PROJECT REPORT

Basic IoT Laboratory

Semester IV

SY BTech (A.Y. 2022-23)

Electrical and Computer Engineering (2021-25)

VEHICLE REAR PARKING SENSOR

Group Members

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Title of the Project:

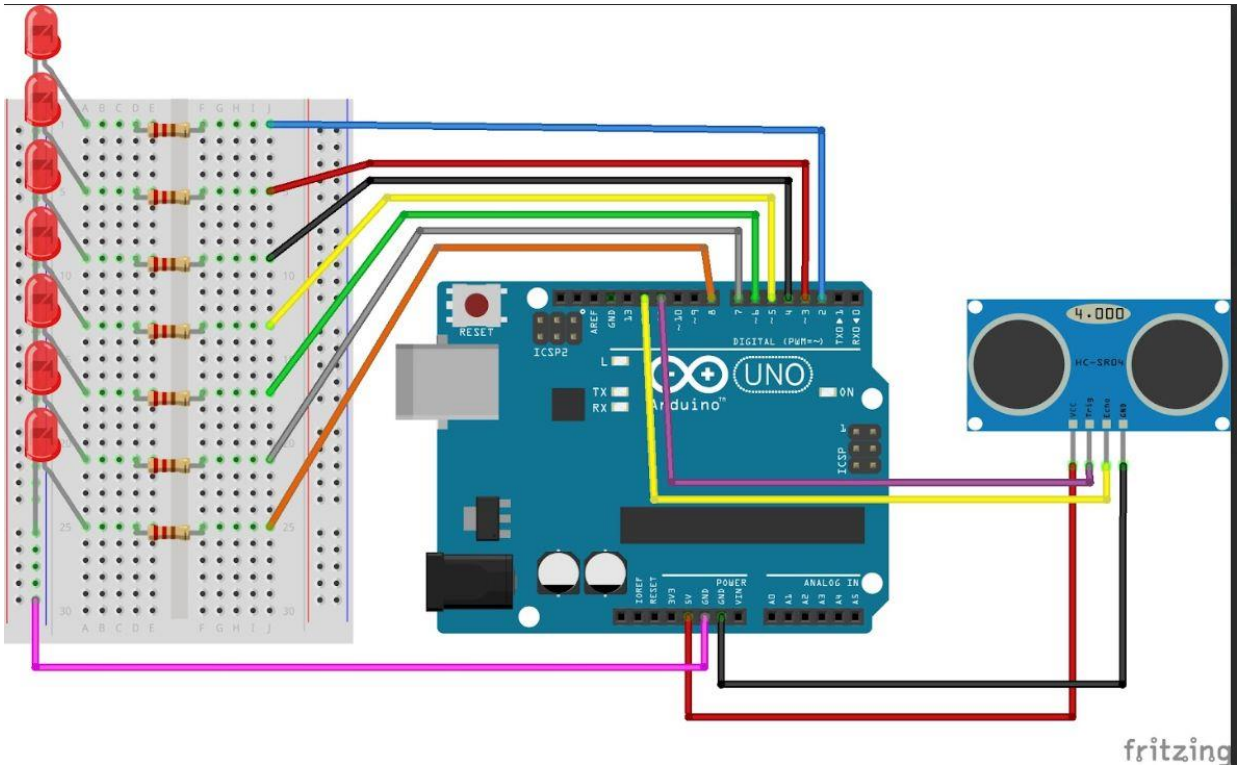
Vehicle Rear Parking Sensor

Using Arduino and Ultrasonic Sensor

Components:

1. Arduino Uno
2. Ultrasonic Sensor
3. LEDs
4. Resistors (1 k Ω)
5. Buzzer
6. Connecting Wires
7. Breadboard

Circuit/Digital Diagram:



Arduino Code:

```
const int trig = 11;
const int echo = 12;

const int LED1 = 2;
const int LED2 = 3;
const int LED3 = 4;
const int LED4 = 5;
const int LED5 = 6;
const int LED6 = 7;
const int LED7 = 8;

int duration = 0;
int distance = 0;

void setup()
{
  pinMode(trig , OUTPUT);
  pinMode(echo , INPUT);

  pinMode(LED1 , OUTPUT);
  pinMode(LED2 , OUTPUT);
  pinMode(LED3 , OUTPUT);
  pinMode(LED4 , OUTPUT);
  pinMode(LED5 , OUTPUT);
  pinMode(LED6 , OUTPUT);
  pinMode(LED7 , OUTPUT);

  Serial.begin(9600);
```

```
}

void loop()
{
  digitalWrite(trig , HIGH);
  delayMicroseconds(1000);
  digitalWrite(trig , LOW);


  duration = pulseIn(echo , HIGH);
  distance = (duration/2) / 28.5 ;
  Serial.println(distance);


  if ( distance <= 5 )
  {
    digitalWrite(LED1, HIGH);
  }
  else
  {
    digitalWrite(LED1, LOW);
  }
  if ( distance <= 7 )
  {
    digitalWrite(LED2, HIGH);
  }
  else
  {
    digitalWrite(LED2, LOW);
  }
```

```
if ( distance <= 10 )
{
  digitalWrite(LED3, HIGH);
}
else
{
  digitalWrite(LED3, LOW);
}
if ( distance <= 15 )
{
  digitalWrite(LED4, HIGH);
}
else
{
  digitalWrite(LED4, LOW);
}
if ( distance <= 17 )
{
  digitalWrite(LED5, HIGH);
}
else
{
  digitalWrite(LED5, LOW);
}
if ( distance <= 20 )
{
  digitalWrite(LED6, HIGH);
}
else
{
```

```
    digitalWrite(LED6, LOW);
  }
  if ( distance <= 25 )
  {
    digitalWrite(LED7, HIGH);
  }
  else
  {
    digitalWrite(LED7, LOW);
  }
}
```

Working Model:

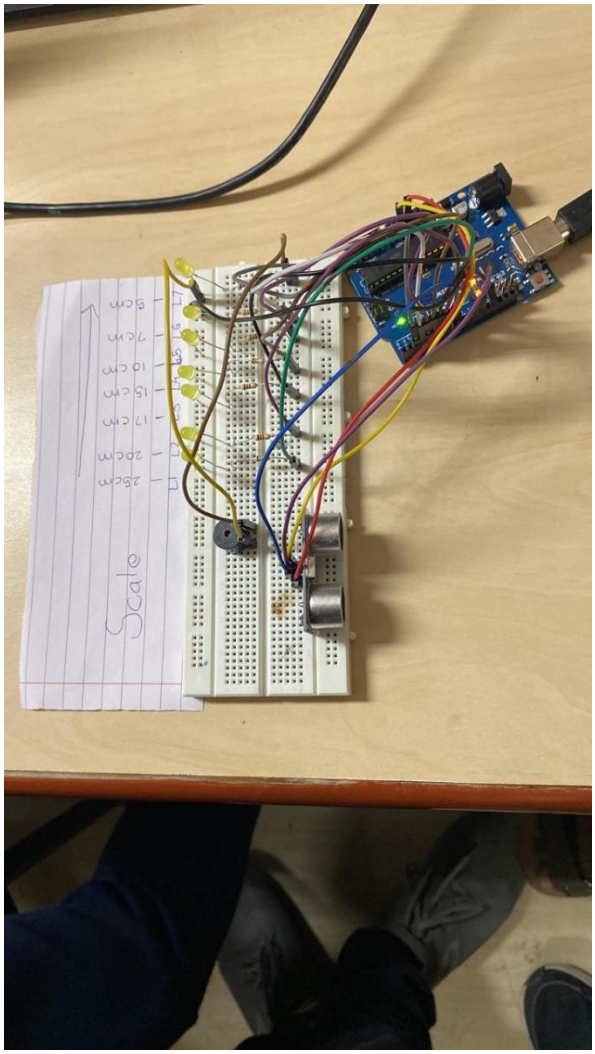


Image 1: Vehicle Far from Obstacle

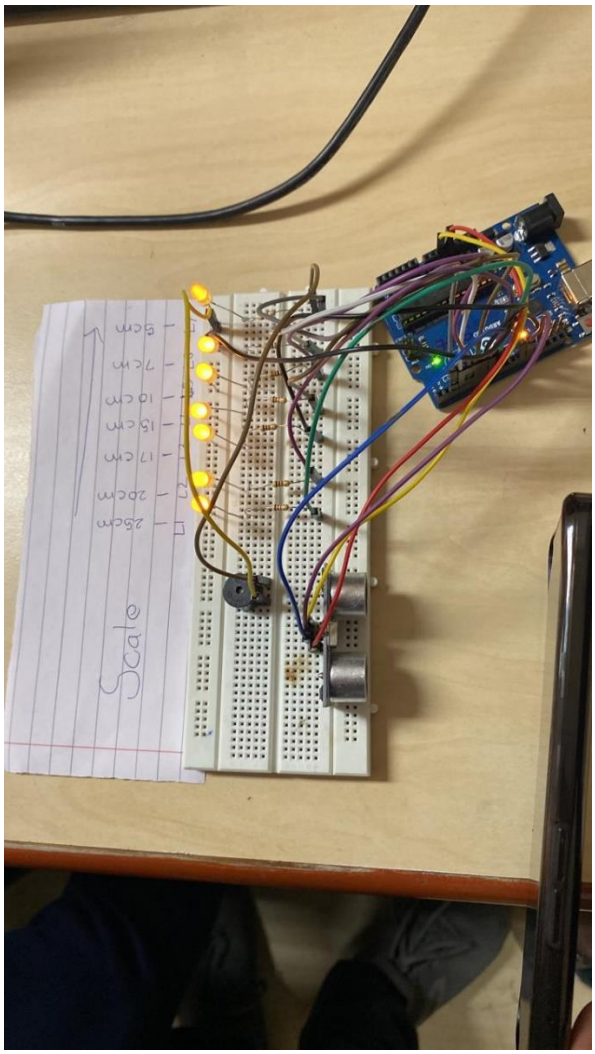


Image 2: Vehicle Near Obstacle

Working:

This device is an Ultrasonic Sensor based Vehicle Rear Parking Sensor designed with the help of an Arduino Uno. This device can be installed on the rear side bumper of the vehicle and can assist the driver during the reverse motion of the vehicle especially during parking.

The device senses obstacles in front of the sensor and is able to measure how far the obstacles are present and give an indication of the same through the multiple LEDs. Finally, when the car is dangerously near to the obstacle the buzzer produces a noise to alert the driver.

Working/Operation Explanation:

This device operates with the help of an Ultrasonic Sensor. The Ultrasonic sensor has two pins (trig, echo) other than the VCC and ground pins. These two pins correspond to the two different functions of the Ultrasonic sensor, that is, trigger or emitting an ultrasonic wave and echo or receiving the ultrasonic wave after reflecting from an object.

In one loop, the trig is provided with a HIGH input that causes the sensor to emit an ultrasonic wave. This wave reflects from the surface of the object in front of it and reaches back to the sensor which senses the wave and produces a digital input which is fed from the echo pin of the sensor to the Arduino.

The duration in which the Ultrasonic sensor detects the wave is measured with the help of the pulseIn() function. This duration is proportional to the distance of the object from the sensor and hence this distance can be calculated by dividing the appropriate factors to half the duration (time taken by the wave to reach back to the sensor) value.

For the purpose of indicating the distances, multiple LEDs are connected to the Arduino pins which are set (in the setup() function) in the OUTPUT configuration.

Now using if-else statements we can provide output through the Arduino to the respective LEDs, if the distance is equal to or less than the respective distances that the LEDs are indicative of, causing the LEDs to glow.

This process takes place in a loop causing the LEDs to glow continuously, as long as the object remains in front of the sensor.

The last LED, which is indicative of the nearest critical distance, is connected in series to a buzzer. Hence, when the object is at the critical/dangerous distance from the sensor the buzzer is activated along with the LED causing the device to produce a sound that is meant to alert the driver of the vehicle.

CONCLUSION:

This Arduino based Vehicle Rear Parking Sensor is able to detect obstacles in front of it with a remarkable accuracy and can alert the driver of the same and avoid any collision between the vehicle and the obstacles especially during parking or reverse motion scenarios.

REFERENCES:

1. Tutorials Point
   https://www.tutorialspoint.com/arduino/arduino_ultrasonic_sensor.htm

2. Coderdojo Athlone
   https://coderdojoathlone.com/en/resources/electronic-resources/ultrasonic-sensor-2019

3. Last Minute Engineers
   https://lastminuteengineers.com/arduino-sr04-ultrasonic-sensor-tutorial/

4. Arduino Documentation
   https://docs.arduino.cc/hardware/uno-rev3

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