

# Implementation on Object Detection Using Ultrasonic Sensor with the Help of Arduino

Deepa Bisen<sup>1</sup>, Farheen Khan<sup>2</sup>  
Kalyani Dhabarde<sup>3</sup>, Sanchita Kaste<sup>4</sup>

1(Smt Radhikatai Pandav College of Engineering, Nagpur

2 (Smt Radhikatai Pandav College of Engineering, Nagpur

3 (Smt Radhikatai Pandav College of Engineering, Nagpur

4 (Smt Radhikatai Pandav College of Engineering, Nagpur

## Abstract:

The setup is developed to detect an object using ultrasonic sensor and interfaced with arduino. Question identification should be possible utilizing an assortment of sensors-Ultrasonic, IR, radar, laser, and so forth. With the help of ultrasonic sensor, can detect the object & measure the distance with high accuracy by using micro controller. The scope of 2cm to 2m with a determination of 0.3cm is estimated utilizing ultrasonic transducer. Arduino is a little microcontroller board with a USB attachment to interface with sensor. The arduino board is sense the earth by accepting contribution from a ultrasonic sensor. In this undertaking separation estimation and discovery of a question by utilizing ultrasonic transmitter, beneficiary and a microcontroller is introduced.

**Keywords** — Ultrasonic Sensor, Microcontroller, Distance Measurement

## I. INTRODUCTION

The venture is intended to display identification of any protest before the ultrasonic transducer. It can be utilized for applications like security zone checking, separate estimating and so on. The ultrasonic module is interfaced to the microcontroller. At whatever point any question draws close to the ultrasonic module, the flag transmitted the transmitter is reflected by this protest and it is gotten by the ultrasonic module. At the point when the microcontroller gets the flag from ultrasonic collector it make act the yield to make the reasonable move.

The ultrasonic sensor used for challenge revelation system with the help of arduino contraption. Ultrasonic sensor gives a basic technique to distinguish the inquiry. The sensor is ideal for distinguish between moving or stationary items.

### A. ULTRASONIC SENSOR

Ultrasonic sensor having four pins i.e. VCC, Trigger, Echo, GND. Which are related with the arduino gadget.

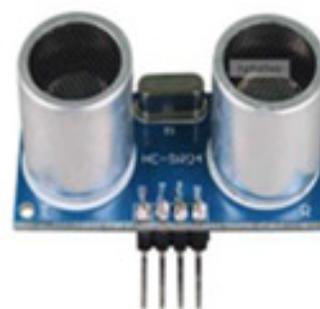


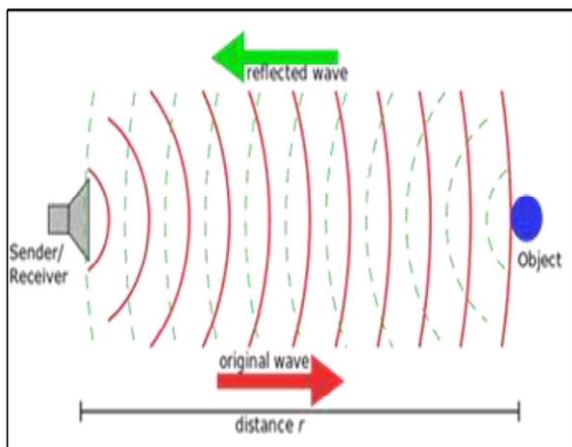
Fig.1 Ultrasonic sensors

gadget.

### A. WORKING PRINCIPLE OF AN ULTRASONIC SENSOR

The ultrasonic sensor transmits sound waves and gets sound reflected from a dissent .At the point when ultrasonic waves are occurrence on a protest,

diffused impression of the vitality happens over a wide strong edge which may be as high as 180 degrees. Hence some piece of the scene essentialness is reflected back to the transducer as echoes .In the event that the question is near the sensor, the sound waves returns rapidly, yet in the event that the protest is far from the sensor, the sound waves takes more time to return. In any case, if objects are too far from the sensor, the flag takes so long to return (or is extremely feeble when it returns) that the beneficiary can't recognize



it.

Fig. 2 working principle of ultrasonic sensor

The sensor uses the time it takes for the sound to come back from the object in front to determine the distance of an object.

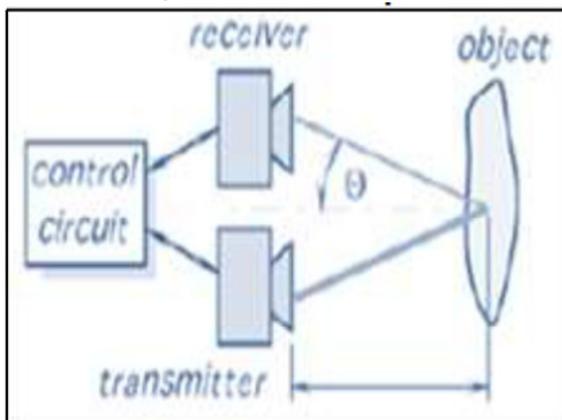


Fig. 3 Block diagram of ultrasonic sensor

$$L = \frac{v t \cos \theta}{2}$$

The distance to the object (L) can then be calculated through the speed of ultrasonic waves (v) in the

medium by the relation, where, 't' is the time taken by the wave to reach back to the sensor and 'θ' is the angle between the horizontal and the path taken as shown in the figure. On the off chance that the protest is in movement, instruments in view of Doppler move are utilized. The ultrasonic sensor can gauge separates in centimetres and inches.

## B. ARDUINO

The Arduino is a microcontroller board in light of the datasheet. It has 14 propelled data/yield pins (of which 6 can be used as PWM yields), 6 straightforward wellsprings of information, a 16 MHz valuable stone oscillator, a USB affiliation, a power jack, an ICSP header, and a reset get.



Fig.4 Arduino

primary point of this venture is to recognize protest that will be in front of ultrasonic The sensor compute the separation of the question from the sensor, additionally measure separation of the moving item The flag are transmitted at whatever point a protest approaches close to the ultrasonic module. These work destinations are to distinguish the settled or moving item.

## II. PROPOSED WORK

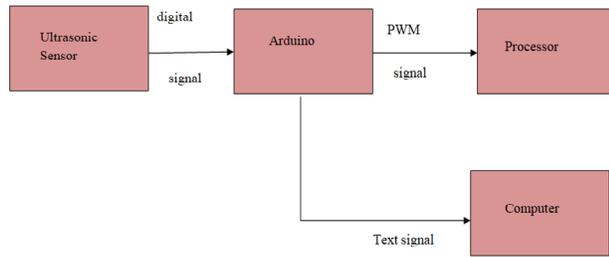


Fig. 5 block diagram

In this work ultrasonic sensor detect the object with the help of arduino. The sensor is connected to the arduino

It is a microcontroller board it is have processor and this processor gives a signal if sensor detects the object.

The arduino having the USB Plug port, through the plug port we can upload the coding in the arduino with the help of USB driver which is connected to the computer.

### III.SYSTEM ARCHITECTURE

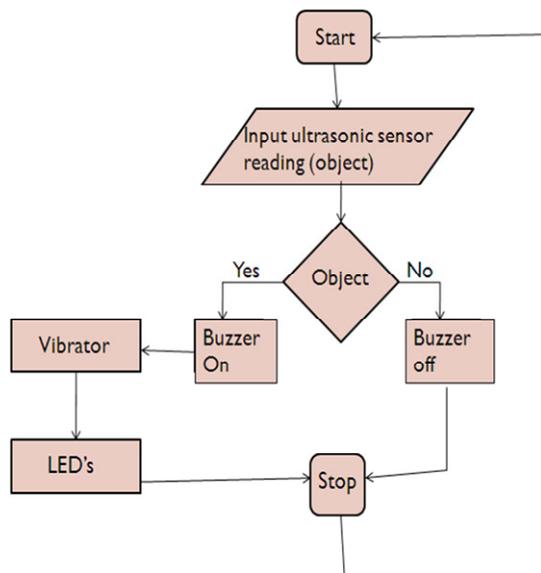


Fig. 6 System architecture

IV. A simple method to follow the meeting paper arranging necessities is to utilize this archive as a layout and basically compose your content into it.

### V. MODULES

1. **Switch on :** To turn on the system get switch on
2. **Reading object:** Sensor read presence of object
3. **Detection of an object:** If object is not in front of sensor
  - a) Then buzzer will off
  - b) If any abject ahead of sensor then buzzer will on.
  - c) Buzzer is in on condition then vibrator gives the sound.
  - d) After detection of an object LED light will glow.
4. **Switch Off:** To turn off the system get switch off.

### VI. TECHNIQUES USED (SOFTWARE & HARDWARE)

#### B. Hardware Requirements:

- Arduino
- Ultrasonic sensor
- Piezo buzzer
- Bread board
- Jumper wires
- LED
- RAM

#### C. Software Requirement

- Programming language: C
- IDE (Integrated Development Environment)

### VII. EXPERIMENTAL RESULTS

#### A Distance Measurement

In this study we take the Ultrasonic sensor HCSR-04. The figures 7&8 show the working of the ultrasonic sensors. In this work keep a flat object in front of the sensor and measure the distance when the code is run. The actual distance is also measured with the help of a scale and both the distances are compared and a graph given below is plotted.

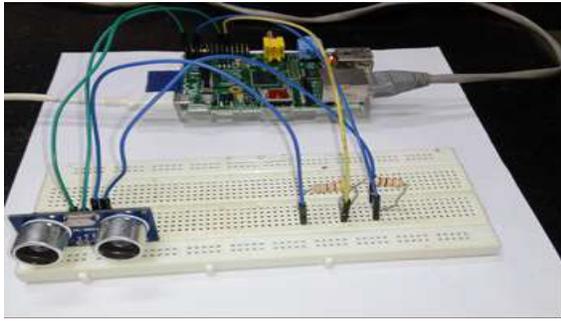


Fig. 7 Experimental setup

Suppose some obstacle is detected in front of the setup, the ultrasonic sensor will detect a receiving signal and finds the approximate distance of the object from the setup

Table I Object Measurement Results

Sr. No	Actual Distance (cm)	Measured Distance (cm)	Percentage error %
1	5	4.94	0.012
2	8	7.86	0.0175
3	10	9.98	0.002
4	13	13.19	0.015
5	15	14.82	0.012
6	18	18.2	0.011
7	20	20.03	0.0015

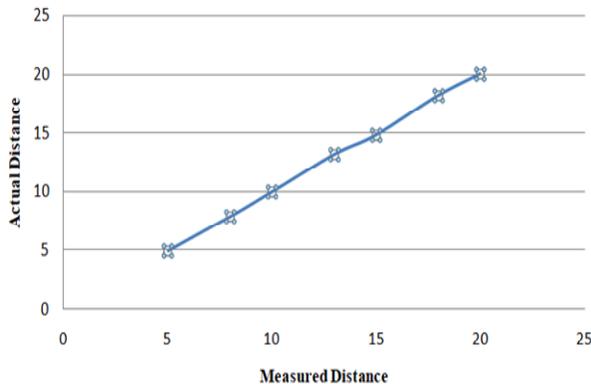


Fig. 8 Actual distance vs measured distance

The experimental results for the distance measurement are shown in Table I. Fig.8 demonstrates the chart between genuine separation and estimated remove. We observe that there is considerable error in the measured distance as

compared to the actual distance. The %error column also shows similar results. Since the error is very small, we can easily correct it while programming the code.

The above ultrasonic sensors were studied and the HCSR-04 ultrasonic sensor was selected,

## VIII. CONCLUSIONS

The above ultrasonic sensors were pondered and the HCSR-04 ultrasonic sensor was picked. It detects any moving and fixed object/ person by using transmitting a ultrasonic echo sound. Also to calculate a distance of that object, if this object is moving then to calculate the speed of the moving object with accuracy in the range of 2cm to 2m. On successful implementation of distance measurement. The detection algorithm was successfully carried out too with minimal errors.

## ACKNOWLEDGMENT

We would like to thank all those who have directly or indirectly encouraged us to take up this project.

## REFERENCES

- [1] J. David and N. Cheeke, "Fundamentals of ultrasonic waves," CRC Press, Florida, USA, 2002, ISBN 0-8493-0130-0.
- [2] S. P. Singh, A. Verma, and A. K. Shrivastava , "Design and development of robotic sewer inspection equipment controlled by embedded systems," *Proceedings of the First IEEE International Conference on Emerging Trends in Engineering and Technology*, Jul. 2008, Nagpur, India, pp. 1317-1320.
- [3] A. K. Shrivastava, A. Verma, and S. P. Singh, "Partial automation of the current sewer cleaning system," *Invertis Journal of Science and Technology*, Vol. 1, No. 4, 2008, pp. 261-265.
- [4] O. Duran, K. Althoefer, and L. Seneviratene, "State of the art in sensor technologies for sewer inspection," *IEEE Sensors Journal*, Apr. 2002, Vol. 2, No. 2, pp. 73-81.
- [5] H. He, and J. Liu, "The design of ultrasonic distance measurement system based on S3C2410," *Proceedings of the IEEE International Conference on Intelligent Computation Technology and Automation*, Oct. 2008, pp. 44-47.
- [6] Y. Jang, S. Shin, J. W. Lee, and S. Kim, "A preliminary study for portable walking distance measurement system using ultrasonic sensors," *Proceedings of the 29th Annual IEEE International Conference of the EMBS*, France, Aug. 2007, pp. 5290-5293.
- [7] C. C. Chang, C. Y. Chang, and Y. T. Cheng, "Distance measurement technology development at remotely teleoperated robotic manipulator system for underwater constructions," *IEEE*

*International Symposium on Underwater Technology*, Apr. 2004, pp. 333-338.

[8] D. Webster, "A pulsed ultrasonic distance measurement system based upon phase digitizing," *IEEE Transaction on Instrumentation and Measurement*, Vol. 43, No. 4, Aug. 1994, pp. 578-582.

[9] Dameifu and zhihongzhao, "moving object tracking method based on using ultrasonic automatic detection algorithm" in 2016 ieee.

[10] Rajan P Thomas<sup>1</sup>, Jithin K K<sup>2</sup>, Hareesh K S<sup>3</sup>, Habeeburahman C A<sup>4</sup>, Jithin Abraham<sup>5</sup> "Range Detection based on Ultrasonic Principle" in *International journal of advanced research in Electrical, Electronics and Instrumentation engineering* in Vol. 3, Issue 2, February 2014.