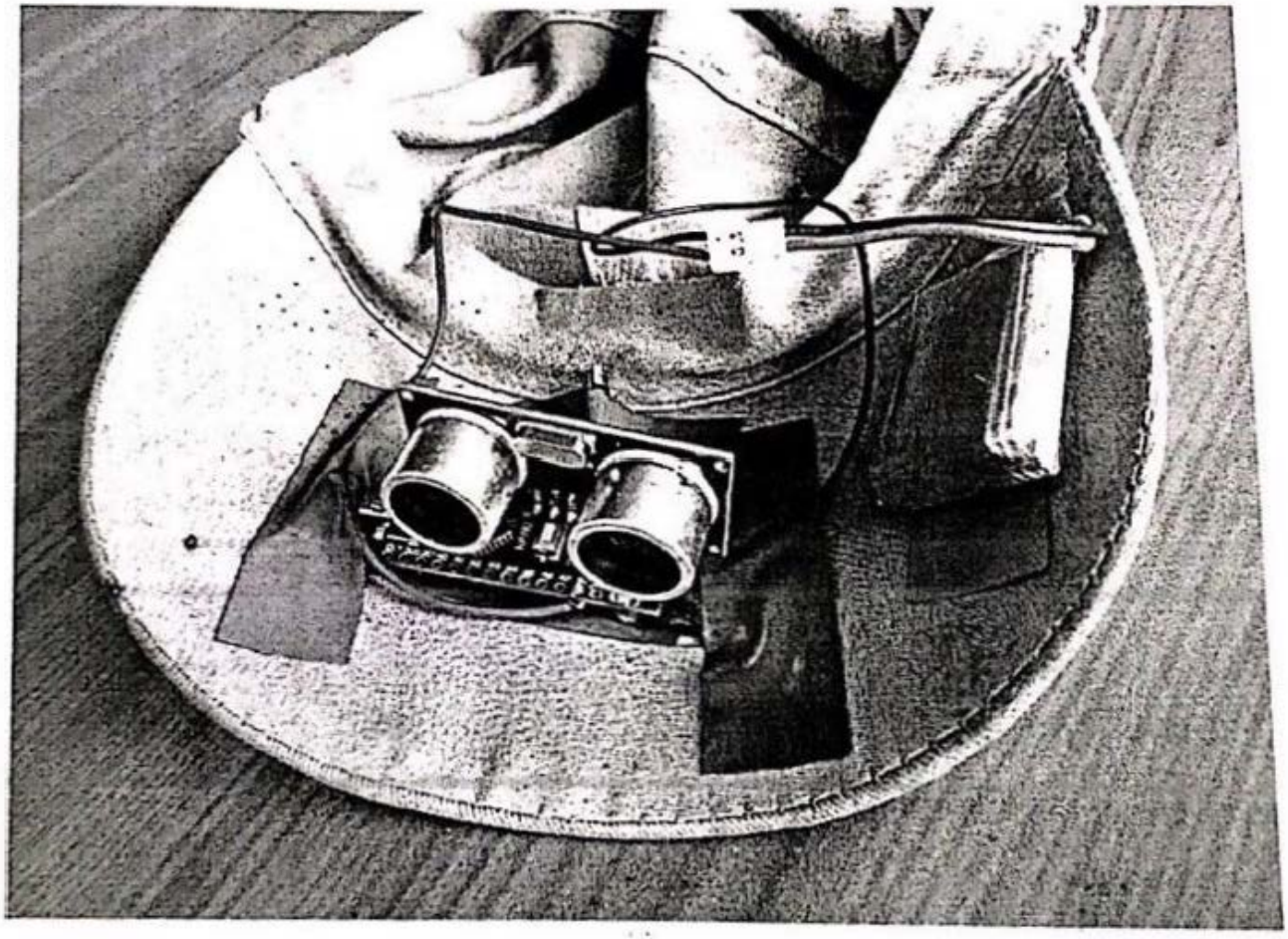
The ultrasonic sensor works on the principle of SONAR and RADAR system which is used to determine the distance to an object. An ultrasonic sensor generates the high-frequency sound (ultrasound) waves. When this ultrasound hits the object, it reflects as echo which is sensed by the receiver as shown in below figure.



The system designed in this project controls basically 4 appliances which are taken by Arduino nano atmega 328, Ultrasonic Sensor, Lipo Battery (3.7 V) , Vibrator Motor.
The device vibrates if there is any obstacle around it this helps the person to whether the object is ahead vibrates . The ultrasonic sensor is connected with arduino nano the Arduino nano is used because it is small in size and it is flexible an ultrasonic sensor is able to detect the measureable distance upto 400 cm . We have used 3.7 V lipo battery for its high capacity and light weight.

6. RESULTS:

The working model of the proposed AVR Atmega32 microcontroller based range finder using ultrasonic module was successfully designed and implemented. The performance of the circuit was analysed for different conditions. The circuit was able to measure distance up to 200 cm. Circuit was tested for measurement of various distances in different atmospheric conditions, accurately. It has a fast response. The ultrasonic module works fine. It responds to the incoming echo accordingly. By using ATmega32 and HC-SR04 we were able to reduce the cost and increase efficiency. This implementation has been a major component in the circuits of major fast consuming electronic goods.



7. Future Scope:

1. Using two or more ultrasonic sensors, we can cover more area for obstacle detection. Currently our object is detecting only front obstacles but in future we planned for right and left obstacles also using multiple devices.

2. Better battery will reduce weight and also provide more duration for our obstacle detector. In future we planned for replacing a normal battery by a solar compatible battery.

3. Using a camera to provide more details of obstacles can be done.

4. Put two motors into the cap, so that left motor will vibrate when there is obstacle to left and right motor will vibrate when obstacle is to right.