An IoT based Obstacle Detection and Alerting System in Vehicles using Ultrasonic Sensor

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Abstract— **A simple approach for obstacle detection and alerting user in any vehicle using ultrasonic sensor and IOT is discussed here. This approach uses an ultrasonic sensor which is mounted on a vehicle with a servo motor which can rotate 0 to 180 degrees and can alert the person in the car about the distance between the vehicle and obstacle. A graphical user interface is provided to the user inside the vehicle to monitor the distance and can avoid collision with the obstacle.**

Keywords— *IoT, Arduino,Ultrasonic Sensor.*

I. INTRODUCTION

In today's world as the population increases day by day the numbers of vehicles also increases on the roads and highways. This result in more accidents that interns lead to the traffic jams and public should get help instantaneously. Recent technological developments have made a lot of improvements in avoiding the accidents and ease human life. IoT has made promising improvements in developing some methods to avoid the accidents. The obstacles which are the main reasons for accidents can be detected and accidents can be avoided.

Distance measurement of an obstacle in front or by the side of a moving vehicle is required in the current traffic scenario. The devices used to measure the distance may be small or large and simple or complex. There are various different kinds of sensors available to perform this. In most of the applications, low cost, accuracy of the devices and speed to be considered.

To measure the distance from obstacle, ultrasonic sensors play a vital role. Ultrasonic sensors are very flexible in distance measurement. They provide inexpensive solutions. Ultrasound waves are useful for both the air and underwater [1]. Ultrasonic sensors are also quite fast for most of the common applications.

In this paper we discuss about an IoT based approach for detecting an obstacle and alerting system using ultrasonic sensor. Section 2 discuss about literature review. Section 3 focus on the methodology and its implementation. Section 4 highlights about results and discussion. Finally the paper is concluded.

II. LITERATURE REVIEW

A. K. Srivastava et.al [2] has presented a distance measurement of obstacle using ultrasound sensors and microcontroller P89C51RD2. Sumit Badal et.al [3] has proposed a practical obstacle detection and avoidance system, where the range information is obtained from stereo images by first computing and extracting points above the ground plane. Nils Gageik et.al [4] has discussed an approach for obstacle detection and collision control of a flying unmanned quadrocopter. This approach uses ultrasound sensors with simple data fusion technique. D. S. Vidhya et.al [5] has presented an obstacle detection approach using ultrasonic sensors to detect the obstacles. This approach is implemented in vehicular applications and compared with a small automobile prototype using Raspberry Pi, to provide an output for obstacle detection. Ta-Chung Wang et.al [6] has presented an approach to detect obstacles using Danger Zone approach. This approach is implemented for unmanned vehicles to detect the obstacles and avoid them. The danger zone concept will judge whether the obstacle will cause a possible collision or not. Y. Jang, et.al [8] had studied a portable walking distance measurement system having 90% accuracy.

III. MTEHODOLOGY AND IMPLEMENTATION

The methodology discussed in this paper composes of following phases. Firstly obstacle detection by using ultrasonic sensor from 0 to 180 degree with the help of servo motor. Secondly the sensed data is fed to Arduino board and finally processed by the Arduino software. The architecture of the system is shown in Figure 1.
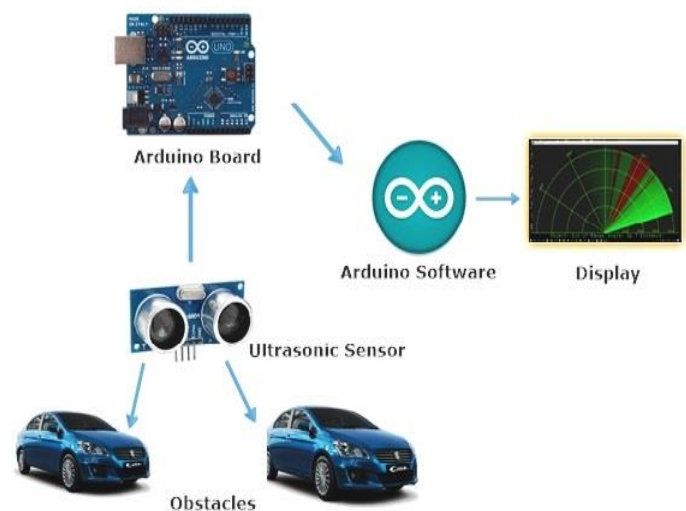

Figure 1. Methodology

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The major hardware components used are discussed here.

A. Ultrasonic Sensors

Figure 2. Ultrasonic Sensor

Figure 2. Shows an ultrasonic sensor used to identify any obstacle is there around a vehicle. The ultrasonic sensor transmits sound waves and receives sound reflected from an object [7]. When ultrasonic waves are incident on an object, reflection of the energy takes place up to 180 degrees. If the obstacle is near the incident energy is reflected back very soon. If the object is far then the reflected signal will take some small amount of time to reach the receiver.

B. Arduino Board

Figure 3. Arduino Board

Figure 3. Shows Arduino board used to connect with the sensor device and provide connectivity and hardware support. It is a platform to implement the hardware connections for the methodology.

IMPLEMENTATION

Figure 4 and 5. Show the implementation of the above methodology.
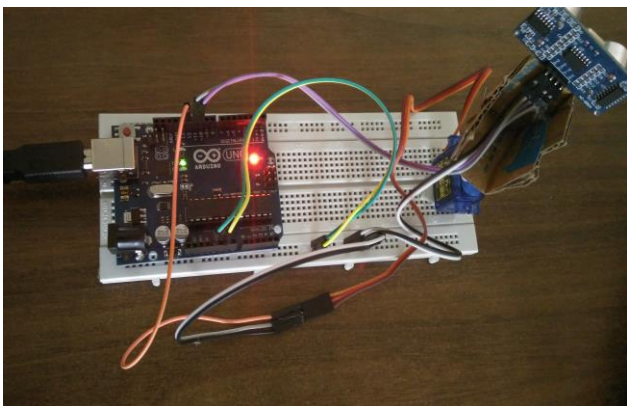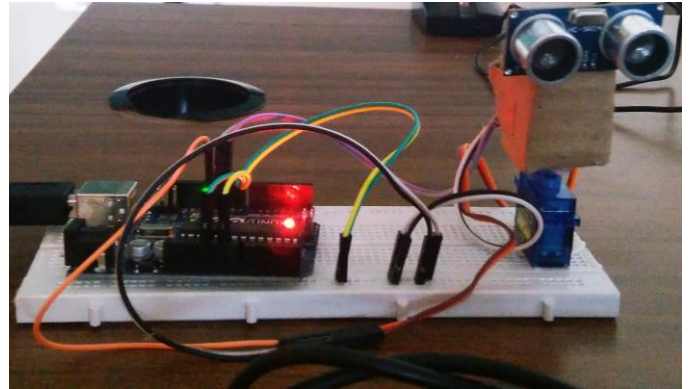

Figure 4. Hardware Implementation

Figure 5. Hardware Implementation

As discussed the ultrasonic sensor is mounted on servo motor which has capability to rotate till 180 degrees. As the obstacle is found within the range of the sensor then an alert is viewed on the screen. HC-SR04 is used as ultrasonic sensor for distance measurement for distances from 2cm to 400cm. It has 4 pins: VCC – 5V, input power; TRIG – Trigger Input; ECHO – Echo Output; GND – Ground.

IV. RESULTS AND DISCUSSION

The following results were obtained from the experiment and it can be seen that if there is no obstacle the entire arc will be green in color. Figure 6. Shows that there is no obstacle.
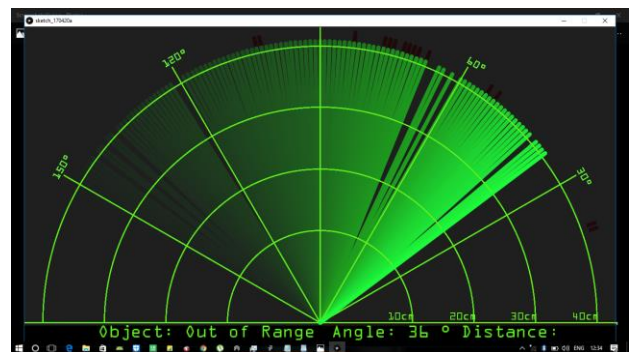

Figure 6. No Obstacle Found

If there is any obstacle found in the path then the arc will become red in color indicating the occurrence of collision. Figure 7. Shows an obstacle found.
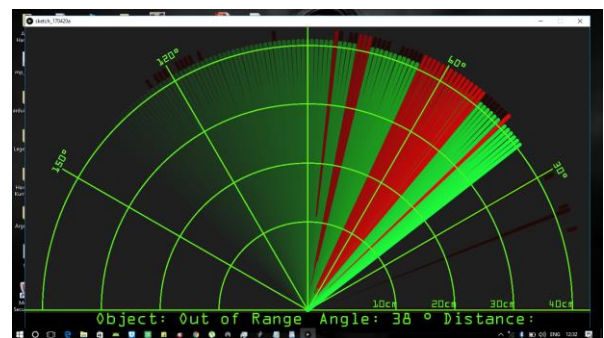

Figure 7. Obstacle Found

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V. CONCLUSION

An IoT based approach for detecting an obstacle and alerting system is discussed in this paper. The methodology employs a distance measurement sensor namely ultrasonic sensor which detects the range of the obstacle and Arduino processes it to alert the vehicle users to avoid the possible accidents.

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