CONTENT

CHAPTER 1 – INTRODUCTION

This product is a security system designed for the vehicles. Electronic eye security system can measure the distance using an ultrasonic sensor. This can be used in the front of the vehicle as well as in the rear.

While driving in a highway or when there is traffic the second vehicle should keep a safe distance from the vehicle at front to avoid sudden collision. With the type of the vehicle driving, it will be harder to maintain this safe distance just by watching. By using this security system at the front of the vehicle driver will able to maintain the safe distance as this device display the accurate distance between two vehicles. Also by using this device at the rear of the vehicle, it will avoid the collision with obstacles while reversing. Although there are image based security systems for reversing, there will be difficulties in determining the distance with them due to background complexities.

The device is designed in such a way that it could be powered by the battery of the vehicle. Ultrasonic sensor transmits the signal and the reflected signal is detected by the sensor. Using a pic microcontroller distance is determined and displayed on a LCD display.

Easy operation and maintenance was considered when manufacturing electronic device. Special attention is paid on the size and cost of the device in order to target a wide range of consumers.

CHAPTER 2 – SPECIFICATIONS

Product specifications are given below.

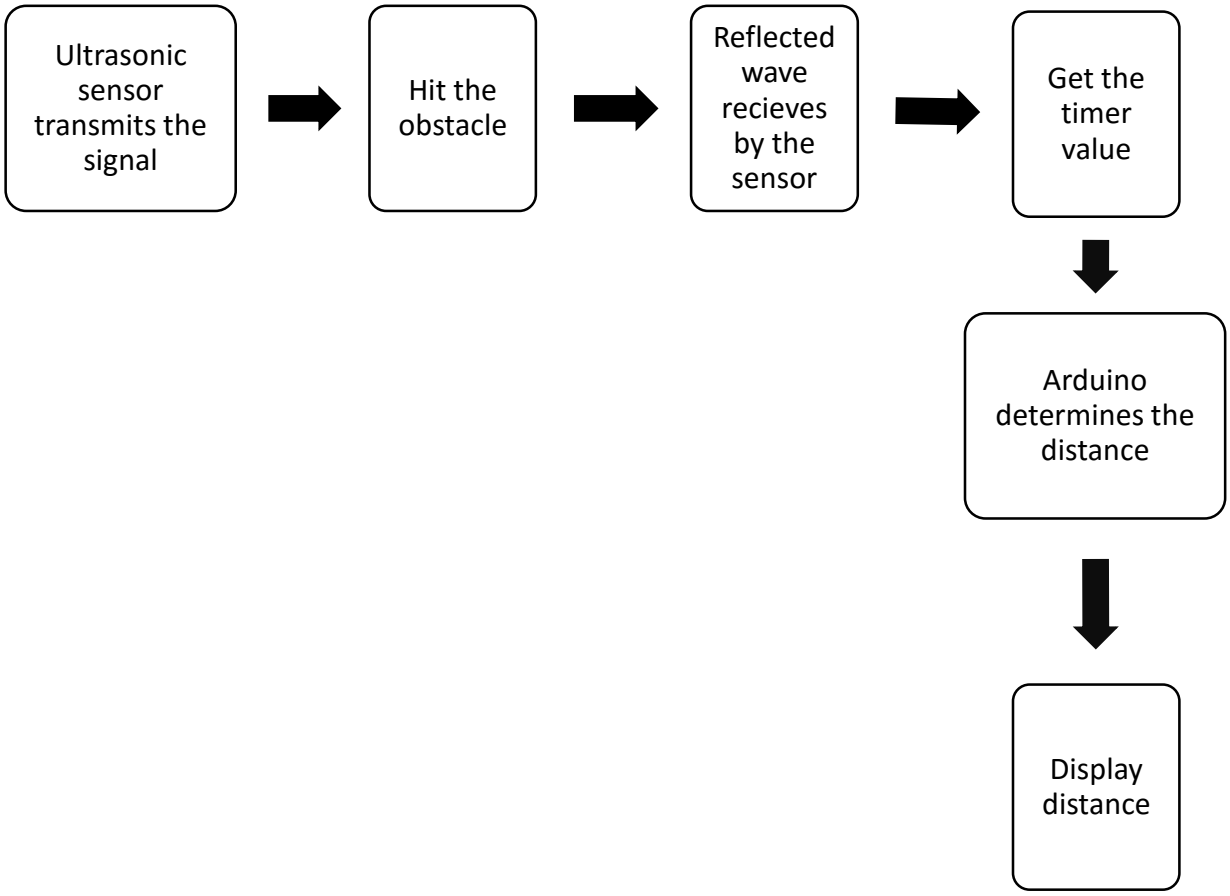
-Can measure the distance from the device

-Uses the battery power of the vehicle

-Measurable distance range:	3 – 400cm
-Distance resolution	1cm
-Frequency of transmitting signal	40 kHz
-Echo pulse width range	150μS - 25mS

CHAPTER 3 – CIRCUIT DESCRIPTIONS

3.1 BLOCK DIAGRAM



3.2 SCHEMATIC DIAGRAM

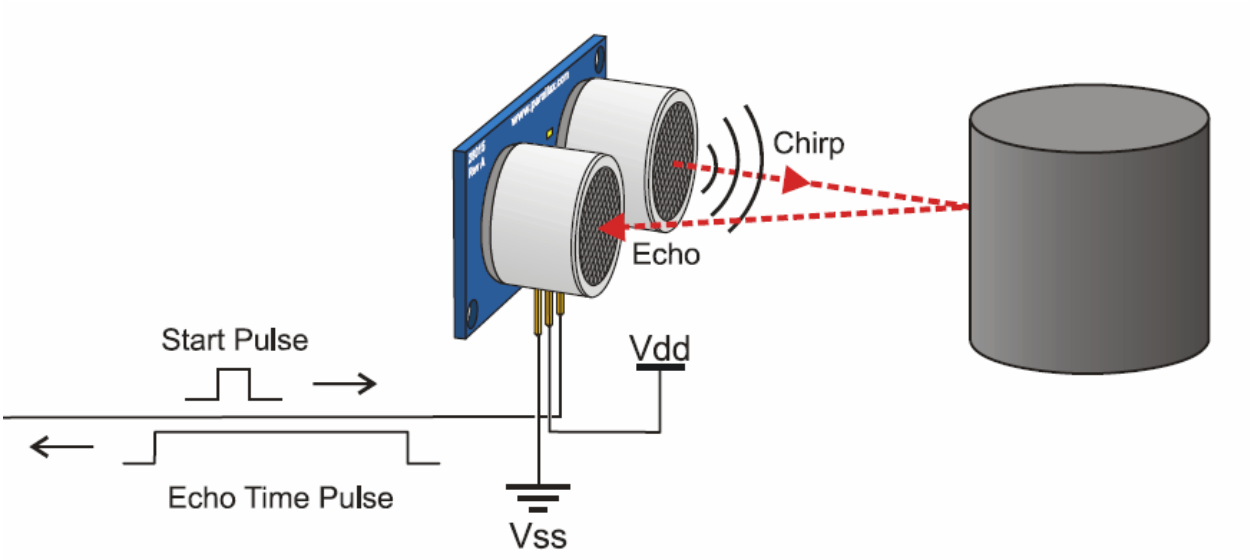
3.3 WORKING OF HC-SR04 ULTRASONIC SENSOR

HC-SR04 Ultrasonic Distance Sensor is a popular and low cost solution for non-contact distance measurement function. It is able to measure distances from 2cm to 400cm with an accuracy of about 3mm. This module includes ultrasonic transmitter, ultrasonic receiver and its control circuit.

HC-SR04 module has 4 pins:

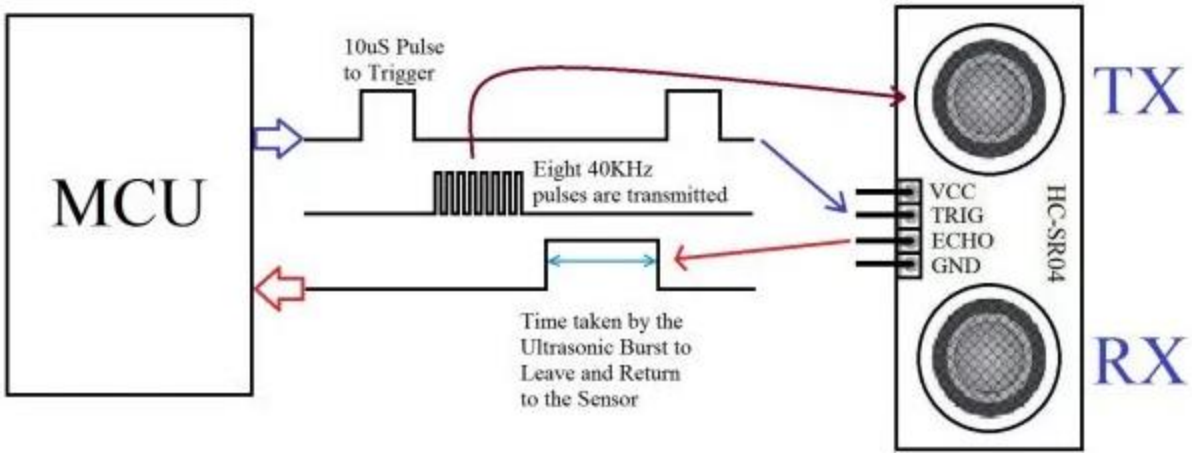
- **VCC** – 5V, +ve of the power supply
- **TRIG** – Trigger Pin
- **ECHO** – Echo Pin
- **GND** – -ve of the power supply

TRIG and ECHO pins can be used to interface this module with a microcontroller unit. These are TTL (0 – 5V) input output pins.



For the ultrasonic module to be working TRIGGER signal should be provided, at least 10µS High Level (5V) pulse. The module will automatically transmit eight 40 KHz ultrasonic burst.If there is an obstacle in-front of the module, it will reflect the ultrasonic burst. If the signal is back, ECHO output of the sensor will be in HIGH state (5V) for a duration of time taken for sending and receiving ultrasonic burst. Pulse width ranges from about 150µS to 25mS and if no obstacle is detected, the echo pulse width will be about 38ms.

3.4 DISTANCE CALCULATION



- Distance = Speed * Time
- Let **d** be the distance between Ultrasonic Sensor and Target
- Total distance traveled by the ultrasonic burst : **2d** (forward and backward)
- Speed of Sound in Air : 340 m/s = 34000 cm/s
- Thus, **d = (34000*Time)/2**,

CHAPTER 4 – PROGRAMMING CODE

```
#include <LiquidCrystal.h>

// initialize the library with the numbers of the interface pins
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

int trigPin = 9;
int echoPin =8;
long duration, cm, inches, m;



void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.setCursor(4,0);
  lcd.print("welcome");
  delay(5000);
  lcd.clear();
  Serial.begin (9600);
  pinMode(7, OUTPUT);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  digitalWrite(trigPin, LOW);
  delayMicroseconds(5);
}
```

```
void loop() {
 digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  duration =pulseIn(echoPin, HIGH);
  cm = (duration / 2) / 29.1;

  inches = (duration /2) / 74;

 if(cm>500){
  lcd.setCursor(0,0);
  lcd.print("you are safe");
  delay(1000);
  lcd.clear();

  }

  else if(cm<60){

    digitalWrite(7, HIGH);
    delay(100);
    digitalWrite(7, LOW );
    lcd.setCursor(0,0);
  lcd.print("distance=");
  lcd.setCursor(10,0);
  lcd.print(cm);
  lcd.setCursor(13,0);
  lcd.print("cm");
```

```
 lcd.setCursor(0,1);
 lcd.print("critical region");
 delay(100);
 lcd.clear();


   }
 else{
lcd.setCursor(0,0);
 lcd.print("distance=");
 lcd.setCursor(10,0);
 lcd.print(cm);
 lcd.setCursor(13,0);
 lcd.print("cm");
 Serial.print(cm);
 Serial.println();
 delay(1000);
 lcd.clear();
 }
}
```

CHAPTER 5 – COST MANUAL

Component	Expected cost (LKR)	Real cost (LKR)
Arduino	750.00	500.00
HC –SR04 Ultrasonic sensor	250.00	265.00
Liquid Crystal Display	500.00	300.00
Voltage regulator	10.00	25.00
Buffer		
Volume Controler	30.00	30.00
wires	50.00	100.00
Other	100.00	345.00
Total		

6 – TROUBLE SHOOTING AND IMPROVEMENTS

We encountered some difficulties when programming the PIC. 8 MHz oscillator was used for the circuit. When the program is running, oscillator became unstable and readings became floating values. Trial and error method was used to overcome this problem but it was not able to fix the problem. So that we decided to use arduino instead of the PIC.

In our current project we have used a wire chord to transmit signal to the display. Since there is a considerable distance from arduino to the display we can improve this product to use wireless transmission to transmit signal from arduino to the display.