Nahda University
Faculty of Engineering
Mechatronics Engineering Program

Sensors and Measurement Systems…

Project

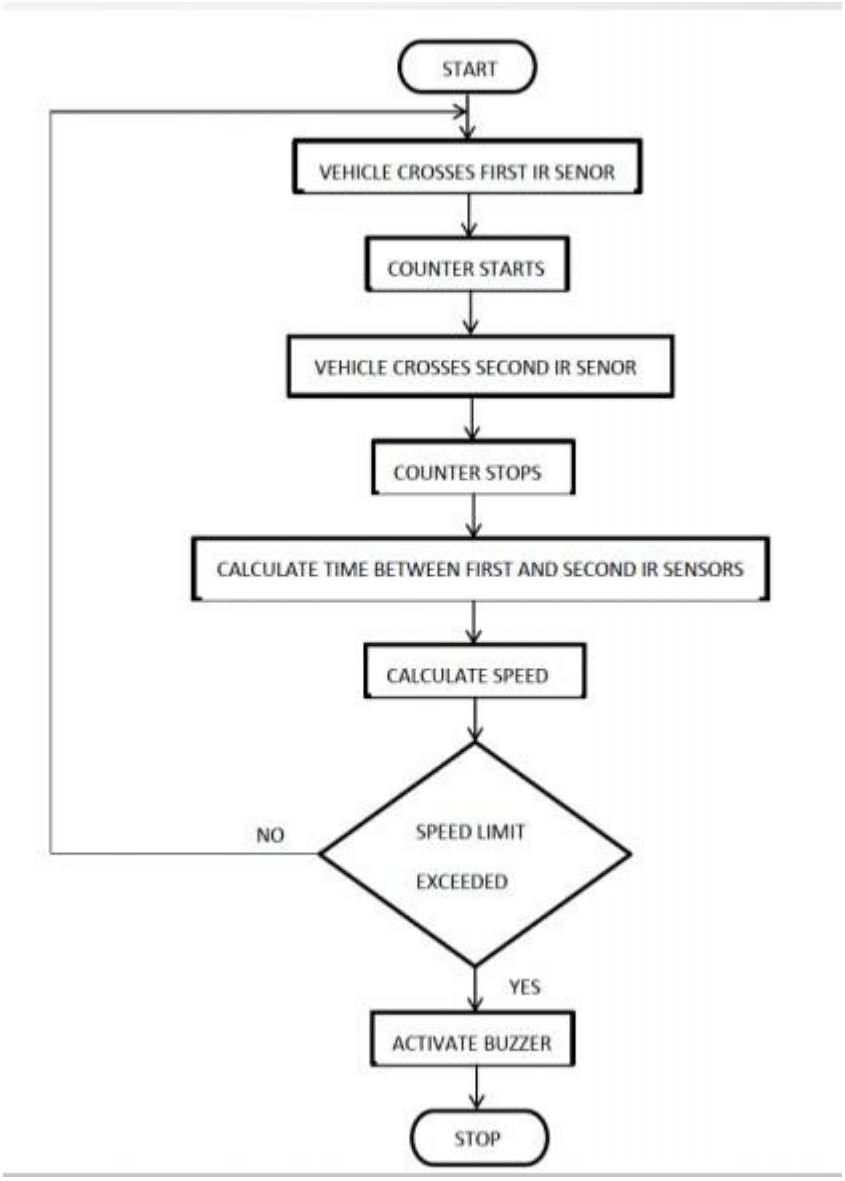
Instantaneous velocity measurement

- Mahmoud Abdulrahman 191060171
- Bemin Magdy 191060072

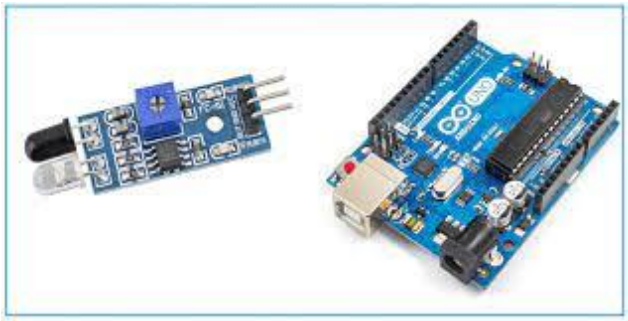
Introduction:

There are definite rules laid out by authorities about driving cars on roads. The most common rule in any country is speed limit in certain roads. You will be in violation of the law if your car speed exceeds this limit. In order to detect the speed of a moving car, the patrolling officers usually depend on a handheld gun that works on Radar Technology or Lidar Technology. This is a tedious process as the officer has to manually check for over speeding for each vehicle. What if the Car Speed Detection is made automatic? A simple automatic detection of speed of a vehicle is designed in Arduino Car Speed Detector project, where you can place the system in one place and view the results instantly without any human intervention.

Principle of the Project: IR Sensors are the main part of the project that detects the speed of a car. Practically, you can implement the setup of IR Sensors in many ways but in this project, I have used two reflective type IR Sensors and placed them 18 cm apart. When a car travelling reaches the first sensor, the IR Sensor gets activated. From this moment onward, a timer is initiated and will continue to keep time until the car reaches the second IR Sensor. You can calculate the speed at which the car travelled from IR Sensor 1 to IR Sensor 2 as you already know the time of travel. All the calculations and data gathering are done by Arduino and the final result is displayed on a 16X2 LCD Module.


START
VEHICLE CROSSES FIRST IR SENOR
COUNTER STARTS
VEHICLE CROSSES SECOND IR SENOR
COUNTER STOPS
CALCULATE TIME BETWEEN FIRST AND SECOND IR SENSORS
CALCULATE SPEED
SPEED LIMIT
EXCEEDED
NO
YES
ACTIVATE BUZZER
STOP

• Components Required
- Arduino UNO
- IR Sensors x 2
- 16X 2 LCD Display Modules
- Breadboard
- Connecting Wires
- Power Supply



IR Sensor:

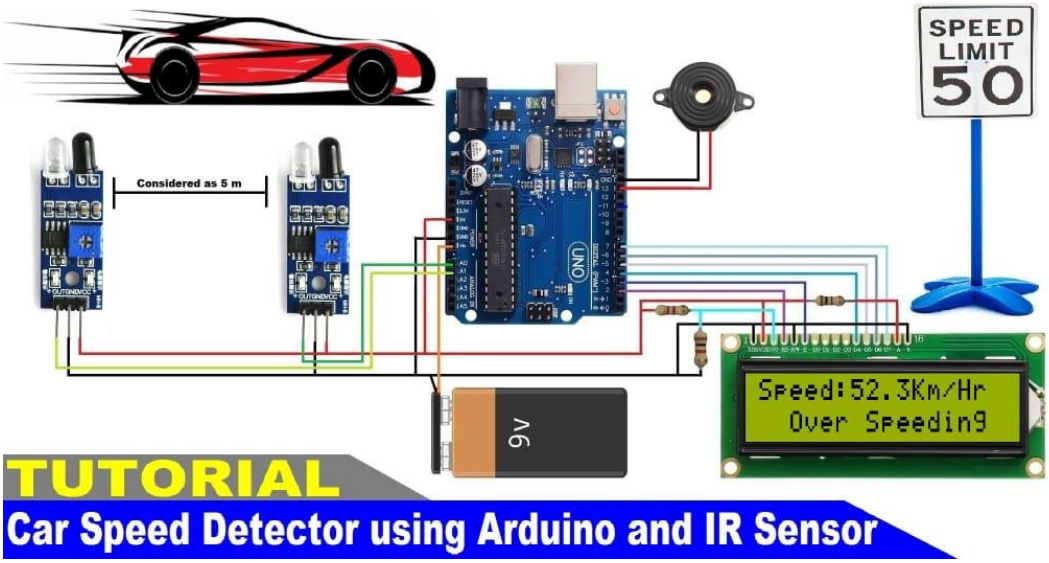
First of all, I have used two digital IR Sensors, which consists of an IR Transmitter (IR LED), an IR Receiver (Photo Diode), a Comparator IC and a few supporting components. The IR Transmitter and Receiver Pair are placed side-by-side so that they form a Reflective Type IR Sensor. In this type, the IR Transmitter continuously emits Infrared radiations and if there is no object in front of the sensor, none of the Infrared radiation gets reflected back to the IR Receiver. Interfacing IR Sensor with Raspberry Pi IR Sensor But if there is an object in front of the sensor, some of the infrared radiation hits the object and gets reflected back. This reflected radiation falls on the IR Receiver, which means that the sensor has detected the object. Some IR Sensors has the option to produce both Analog and Digital Outputs but the module I have used has only Digital Output i.e. the output is HIGH when an object is detected and LOW when there is no object.

❖ How to operate Arduino Car Speed Detector Project?

- Make all the necessary connections with respect to the circuit diagram and upload the code to Arduino. - Place the two IR Sensors on the edge of the breadboard so that the distance between them is approximately 18 centimeters. - Simulate a car movement in front of the sensors either by using your hands or a toy car. - Arduino calculates the speed and displays the result on the 16×2 LCD.

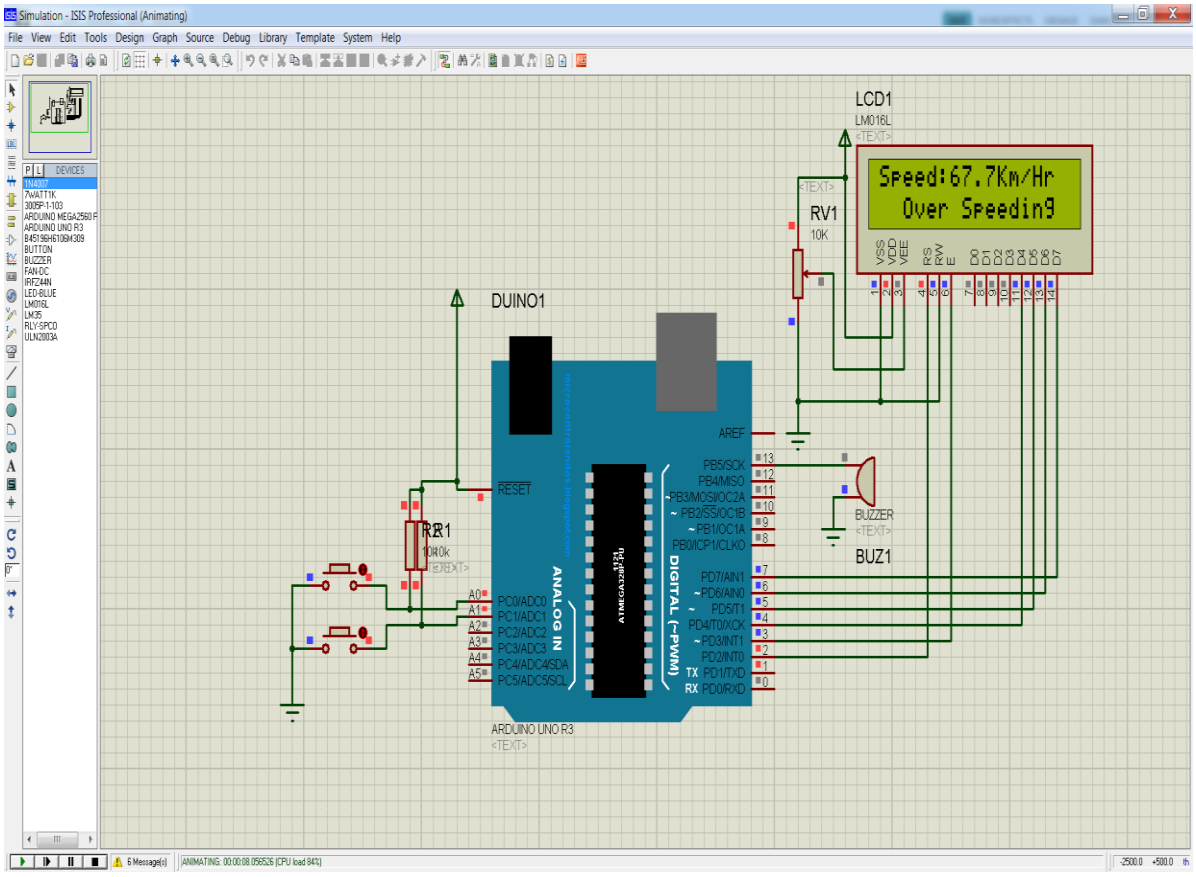
Working: The working of the Arduino based car speed detector project is very simple. Arduino continuously reads the inputs from the IR Sensors. When a car moving in front of the setup reaches the first sensor, Arduino becomes alert and capture a time stamp the moment the car leaves the first IR Sensor. Another time stamp is recorded when the car reaches the second IR Sensor. Millis () function of Arduino used for capturing the time stamps. Arduino Car Speed Detector Image 1 Arduino then calculates the velocity by assuming the distance as 5 cm between the two IR Sensor and displays the result in kilometers per hour on the 16×2 LCD Display

• Electric Circuit Of the project:



1-Connect the ground of all components together to the ground on the Arduino.
2-We connect the output of the IR sensor to A0, A1 on the Arduino.
3-We connect the battery positive to the Vin input on the Arduino.
4-The buzzer is connected to the digital output.
5-we connect the pins of the LCD to the Arduino.

❖ Simulation in Proteus:



❖ The code of Arduino:

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);

int timer1;
int timer2;

float Time;

int flag1 = 0;
int flag2 = 0;

float distance = 5.0;
float speed;

int ir_s1 = A0;
int ir_s2 = A1;

int buzzer = 13;

void setup(){
  pinMode(ir_s1, INPUT);
  pinMode(ir_s2, INPUT);
  pinMode(buzzer, OUTPUT);

  lcd.begin(16,2);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(" WELCOME To  My ");
  lcd.setCursor(0,1);
  lcd.print("YouTube  Channel");
  delay(2000);
  lcd.clear();
}

void loop() {
if(digitalRead (ir_s1) == LOW && flag1==0){timer1 =
millis(); flag1=1;}

if(digitalRead (ir_s2) == LOW && flag2==0){timer2 =
millis(); flag2=1;}

if (flag1==1 && flag2==1){
     if(timer1 > timer2){Time = timer1 - timer2;}
else if(timer2 > timer1){Time = timer2 - timer1;}
 Time=Time/1000;//convert millisecond to second
 speed=(distance/Time);//v=d/t
 speed=speed*3600;//multiply by seconds per hr
 speed=speed/1000;//division by meters per Km
```

```
}

if(speed==0){
lcd.setCursor(0, 1);
if(flag1==0 && flag2==0){lcd.print("No car  detected");}
                    else{lcd.print("Searching...    ");}
}
else{
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Speed:");
    lcd.print(speed,1);
    lcd.print("Km/Hr  ");
    lcd.setCursor(0, 1);
  if(speed > 50){lcd.print("  Over Speeding  ");
digitalWrite(buzzer, HIGH);}
            else{lcd.print("  Normal Speed   "); }
    delay(3000);
    digitalWrite(buzzer, LOW);
    speed = 0;
    flag1 = 0;
    flag2 = 0;
 }
}
```