

# Detecting Long Range Objects Under Radar System using Arduino

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**Abstract:** *The increase in demand for security purpose and detection of objects using the radar system has very much popular in many occasions. A new approach of finding objects under radar using Arduino controller makes it more efficient for Detection and Ranging. The Ultrasonic sensor mounted on the servo Motor produce ultrasonic sound waves ,if an object bounce off in their path it interrupts the sound waves which produce a signal to the user by displaying on computer , laptops or on any screen . This project aims at making an efficient, cheaper and more reliable way that reflects all the possible techniques that a radar consists of.*

**Keywords:** RADAR, Ultrasonic Sensor , Arduino controller.

## I. INTRODUCTION

This paper is about finding distance objects under Radar using Arduino with the help of Ultrasonic sensor and Arduino controller which are connected together to produce the output radar in a laptop or computer display. A Radar is nothing but a device capable of finding objects which trespasses it. Using the help of Arduino controller which contains the codes for the function to perform helps in transmit the signal from Ultrasonic sensor to the laptop . Arduino is a single-board microcontroller which used as electronics in multidisciplinary projects which is more accessible. The Ultrasonic sensor is used to transmit sound waves to measure the object distance near it.

This process is also useful in identifying enemies or any unidentified object which comes near the radar zone and display it in the monitor screen. This application can be used mainly in military bases and for other security purposes. This technology can also be used in monitoring flights, ships ,geological observations and for guided missile targets in wars. This process is known for its wide range of purpose in this modern world.

## II. LITERATURE SURVEY

This system upcomes with an idea of monitoring the air toxicity level while traveling on roads and find out the best to travel. For this to perform an IoT kit with arduino IDE and a Wi-Fi module is placed all over the city to measure the air

toxicity level where it provides the best route through android app where the air toxicity is less.

This method is used to harvest energy from rainfall which actually follows the method with the help of piezoelectric transducer with an arduino measuring system. The energy is obtained from a single drop of rain and the Arduino is used to measure the actual energy produced in it .When rain drop falls on the structure creates an impulsive force which generates an impulsive voltage on electrodes.

This method consist of a datalogger built with hardware and software components to experience in multiple sites. The datalogger contains the climatic and electric parameters with accuracy .A 3G technology is included to monitor the environmental conditions with the help of photovoltaic cells to obtain energy from the climatic factors and consume it as electrical energy with help of internet and datacloud where the datalogger is used.

This paper is about improving the urbanization in countries to avoid over filling of garbage wastes in streets. This proposed system will alert by sending SMS or alarm to inform that the garbage is full. When the waste components estimates over the garbagebin it senses it with the help of Arduino controller and send an SMS to the user via the Android application developed for it.

In this modern era automation is one of an important aspect takes place in moving to smart technologies. As of smart technologies there are smart cars which provide better convenience for driving. This technology consist of an Arduino ,ultrasonic sensor and a Li-Fi circuit .First a transmitter and a receiver is placed on the front and the back of the cars .The ultrasonic sensor measures the distance of between the cars and the data is transmitted and send via transmitter which is placed in the backend of the car. The information is received through the receiver of the front end of the second car which shows the speed of the first car to avoid collision. This method is worked by applying this technology on every cars to prevent accidents.

## III. SYSTEM WORKING

The proposed system design shows how the model work with the help of required functions. The ultrasonic sensor is mounted on a servomotor to cover the angle range for the Radar. Where the sensor that produce frequent radio waves is interrupted by any object the ultrasonic sensor return back as if finds any object which measures the distance and the location of the object. These informations is then carried via the arduino controller .

An Arduino controller is nothing but a board which is equipped with a set of digital input output pins to carry connection between hardware and software components. When the signals carried from the ultrasonic sensor to the Arduino board it generate the signals and display it in a monitor screen.

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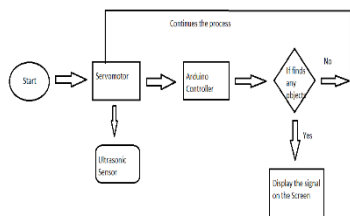
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The Arduino is uploaded with codes that contains the angle range of the servomotor and the distance for each degree of angle and also contains the codes for the format of Radar.

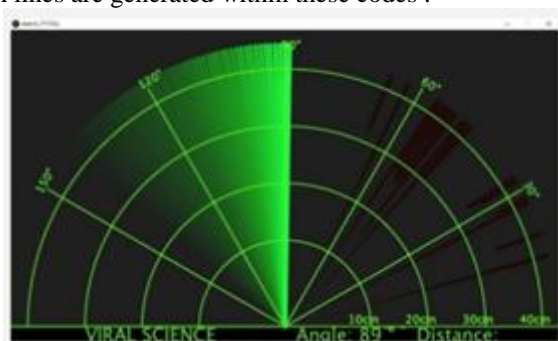


**Figure 1 System Architecture**

This process is continuously run until it finds an object, if it finds any object the above method is processed and displays it on the monitor ,if it doesn't find any object it runs until it finds something.

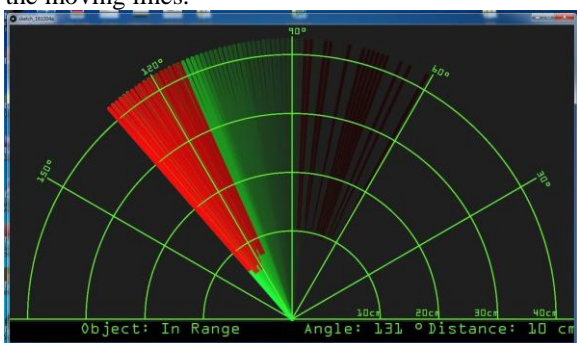
### IV. RADAR DISPLAY

The Radar is displayed with the help of function codes that contain each set of codes to display the Radar on the screen. The code are used to create the arc ,lines and the degree of each lines are generated within these codes .



**Figure 2 Radar with no obstacle**

All these functions comes under void drawRadar() function. Under the drawObject() function the distance of the object and the pixels of the distance objects is also created, and the drawText() function is used to draw the text on the screen. In the end all the above functions are enclosed in void draw(), where the fill function is used for the stimulation for the moving lines.



**Figure 3 Radar with object detected**

The above image shows an Ultrasonic sensor detects an object and display it in a Radar the moving lines shows that an object is detected in an appropriate distance and indicates it in the red colour. These performs should require the above function code to work efficiently.

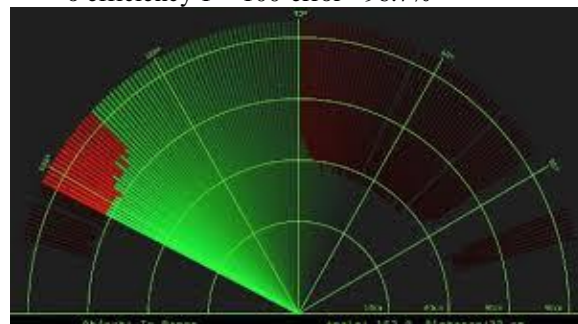
### V. EXPERIMENTAL RESULTS

The proposed system is to find the distance and the angle of the object near the radar system and represents them in a graphical form of radar in the output screen. We used two

objects at different levels to find the efficiency of the system to observe how fast it can identify the objects.

a) Object 1 is placed 31cm far from the radar, radar gives the distance 32 cm :

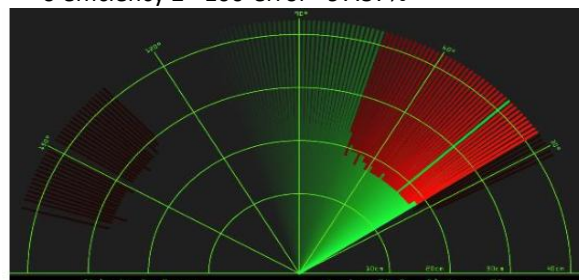
$$\begin{aligned} \text{error} &= ((32-31)/31)*100 = 3.22\% \\ \text{efficiency 1} &= 100-\text{error} = 96.7\% \end{aligned}$$



**Figure 4 testing result of Object 1**

b) Object 2 placed at a distance of 20.5 cm ,radar gives the distance 21 cm:

$$\begin{aligned} \text{error} &= ((21-20.5)/20.5)*100 = 2.43\% \\ \text{efficiency 2} &= 100-\text{error} = 97.57\% \end{aligned}$$



**Figure 5 testing result of Object 2**

### VI. COMPONENTS REQUIRED

#### A. Ultrasonic Sensor

The Ultrasonic sensor is a device which is used for both transmitting and receiving the signals of the data. The sensor generate radio active wave which helps us to find the distance objects .When the waves echoes from the distance object it measures the distance with the use of sensor. The sensor calculates the distance between the object and the device.

This technology has been used in wide range of applications in submarines, chemical process, bats uses ultrasonic sound waves to locate objects and preys in their paths. It can also used medical field to see the images of internal organs, tissues for diagnoses.



**Figure 6 Ultrasonic Sensor**



These sound waves contains high frequency than human ears which is not audible, it is also used in anemometer to measure the wind speed and the direction of wind.

**B. Arduino Controller**

The Arduino controller is a board that contains a set of digital and analog input and output pins they may be used for different use with different sets of boards. It contains an USB cable which is used to connect with a computer, a resonator which help to oscillate the signals of the frequency, a power jack and a reset button to restarts from the beginning of the code.

The Arduino is microcontroller board that is efficient to use between the software and the hardware components. In this arduino controller the programs can be easily loaded with less memory of boot loader.

The Arduino controller uses c/c++ function to perform actions and it is also an Object Oriented programming language to gather all variables and functionality into C programmings.



**Figure 7 Arduino Controller**

**C. Servomotor**

A servomotor provides an acceleration control of a linear or angular motion. It is a closed loop mechanism that provides the action. The servomotor is a DC motor that runs on batteries with a low torque.

It can be used to rotate an object in either directions depends upon the supply. It produce low torque to move less weight object or to pull it. It can usually found in toys and in DVD players to move the CD trays.

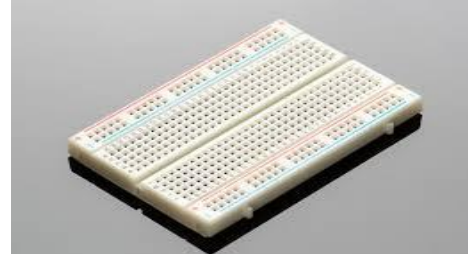


**Figure 8 Servomotor**

**D. Bread Board**

This board helps you to connect electronic components in a basic circuit. It contains numbers of small holes where any jumper cables or connecting wires is placed on the same line to provide a series of circuit connection. It is a solderless based method of connecting wires and components together and it is easy to connect different components together.

The top and bottom rows of the bread boards are in horizontal which contains the positive and negative power supply, while the vertical holes are connected to a metal strip underneath the bread board which provides the connection between these holes. This board is used to test connection supply without soldering the wires everytime.



**Figure 9 Bread Board**

**VII. CONCLUSION**

From this paper, we proposed a improved method for identifying objects in an efficient way. As we discussed about the features using Aduino controller it provides an additional improvement in finding large distance object using C/C++ in a short term and display it in the screen as Radar function. This method can be applicabe for futher future technologies in an improved manner.

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