

# **ALCOHOL DETECTION AND ENGINE OFF SYSTEM WITH GPS AND GSM MODULE**

A course project report submitted in partial fulfilment of  
requirement for the completion of

## **SMART SYSTEM DESIGN**

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## **ABSTRACT**

This report concludes the design of alcohol detection with engine off system and alerting through GPS and GSM modules which helps in saving peoples life's by stopping drunk and drive cases. The purpose of this project is to prevent accidents that are majorly caused due to alcohol consumption.

The whole system can be employed in steering wheel equipped in motor vehicle. The alcohol sensor is kept inside the steering wheel which senses the alcohol percentage. If the detected alcohol is greater than threshold [limit] value. Then the motor wheels will be stopped and an alerting SMS and LIVE LOCATION will be sent through GSM and GPS navigators.

## **Introduction to project**

From the past five years analysis from the records of trafficking and police, for EVERY HOUR FOURTEEN PERSONS ARE DYING IN THE SOCIETY. 65% OF PEOPLE ARE OF RASH AND DRUNKEN DRIVING. This has been revealed by the WORLD HEALTH ORGANIZATION [WHO] in its first ever Global status report on Road safety. The report pointed to speeding, Drunk Driving and low use of helmets, seat belts and child restraints in vehicles as the main factors. Every hour, forty people under the age of 25 die in road accidents around the globe. According to WHO, this is the second most important cause of death for 5 to 29 years old. The total numbers death every year due to road accidents has now passed the 1,35,000 marks. According to the latest report of NATIONAL CRIME RECORDS BUREAU [NCRB].

While trucks and two-wheelers were responsible for over 40% of deaths, peak traffic during the afternoon and evening rush hours in the most dangerous times to be on the roads. Road deaths increased by nearly 40% between 2003 and 2009 in India. Now it is increased by 65%. The progressive and developed states like Andhra Pradesh, Telangana, Maharashtra and Tamil Nadu are the ones most affected.

Drunk and drive is major problem in this world. Many accidents are occurring due to consuming alcohol and driving the vehicle. To stop this, we need a new process or idea. Drinking alcohol is injurious to health and driving after drinking is more harmful to the society. The drivers who drink alcohol are not in stable condition and also, rash driving occurs on highways which can be risky to lives of the people on the road and including driver. The laws in India are currently prohibiting drivers to drink and drive so that the fine can stop them to drink and drive.

It's a very big challenging task to policemen and road safety officers to check each and every vehicle and stop drunk and drives. Sometimes even officers are affected by the drunk and drivers. Many awareness programs are conducted by the government but the result of them is insufficient in reducing drunk and drives.

There is therefore the need for an automatic alcohol detection system that can function without the restriction of space and time.

## **Objective of the project**

The main objective of the project is to reduce accidents caused by the drunk and drive. Here we designed a smart alcohol detection system which helps in reducing accidents and saving people's lives.

This system is designed in such a way that, when a person who consumed alcohol drives the car, the sensor detects the alcohol and stops the car and sends the location to registered mobile number so that we can stop the person to drive the vehicle. This system is designed in the way such that we can reduce time and space. This also reduces the work of policemen and road safety officers. This system does not allow the person who consumed alcohol to drive the vehicle. It also helps in reducing deaths caused by drunk and drive.

## **Existing methods**

There are several existing methods such as:

### ***Detecting alcohol and engine off system***

- In this system alcohol is detected and engine gets off Immediately.
- When a person drives the vehicle after consuming alcohol, the alcohol sensor detects the alcohol.
- Then after detecting the alcohol the engine gets off immediately.

### **Breath analyzer**

- Breath analyzer is used by policemen to detect whether a person is consumed alcohol or not.
- When alcohol is detected by the analyzer it produces a sound.
- This breath analyzer is used by police officers, they just keep this analyzer in the mouth of a person.
- When the person is consumed alcohol, breath analyzer detects it.
- After detecting it produces sound.
- The analyzer has some limited reading values of alcohol detection.
- If the person was overly consumed, analyzer produces the sound.
- If the person consumes alcohol limitedly, it doesn't produce the sound.



## **Proposed method**

Analyzing the existing solutions we have found that we can just detect alcohol and turn off the vehicle. However this does not help trafficking police and in turn it can cause heavy traffic while alcohol is detected in the highways and narrow roads.

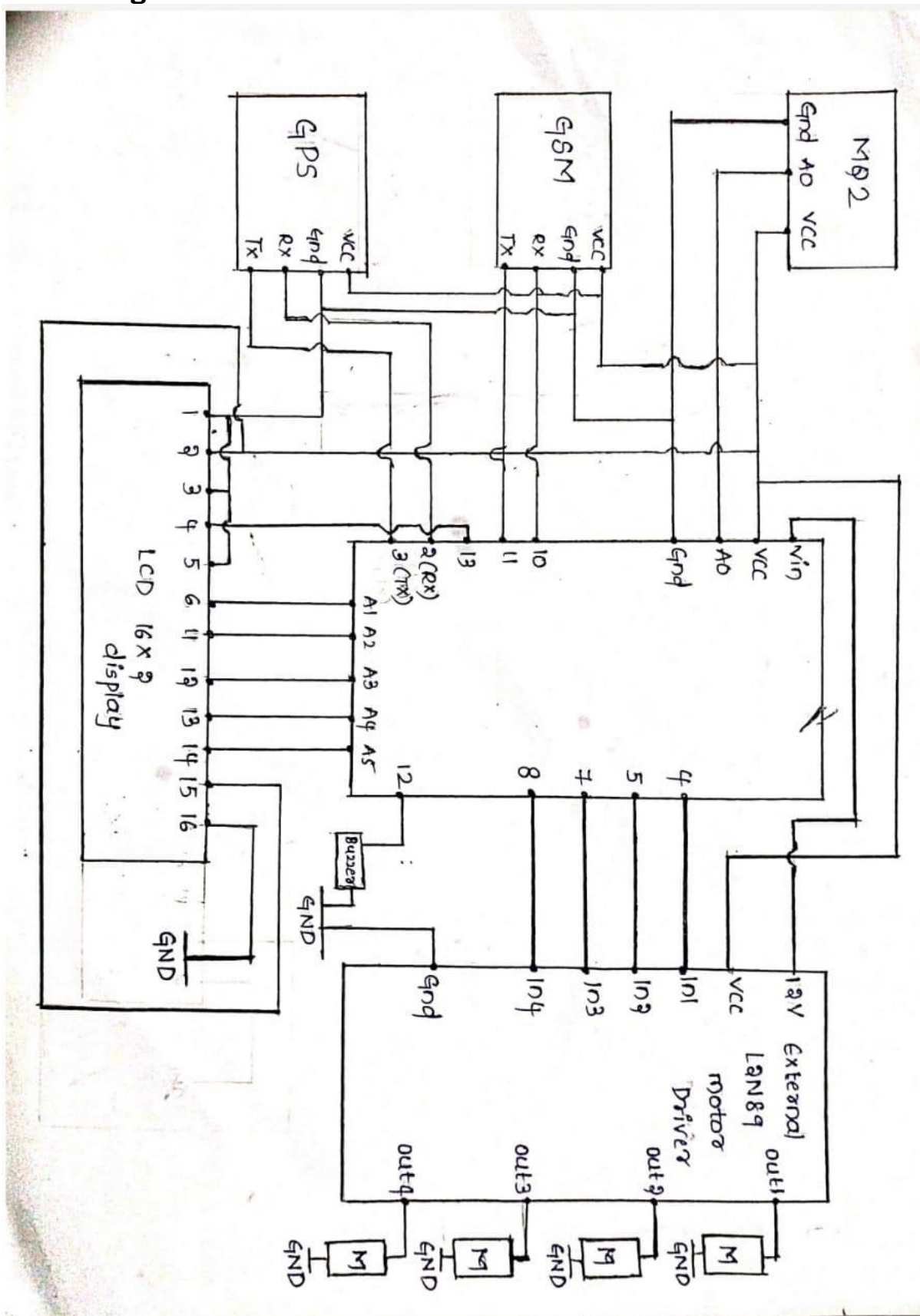
Using the advantage of new communication systems like GSM [Global System for Mobile communication] and GPS [Global Positioning System] we can overcome the draw backs that are mentioned above.

The purpose of this system is:

- Whenever a person consumes alcohol and drives the vehicle
- The MQ-2 gas sensor detects Ethanol percentage and compares with knee/threshold value that has been set by WHO
- If the detected alcohol percentage is more than that of knee value then the car engine stops automatically.
- Immediately, GPS module detects the latitude and longitude positions of the vehicle.
- This Live Location is then sent to registered mobile number via GSM.

## Project description

### Block diagram

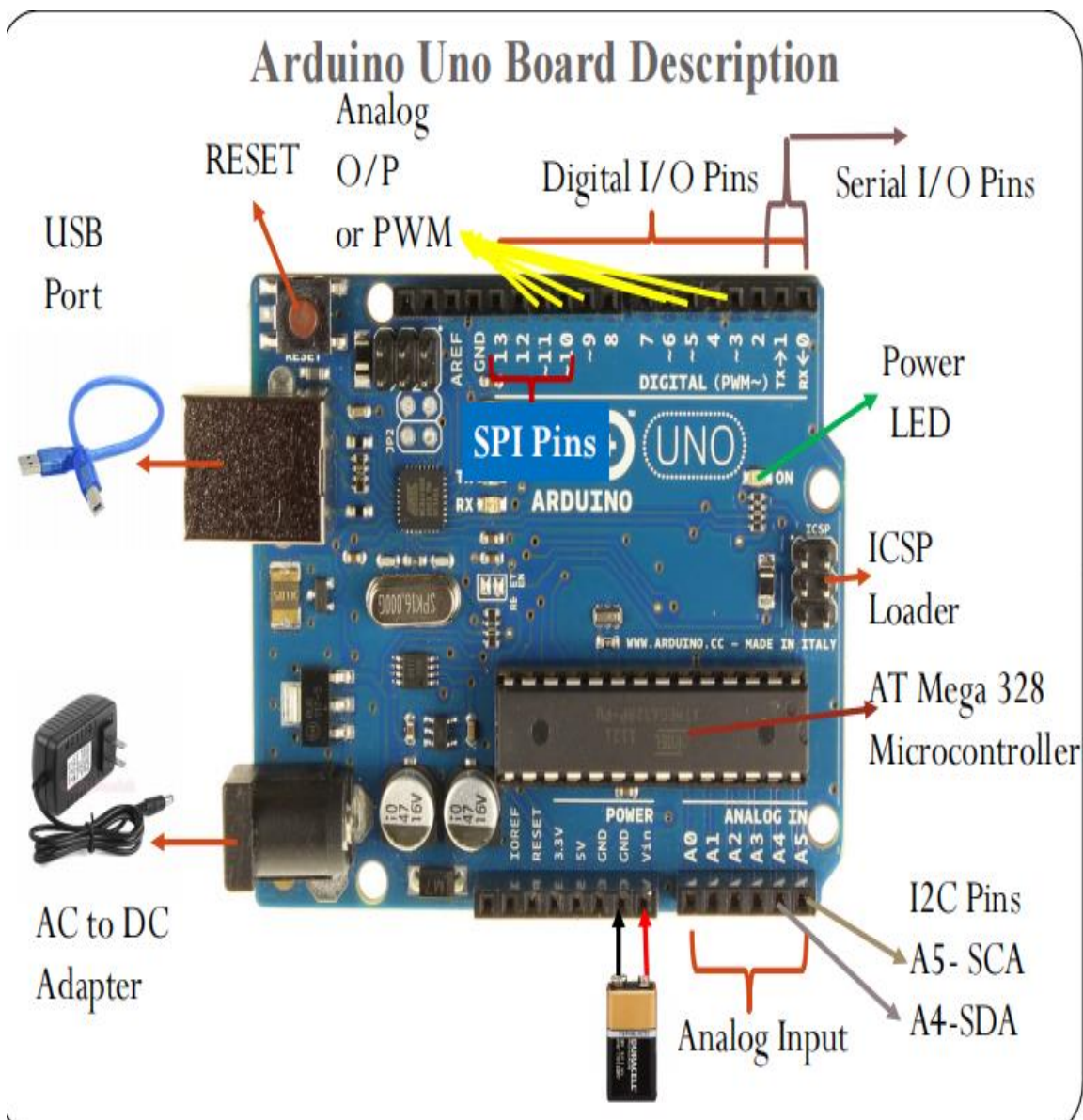


## Component's description

### 1. Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read input through sensors and make decisions with the help of micro-controller and performs the desired output.

Here we have used Arduino uno which is most commonly used and easily available .



## Technical Specifications Of ARDUINO UNO

- ✓ Microcontroller ATmega328
- ✓ Clock Speed 16 MHz
- ✓ Operating Voltage 5V
- ✓ Input Voltage (limits) 6-20V
- ✓ Input Voltage (recommended) 7-12V
- ✓ Digital I/O Pins 14 (of which 6 provide PWM output)
- ✓ Digital I/O Pins 14 (of which 6 provide PWM output)
- ✓ Analog Input Pins 6
- ✓ DC Current per I/O Pin 40 mA
- ✓ DC Current for 3.3V Pin 50 mA
- ✓ Flash Memory 32 KB of which 0.5 KB used by bootloader
- ✓ SRAM 2 KB, EEPROM 1 KB
- ✓ Serial Communication ports: UART, I2C, SPI

Pin Descriptions		
Pin Category	Pin Name	Details
Power Pins	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Power source, 3.3V: Power source GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0 – A5	Used to provide analog input in the range of 0-5V
Input/ Output Pins	Digital Pins (0 – 13)	Can be used as input or output pins.
PWM	3, 5, 6, 9, 10, 11	Provides 8-bit PWM output.

Pin Description		
Pin Category	Pin Name	Details
AREF	AREF	To provide reference voltage for input voltage.
Serial	0(Rx) 1(Tx)	Used to receive and transmit TTL serial data.
I2C	A4(SDA) A5 (SCA)	Used for I2C communication.
SPI	10 (SS), 11(MOSI) 12 (MISO) 13 (SCK)	Used for SPI communication.
External Interrupts	2, 3	To trigger an interrupt.

## **2. MQ2 ALCOHOL AND GAS SENSOR**

MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, Propane, Methane, Hydrogen, Alcohol, Smoke and Carbon Monoxide.

MQ2 gas sensor is also known as chemi-resistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas.

MQ2 is a metal oxide semiconductor type gas sensor. Concentrations of gas in the gas is measured using a voltage divider network present in the sensor. This sensor works on 5V DC voltage. It can detect gases in the concentration of range 200 to 10000ppm.

### **Working Principle**

This sensor contains a sensing element, mainly aluminium-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless-steel mesh. Sensing element has six connecting legs attached to it. Two leads are responsible for heating the sensing element, the other four are used for output signals.

Oxygen gets adsorbed on the surface of sensing material when it is heated in air at high temperature. Then donor electrons present in tin oxide are attracted towards this oxygen, thus preventing the current flow.

When reducing gases are present, these oxygen atoms react with the reducing gases thereby decreasing the surface density of the absorbed oxygen. Now current can flow through the sensor, which generated analogue voltage values. These voltage values are measured to know the concentration of gas. Voltage values are higher when the concentration of gas is high.

## CONNECTIONS WITH ARDUINO UNO:



The MQ2 gas sensor consists of 4 pins named as VCC, ANALOG OUTPUT, DIGITAL OUTPUT AND GND PIN.

- ✓ The VCC Pin is Connected To 5v Arduino Uno Pin.
- ✓ The Gnd Pin Is Connected to Gnd Pin of Arduino Uno.
- ✓ Either analogue or digital pin can be used. Analogue pin is connected to Arduino analogue input pins to detect small change in alcohol levels.
- ✓ The digital pin can be used to detect ethanol. It reads 1 when ethanol is detected and 0 when not detected.

### 3. GLOBAL SYSTEM FOR MOBILE COMMUNICATION [GSM MODULE]

SIM900A GSM Module is the smallest and cheapest module for GPRS/GSM communication. It is common with Arduino and microcontroller in most of embedded application. The module offers GPRS/GSM technology for communication with the uses of a mobile sim. It uses a 900 and 1800MHz frequency band and allows users to receive/send mobile calls and SMS. The keypad and display interface allows the developers to make the customize application with it. Furthermore, it also has modes, command mode and data mode. In every country the GPRS/GSM and different protocols/frequencies to operate. Command mode helps the developers to change the default setting according to their requirements.

#### SIM900A GSM Module Main Features

FEATURES	DETAIL
Power Input	3.4V to 4.5V
Operating Frequency	EGSM900 and DCS1800
Transmitting Power Range	2V for EGSM900 and 1W for DCS1800
Data Transfer Link	Download: 85.6kbps, Upload:42.8kbps
SMS	MT, MO, CB, Text and PDU mode.
Antenna Support	Available
Audio Input/output	Available
Serial Port	I2C and UART
Serial Debug Port	Available



## CONNECTIONS WITH ARDUINO UNO:



It has 4 pins to communicate with Arduino Uno namely [VCC, GND, TX and RX pins]. However additionally it requires an external power supply nearly 12V- 2A to communicate with the SIM 900A modem.

1. The VCC pin is connected to Arduino VCC.
2. GND pin is connected to Arduino GND.
3. TX of GSM is connected to RX of Arduino uno.
4. RX of GSM is connected to TX of Arduino.



#### 4. GLOBAL POSITIONING SYSTEM [GPS NEO 6M]

The GPS System (GPS Global Positioning) is a navigational system that uses a network of 24-32 satellites to determine the exact position of any object on earth. The satellites are positioned in orbits about an altitude of 12,000 miles from the earth surface. The satellites send microwave signals which are collected by GPS receivers. The collected information is used to infer the distance using velocity and time.

##### Working of GPS

GPS is a system of 30+ navigation satellites orbiting the earth. They constantly transmit information about their position and current time to Earth in the form of radio signals.

A GPS receiver listens to these signals. Once the receiver calculates its distance from at least three GPS Satellites, it can figure out the object where it is. This process is known as Trilateration.

##### CONNECTIONS WITH ARDUINO:



GPS NEO 6M consists of 4 pins namely VCC, GND, TX and RX pins.

The operating voltage is nearly 3.3 to 4.7V with 50mA current rating.

1. VCC is connected to VCC of Arduino uno.
2. GND is connected to GND of Arduino Uno.
3. TX pin is connected to RX pin of Arduino uno.
4. RX pin is connected to TX pin of Arduino.

## 5. LIQUID CRYSTAL DISPLAY [LCD]

An electronic device that is used to display data and the message is known as LCD 16×2. As the name suggests, it includes 16 Columns & 2 Rows so it can display 32 characters ( $16 \times 2 = 32$ ) in total & every character will be made with  $5 \times 8$  (40) Pixel Dots. So the total pixels within this LCD can be calculated as  $32 \times 40$  otherwise 1280 pixels.



16 X2 displays mostly depend on multi-segment LEDs. There are different types of displays available in the market with different combinations such as  $8 \times 2$ ,  $8 \times 1$ ,  $16 \times 1$ , and  $10 \times 2$ , however, the LCD  $16 \times 2$  is broadly used in devices, DIY circuits, electronic projects due to less cost, programmable friendly & simple to access.

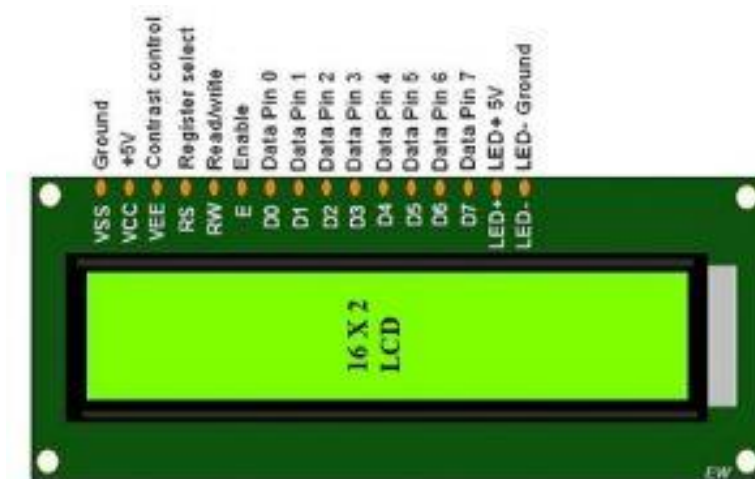
### Specifications of LCD 16X2

The specifications of LCD 16X2 are discussed below.

- The operating voltage of this display ranges from 4.7V to 5.3V
- The display bezel is 72 x 25mm
- The operating current is 1mA without a backlight
- PCB size of the module is 80L x 36W x 10H mm
- HD47780 controller
- LED color for backlight is green or blue
- Number of columns – 16
- Number of rows – 2
- Number of LCD pins – 16
- Characters – 32
- It works in 4-bit and 8-bit modes
- Pixel box of each character is  $5 \times 8$  pixel
- Font size of character is 0.125Width x 0.200height

## Lcd connections with Arduino Uno:

The pin configuration of LCD 16 X 2 is given as:



**16X2 LCD Pin Diagram**

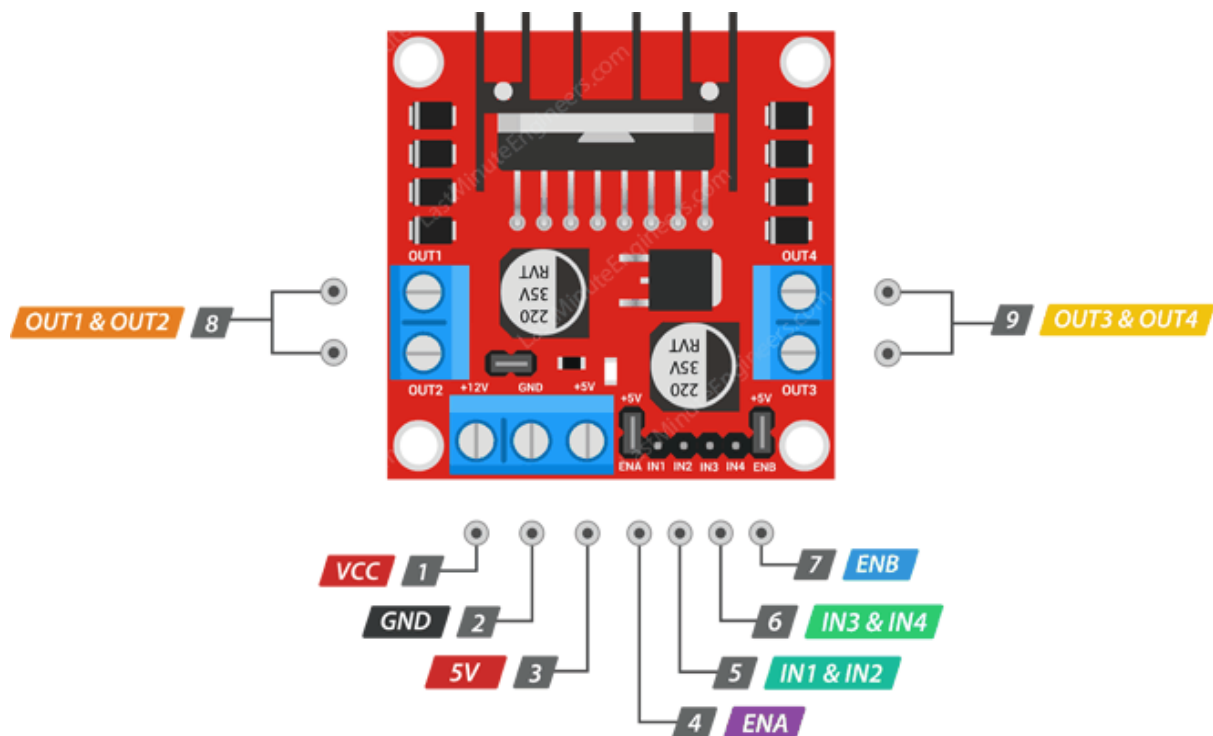
- Pin1 (Ground): This pin connects the ground terminal.
- Pin2 (+5 Volt): This pin provides a +5V supply to the LCD
- Pin3 (VE): This pin selects the contrast of the LCD.
- Pin4 (Register Select): This pin is used to connect a data pin of an MCU & gets either 1 or 0. Here, data mode = 0 and command mode =1.
- Pin5 (Read & Write): This pin is used to read/write data.
- Pin6 (Enable): This enables the pin must be high to perform the Read/Write procedure. This pin is connected to the data pin of the microcontroller to be held high constantly.
- Pin7 (Data Pin): The data pins are from 0-7 which are connected through the microcontroller for data transmission. The LCD module can also work on the 4-bit mode through working on pins 1, 2, 3 & other pins are free.
- Pin8 – Data Pin 1
- Pin9 – Data Pin 2
- Pin10 – Data Pin 3
- Pin11 – Data Pin 4
- Pin12 – Data Pin 5
- Pin13 – Data Pin 6
- Pin14 – Data Pin 7
- Pin15 (LED Positive): This is a +Ve terminal of the backlight LED of the display & it is connected to +5V to activate the LED backlight.
- Pin16 (LED Negative): This is a -Ve terminal of a backlight LED of the display & it is connected to the GND terminal to activate the LED backlight.

## 6. L298N Motor Driver Module

The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

### L298N Motor Driver Module Pins

The L298N module has a total of 11 pins that connect it to the outside world. The pins are as follows:



## Power Pins

The L298N motor driver module is powered through 3-pin 3.5mm-pitch screw terminal.

The L298N motor driver actually has two input power pins – VS and VSS.

VS pin gives power to the internal H-Bridge of the IC to drive the motors. You can connect an input voltage anywhere between 5 to 12V to this pin.

VSS is used to drive the logic circuitry inside the L298N IC which can be 5 to 7V.

GND is the common ground pin.

## Output Pins

The L298N motor driver's output channels OUT1 and OUT2 for motor A and OUT3 and OUT4 for motor B are broken out to the edge of the module with two 3.5mm-pitch screw terminals. You can connect two 5-12V DC motors to these terminals.

## Direction Control Pins

By using the direction control pins, you can control whether the motor rotates forward or backward. These pins actually control the switches of the H-Bridge circuit inside the L298N chip.

The module has two direction control pins for each channel. The IN1 and IN2 pins control the spinning direction of motor A; While IN3 and IN4 control the spinning direction of motor B.

The spinning direction of the motor can be controlled by applying logic HIGH (5V) or logic LOW (Ground) to these inputs.

## 7. Motors

There are three different types of motors:

- DC motor
- Servo motor
- Stepper motor

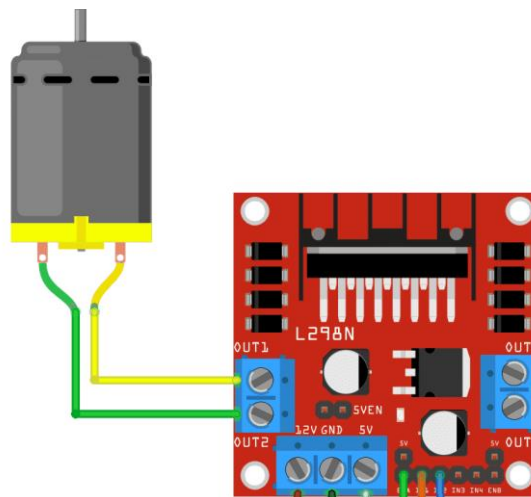
We use DC motor in our project.

A DC motor (Direct Current motor) is the most common type of motor. DC motors normally have just two leads, one positive and one negative. If you connect these two leads directly to a battery, the motor will rotate. If you switch the leads, the motor will rotate in the opposite direction.



### Connections with Arduino uno:

Every DC motor has 2 pins which are connected to L298N motor driver which controls the speed and direction of the motor.



## **BUZZER**



A buzzer is an electrical device that makes a buzzing noise and is used for signalling.

The buzzer is a sounding device that can convert audio signals into sound signals. It is usually powered by DC voltage. It is widely used in alarms, computers, printers and other electronic products as sound devices.

We use this buzzer in our project to give sound when alcohol is detected by the alcohol sensor.

When a person drives the vehicle after consuming, the alcohol sensor detects it and the buzzer gets on.

## Software Description

### Arduino IDE

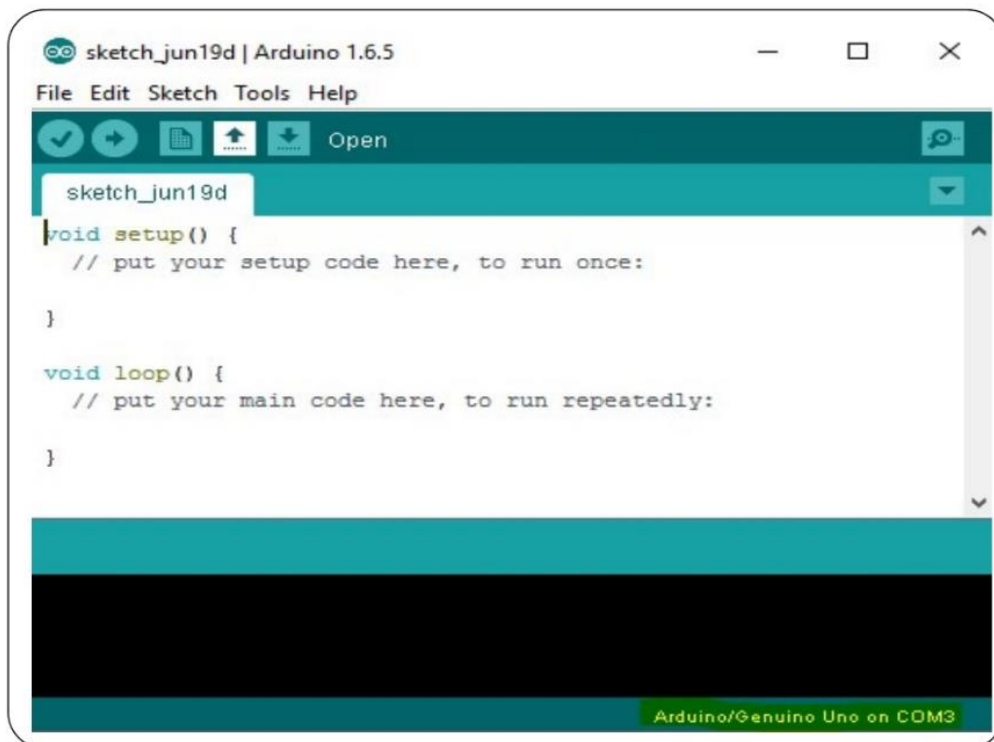
It is a cross-platform application. It is used to write and upload programs to Arduino board.

The Arduino IDE supports the languages C and C++ using special rules of code structuring.

The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main ()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

### Arduino Programming

- ❖ A program for Arduino is called a Sketch
- ❖ Arduino programs are generally written in C- language.





However it has some basic built-in functions apart from C language. Some of them are:

### ❖ **Digital I/O Functions**

- pinMode()  
It is to mention the specified pin to behave as an Input or an Output Pin
- digitalRead()  
It is to read a value from a digital pin [0 or 1]
- digitalWrite()  
It is to write HIGH or LOW value to a digital pin

### ❖ **Analog I/O Functions**

- analogRead()  
it is to read the value from the specified analog pin
- analogWrite()  
it is to write an analog value to a pin

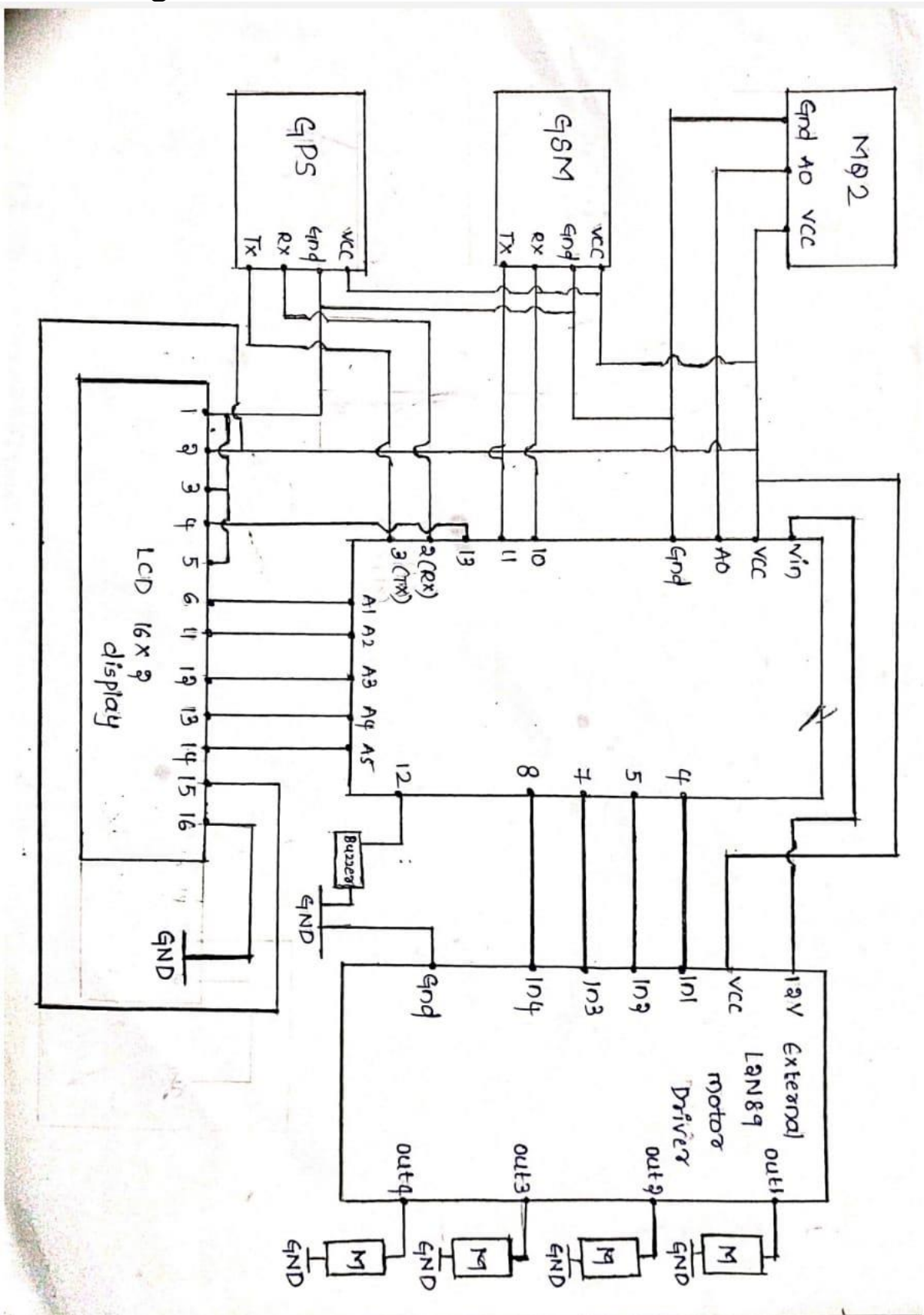
### ❖ **Timer Functions**

- delay()  
it pauses the program for the amount of time (in milliseconds) specified as a parameter.
- delayMicroseconds()  
it pauses the program for the amount of time (in microseconds) specified as a parameter.

### ❖ **Serial I/O Functions**

- Serial.begin()  
It is to set the data rate in bits per second(baud) for serial data transmission.
- Serial.print()  
It prints data to the serial port as human-readable ASCII text
- Serial.read()  
It is to read or send data to Arduino through Serial Monitor
- Serial.println()  
It prints the data to the serial port followed by a carriage return

## Circuit Diagram:



### Source code:

```
#include<SoftwareSerial.h>
#include<TinyGPS.h>
#include<LiquidCrystal.h>
LiquidCrystal lcd(13,A1,A2,A3,A4,A5);
float gpsslat, gpsslon;
TinyGPS gps;
SoftwareSerial sgps(2, 3); //gps rx=2, tx=3
SoftwareSerial sgsm(10, 11); //gsm rx=10,tx=11
void setup()
{
  Serial.begin(9600);
  sgsm.begin(9600);
  sgps.begin(9600);
  lcd.begin(16,2);
  pinMode(A0,INPUT); //mq2 sensor
  pinMode(4,OUTPUT); //MOTOR 1
  pinMode(5,OUTPUT); //MOTOR 2
  pinMode(7,OUTPUT); //MOTOR 3
  pinMode(8,OUTPUT); //MOTOR 4
  pinMode(12,OUTPUT); //BUZZER
}
void loop()
{
  int alcohol=analogRead(A0);
  Serial.println(alcohol);
  sgps.listen();
  while(sgps.available())
  {
    int c=sgps.read();
    if(gps.encode(c))
    {
      gps.f_get_position(&gpsslat,&gpsslon);
    }
  }
  if(alcohol>200)
  {
    sgsm.listen();
    sgsm.print("\r");
    delay(1000);
    sgsm.print("AT+CMGF=1\r");
    delay(1000);
    sgsm.print("AT+CMGS="+919398325300+"\r");
    delay(1000);
```

```

sgsm.print("https://www.google.com/maps/?q=");
sgsm.print(gpslat, 6);
sgsm.print(",");
sgsm.print(gpslon, 6);
delay(1000);
sgsm.write(0x1A);
delay(1000);
lcd.setCursor(0,0);
lcd.print("alcoholtaken");
digitalWrite(12,HIGH); //BUZZER ON
lcd.setCursor(0,1);
lcd.print("sending sms");
digitalWrite(4,LOW); //MOTOR 1 OFF
digitalWrite(5,LOW); //MOTOR 2 OFF
digitalWrite(7,LOW); //MOTOR 3 OFF
digitalWrite(8,LOW); //MOTOR 4 OFF
delay(1000);
}
else
{
digitalWrite(12,LOW); //BUZZER OFF
lcd.setCursor(0,0);
lcd.print("alcoholnottaken");
lcd.setCursor(0,1);
lcd.print("engine running");
digitalWrite(4,HIGH); //MOTOR 1 ON
digitalWrite(5,HIGH); //MOTOR 2 ON
digitalWrite(7,HIGH); //MOTOR 3 ON
digitalWrite(8,HIGH); //MOTOR 4 ON
}
delay(1000);
}

```

### **Code Explanation:**

TinyGPS++ is a library to use GPS module. It consists of many methods like encode, get Latitude, get longitude etc.

SoftwareSerial is a library to establish communication between GPS, GSM and Arduino. The TX and RX pins of both GPS and GSM are communicated with Arduino uno by using this library.

LiquidCrystal library is used to make communication with LCD with Arduino uno.

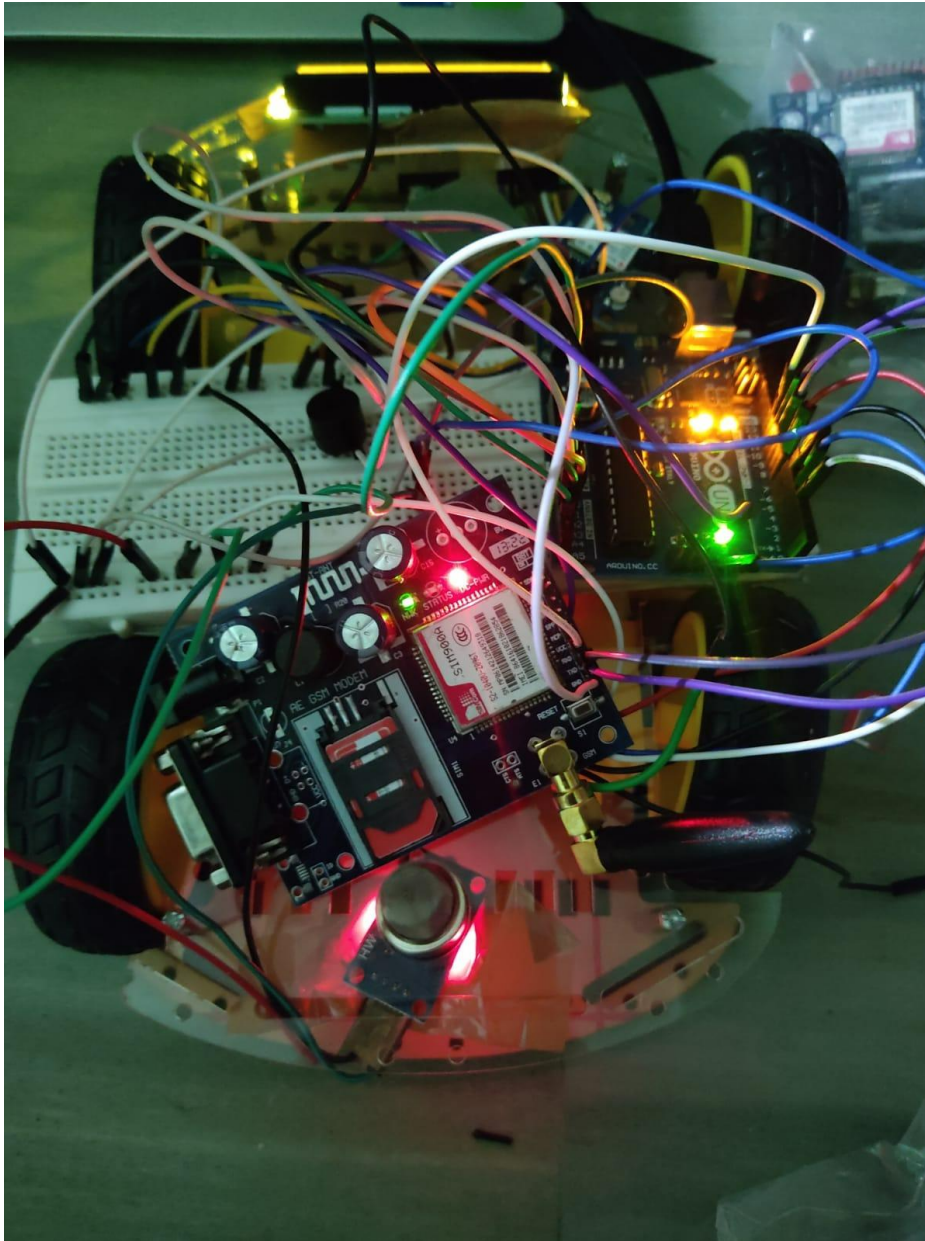
### **Working of project:**

Whenever a person driving vehicle consumes alcohol the gas sensor senses the ethanol percentage in the atmosphere and compares with limit or threshold value if the value detected is more than that knee point. Then car engine motors stops automatically and the GPS receiver extracts the latitude and longitude positions of that vehicle and sends as a map link to the registered mobile number via GSM. Thus, it helps the government to track drunk and driven vehicles easily.

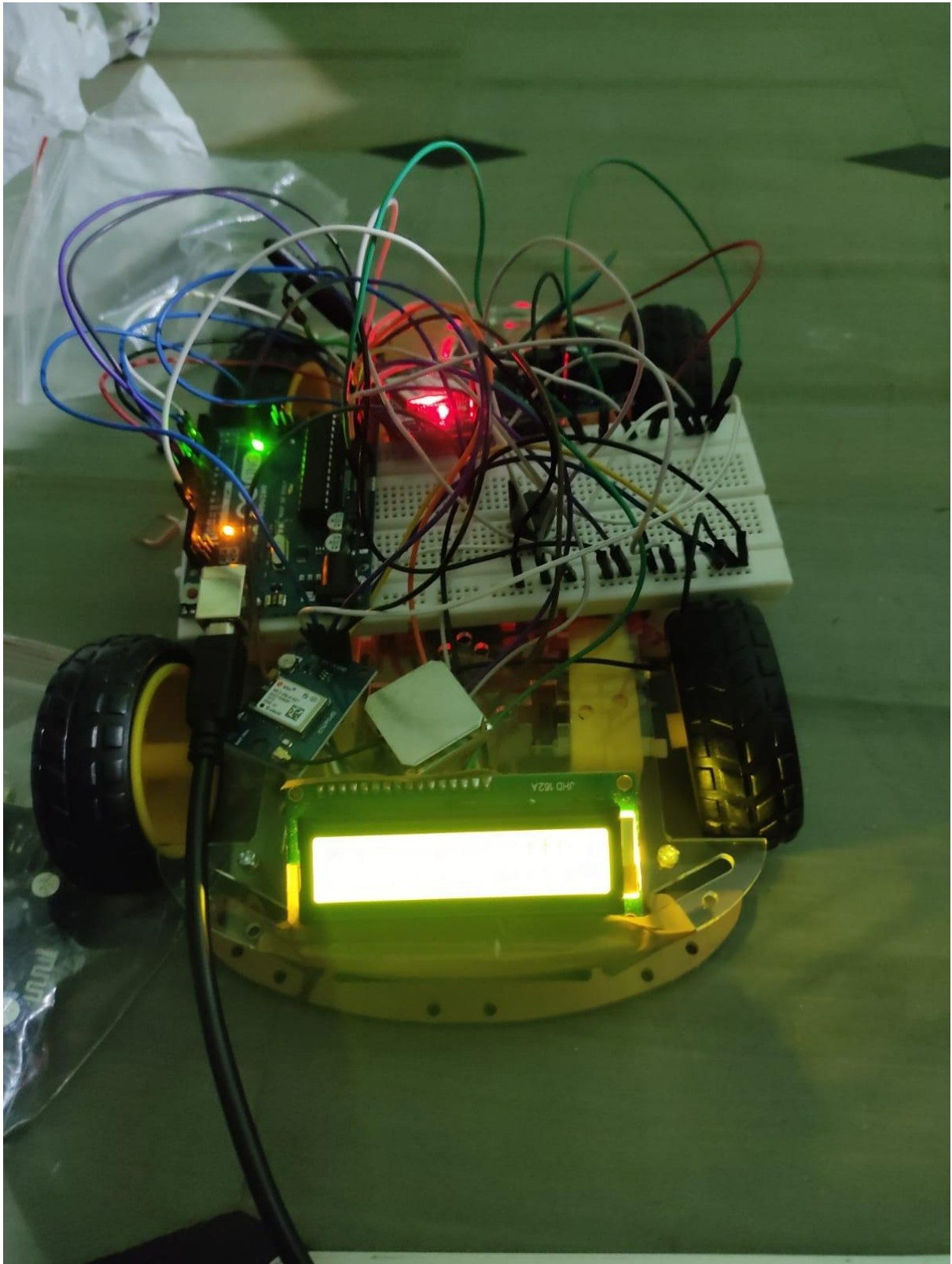
If the detected value is less than knee value then car engine will run as it is.

An LCD and Buzzer is used so that it can be seen and visualized easily.

## Results and discussions

















## **Conclusions**

By this project we conclude that our project will surely help in reducing the accidents caused by drunk and drives. As we used smart system which alerts the people when the driver consumed alcohol, there are very less chances of meeting with accidents. By using this system we can keep a full stop to accidents.

### **Future scope:**

This product can be used to detect alcohol and prevents the consumption. Thus, in future it can be made as an useful service to the government to stop consumption of alcohol which ultimately saves many lives.

### **References:**

- [www. Arduino.com/gps learner](http://www.Arduino.com/gps%20learner)
- [www. Arduino.com/gsm learner](http://www.Arduino.com/gsm%20learner)
- [www. Arduino.com/learn gsm AT commands](http://www.Arduino.com/learn%20gsm%20AT%20commands)







