



## **OBSTACLE AVOIDING ROBOT**

G. Kavitha Reddy, B. Sai Krishna, A. Surendra Reddy, G. Sateesh Kumar

Fourth Year Students, ECE Dept, Tirumala Engineering College.

G. Mallikarjuna Rao, Assoc. Professor, Department of ECE

Corresponding author: G. Kavitha Reddy([kavithagolamari@gmail.com](mailto:kavithagolamari@gmail.com))

### **ABSTRACT:**

The project is designed to build an obstacle avoidance robotic vehicle using ultrasonic sensors for its movement. A microcontroller (ATmega328) is used to achieve the desired operation. A robot is a machine that can perform task automatically or with guidance. The project proposes robotic vehicle that has an intelligence built in it such that it directs itself whenever an obstacle comes in its path. This robotic vehicle is built, using a AT mega 328 micro-controller family. An ultrasonic sensor is used to detect any obstacle ahead of it and sends a command to the micro-controller. Depending on the input signal received, the micro-controller redirects the robot to move in an alternate direction by actuating the motors which are interfaced to it through a motor driver. In this project we are using ultrasonic sensors for detecting the obstacles instead of IR Sensors as they have some limitations to serve the same purpose.

### **I. INTRODUCTION:**

An obstacle avoiding robot is an intelligent device, which can automatically sense and overcome obstacles on its path. Obstacle Avoidance is a robotic discipline with the objective of moving vehicles on the basis of the sensorial information. The use of these methods front to classic methods (path planning) is a natural alternative when the scenario is dynamic with an unpredictable behaviour.

In these cases, the surroundings do not remain invariable, and thus the sensory information is used to detect the changes consequently adapting moving. It will automatically scan the surrounding for further path.

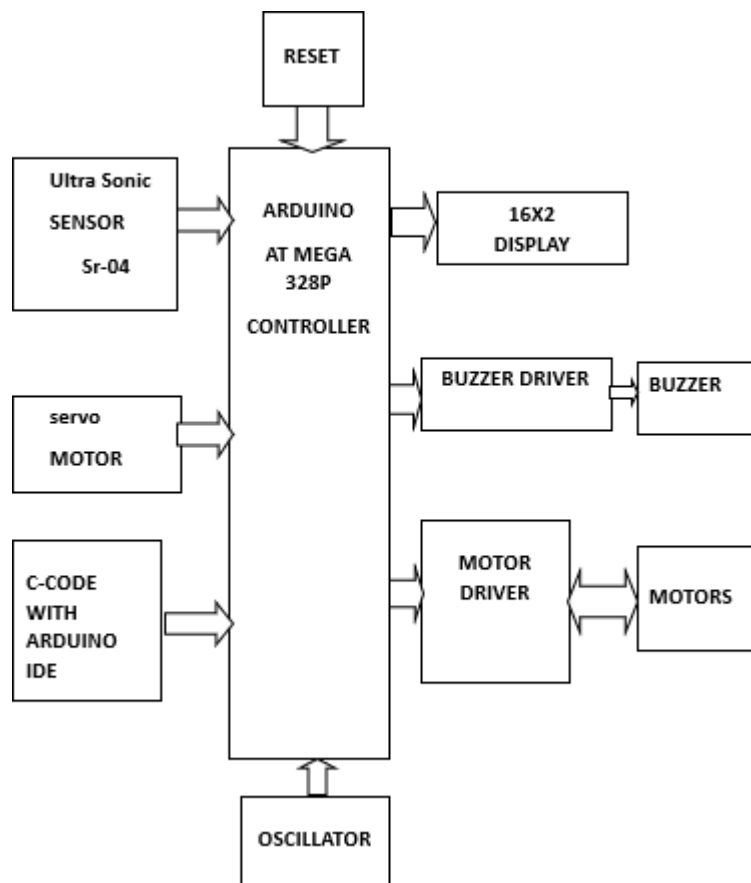
### **II. EXISTING SYSTEM:**

A simple robot, steering algorithm is used for robotic actions in which driver or a human being is controlling the robot using remote. Here driver is present, who can see the obstacle and navigate robot accordingly.

### III. PROPOSED SYSTEM:

The project proposes autonomous robotic vehicle, in which no remote is used for controlling the robotic actions. It intelligently detects obstacles present on its path through the sensors, avoid it and take decision on the basis of internal code that I set for it.

### IV. METHODOLOGY:



The sonar system is used in HC-SR04 ultrasonic sensor to determine distance to an object like bats do. It offers excellent non-contact range detection from about 2 cm to 400 cm or 1feet to 13 feet. Its operation is not affected by sunlight or black material. The ultrasonic sensor emits the short and high frequency signal. If they detect any object, then they reflect back echo signal which is taken as input to the sensor through Echo pin. Firstly user initialize Trigger and Echo pin as low and push the robot in forward direction. When obstacle is detected Echo pin will give input as high to microcontroller. Pulse In function is used for calculating the time of distance from the obstacle. Every time the function waits for pin to go high and starts timing, then timing will be stopped when pin go to low. It returns the pulse length in microseconds or when complete pulse was not received within the timeout it returns. The timing has been determined means it gives length of the pulse and will show errors in shorter pulses. Pulses

from 10microseconds to 3 minutes in length are taken into consideration. After determining the time, it converts into a distance. If the distance of object is moderate then speed of robot get reduced and will take left turn, If obstacle is present in left side then it will take right turn. By using lcd display it will display the distance.

### **AURDUINO ATMEGA328P:**

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.

The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.



### **ULTRASONIC SENSOR:**

Ultrasonic sensor are devices that use electrical–mechanical energy transformation to measure distance from the sensor to the target object.

This is used for sensing the obstacle, measuring the distance, giving input to the controller so that the controller can act accordingly and make other components integrated to it function accordingly.



### **MOTOR DRIVER L293D:**

Arduino board is connected with DC Motor through Motor driver board (pin10, pin11, pin12, pin13) which provide power to the actuators.

The purpose of using motor driver is the motor requires more current than the microcontroller pin provides it, so we need a circuit (transistors) which takes less current amplifies it and generates more current and give it to the motor. This process is done by the motor driver which

is a current amplifier.



## DC MOTORS:

DC motor was used in this project for the movement of the robot. The rear wheels were driven by a motor. Depending upon the input of ultrasonic sensor and ATMEGA 328P, the speed of the motor varies. When the obstacle is at certain distance from the robot, it slows down at first and when it approaches the obstacle it slows down more, and after getting close to the obstacle, it stops.



## SERVO MOTORS:

A servo motor is an electrical device which can push or rotate an object with great precision. If we want to rotate an object at some specific angles or distance, then we use servo motor. It is just made up of simple motor which runs through servo mechanism. If the motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor.



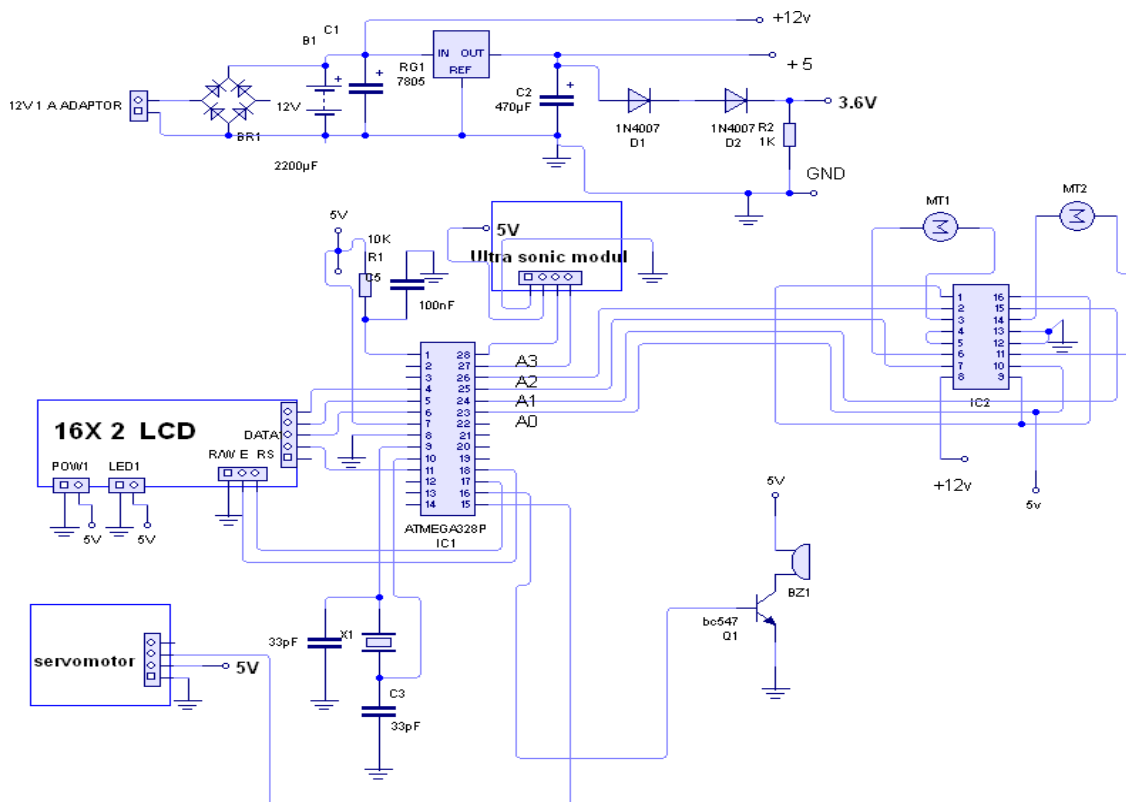
### LCD (Liquid Crystal Display):

A liquid crystal display (LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

Here we are using LCD of 2 Lines 16 characters display for displaying the distance of robot.



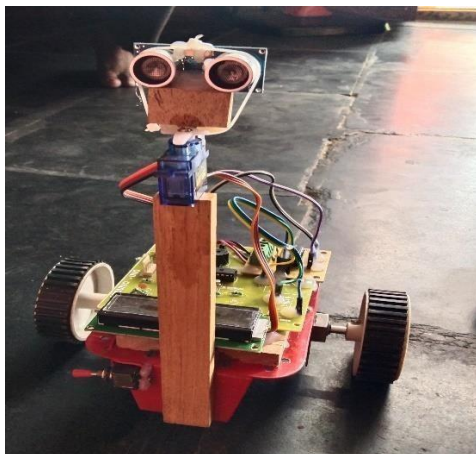
### Circuit Diagram:



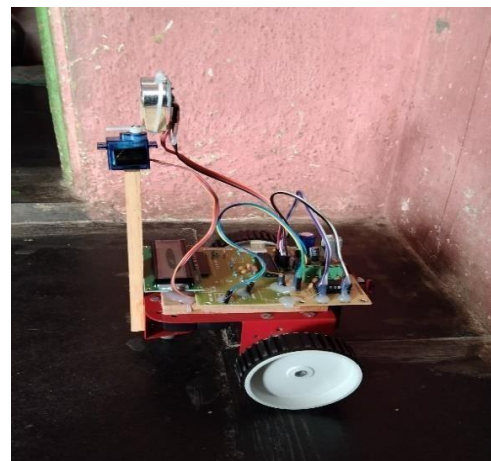
### **Working:**

When the robot is powered on, both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculates the distance between the robot and display the distance on LCD display and the reflective surface. If the object is detected it displays the message as “Obstacle detected” on LCD display. This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 40cm, the Robot stops and scans in left and right directions for new distance using Servo Motor and Ultrasonic Sensor. If the distance towards the left side is more than that of the right side, the robot will prepare for a left turn. But first, it backs up a little bit and then activates the Left Wheel Motor in reversed in direction. Similarly, if the right distance is more than that of the left distance, the Robot prepares right rotation. This process continues forever and the robot keeps on moving without hitting any obstacle.

### **Final Result:**



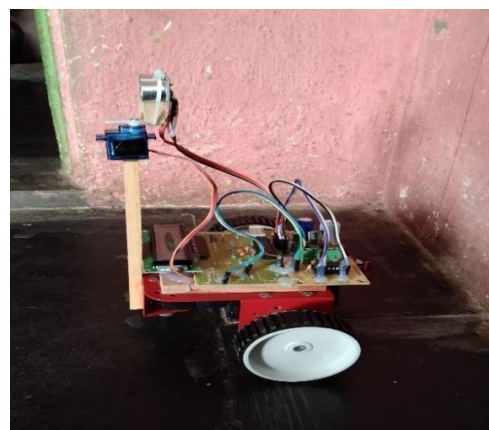
**Fig (a): Moving forward**



**Fig (b): Presence of obstacle**



**Fig (c): Displaying distance of obstacle**



**Fig (d): Change in direction**



### **Conclusion:**

The goal of our project is to create autonomous robot which intelligently detects the obstacle in his path and navigate according to the actions we set for it. This project is been designed and implemented with ATMEGA 328P micro controller in embedded system domain.

Experimental work has been carried out carefully. Sensor's output will be given to controller. According to the program written in the controller it will give instructions to all devices.

### **Future Scope:**

In future this project can be upgraded by connecting Bluetooth module and a camera so that the user can see the detected obstacle on his screen by sitting at just one place. It can be designed even more sophisticated by using touch pads, where the robot can start with a touch or voice detector where voice commands can be set and make them function according to the command. We can also develop an android application in order to control the functioning of the robot using our phone.

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