Alcohol-level Detection system for Driver's Security using IOT

Dissertation/ Project report submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

By

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UNDER THE GUIDANCE OF

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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

May, 2019

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DECLARATION BY THE SCHOLAR

We hereby declare that the work reported in the B-Tech thesis entitled "**ALCOHOL**

LEVEL DETECTION SYSTEM FOR DRIVER'S SECURITY USING IoT"

submitted at **Jaypee University of Information Technology, Waknaghat, India**, is

an authentic record of our work carried out under the supervision of **Ms. Pragya Gupta**.

We have not submitted this work elsewhere for any other degree or diploma.

(Signature of the Scholar)

Paras Mittal

Ayushi Awasthi

Ishita

Department of ELECTRONICS AND COMMUNICATION ENGINEERING

Jaypee University of Information Technology, Waknaghat , India

24th May , 2019

CERTIFICATE

This is to certify that the project entitled "**ALCOHOL LEVEL DETECTION SYSTEM FOR DRIVER'S SECURITY USING IoT"** submitted by Paras Mittal, Ayushi Awasthi and Ishita, to the **Department of ECE** for the fulfilment for the award of **B.Tech** degree from **Jaypee University of Information Technology, Waknaghat** is a record of student's own work carried out under my supervision.

Pragya Gupta

Assistant Professor

Department of Electronics and Communication Engineering

Dated:

ACKNOWLEDGEMENT

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In the end we would like to thank each other for the unfathomable cooperation, participation and pro-activeness towards the successful partial completion of this project.

Any suggestions for the improvement of the project are promptly welcomed and entertained.

Thank you.

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ABSTRACT

Drinking and Driving has become a huge cause of road accidents in today's world. It is found out that more than 60% of road accidents are caused due to drunk driving. Drinking and driving not only affects the person who is drunk but also the ones sitting in the same vehicle or the people and vehicles on road. Therefore, immediate attention should be given to this increasing threat.
The aim of our project is to design a system that takes care of this problem, a system that senses the alcohol in one's breath and preventive measures are taken with the help of internet of things. Even though there are enough laws to penalize such drivers but they can't be implemented on a large scale because cops cannot stand on every road to keep looking for drunk drivers. This is probably a colossal reason for accidents. Hence, there is an immediate need for an adequate system that can check drunk drivers and avoid further threats. Deaths due to drunk-driving are increasing day by day on a large scale which brings us to a question as to how can we minimize these myriad number of cases? The proposed system is a very good method to curb drunk people.

The system will basically comprise of a breath analyzing sensor, MQ-3, which will sense the level of alcohol in your breath. In India, the quality legal limit of alcohol in blood is 0.03%, that means 30 microliters of alcohol in 100 milliliters of blood [10]. If the alcohol content is above this threshold then the engine will not start and the person will not be able to drive. A mail will also be supposedly sent to a friend or a relative using a Raspberry Pi, mentioning the exact location, using a GPS. Thus, by implementing such system, we can reduce alcohol related road mishaps. Hence, these kinds of detectors have a great significance. This project can help prevent life and property loss because of drunk reckless driving.
KEYWORDS: MQ-3, RASPBERRY PI, GPS, EMBEDDED.

CHAPTER 1: INTRODUCTION

1.1 Introduction

The idea of developing an accident prevention system is invoked in the mind of the researcher after reviewing the daily newspaper articles on the increasing number of road accidents. These accidents mainly occur due to increased number of vehicles, violation of rules, alcohol consumption and carelessness of drivers. There are various reasons for road accidents but in this project the main cause which is addressed is alcohol consumption by drivers. If this condition is reduced, road accidents can be reduced to a great extent.

'Alcohol Level Detection System for Driver's Security '- is an initiative to minimize the number of accidents due to drinking and driving and henceforth safeguarding the lives of the pedestrians as well as the people inside the car. It is an embedded, automated and most importantly, an intelligent system which will help the people as well as the environment.

1.1.1 Effects of road accidents

The impact of accidents is very imposing on the mind of people as it causes fatal injuries and even deaths. India has the second largest road network in the world approximately over 3 million kilometers. These roads largely contribute to the Indian economy. Despite of the advantages of roads, it is revealed in an Indian government report that 1,34,000 people died due to road accidents in the year 2010.

- India contributes 10% of road accidents worldwide.
- An estimation of 2,75,000 people are seriously injured on road every year.

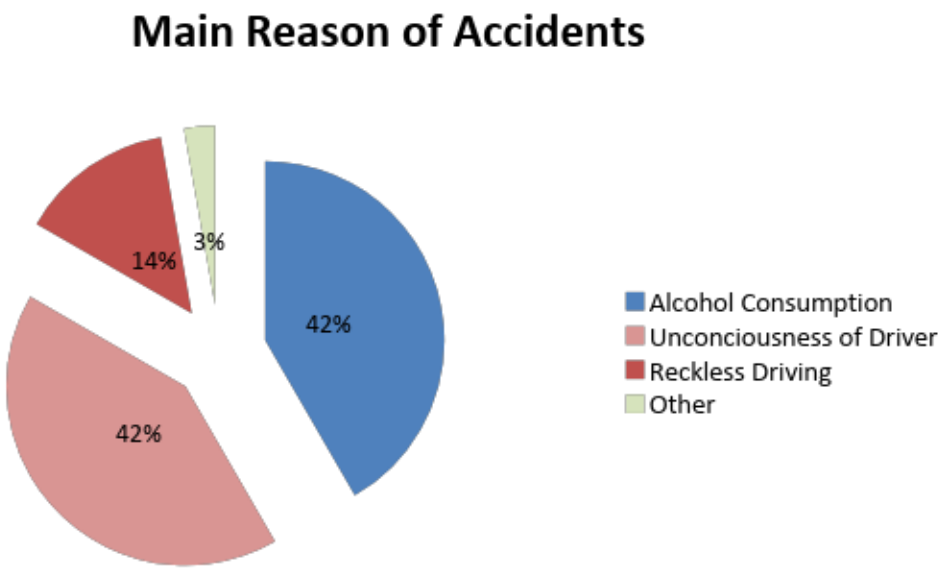

Figure 1.1 Main Reason of Accidents [9]

1.2 Problem Statement

It is shocking that a majority of road accidents occur because of alcohol impaired driving. It is a major problem in India but due to lack of research and measures this problem still remains. A report by Alcohol and Drugs Information Centre (AIDC) revealed that about 40% of road accidents in India occur due to driving under the influence of alcohol. It is evident from the statistical data revealed by the research done on road accidents that drunken driving has been recognized as world hazard. Some of those facts are mentioned below.

- In India, drunk driving majorly contributes to the traffic deaths and 70% of those were fatal.
- Road accidents cause 12 lakh deaths and 500 lakh injuries around the world each year and out of which 4,80,000 of these deaths and about 200 lakh fatal injuries are caused by drunk driving.

In a developing country like India, driving any kind of vehicle requires lot of concentration, quick reflex actions and decision-making abilities for the drivers to avoid any road accidents.

The consumption of liquor past a certain limit, affects the normal functioning of the brain and impacts the 'presence of mind' capability of the driver which in turn result in accidents that not only affect the driver but also its' fellow passengers. In turn, it can even result in fatal trauma to the family members. The proposed system, if fitted inside the vehicle on a steering wheel, will test the many-conditions which can trigger the alarm indicating the drunk or sober state of the driver.

1.3 Objective

The project aims at reducing the reckless driving situations which leads to major accidents not only in India but also in other developing nations too. It will promote safe driving and therefore prevent traffic chaos and reduce the alarming rate of accidents. A very compact system will be placed inside the vehicle as only a breath analyzing sensor will be fitted on the steering wheel.
To achieve the aim of the project with cost efficiency and within the stipulated time duration, a sequence of objectives is made and mentioned below;

- Identify user requirements using various primary research methods and fulfill most of them with cost efficiency and reliability.
- Explore and examine the appropriate hardware and software required to implement the system.
- Develop a reliable and cost effective system to avoid the accidents and safeguard human life by making the transport system more efficient.
- To build a prototype of accident prevention system which can alert the driver beforehand.
- Test and validate the performance of the implemented system to achieve the desired outcome for safe transport system.

1.4 Methodology

1.4.1 Intelligent vehicle system

As described in section 1.1 and 1.2, the impact of road deaths and injuries on the society is too great that demand for vehicle automation is rapidly increasing for safety of individual. So, steps should be taken towards the automation of vehicles which can reduce driver's errors and accidents can be avoided before they actually occur. Enormous advancements have taken place in automobile technologies already and still the research is going on to widen the horizon.

1.4.2 Need of intelligent vehicle systems

From the data analysis, it is sure that the users need an intelligent system in their vehicles that can prevent accidents beforehand. The report gives a clear idea that 95% of the respondents agree to need of installing intelligent system in their vehicles.

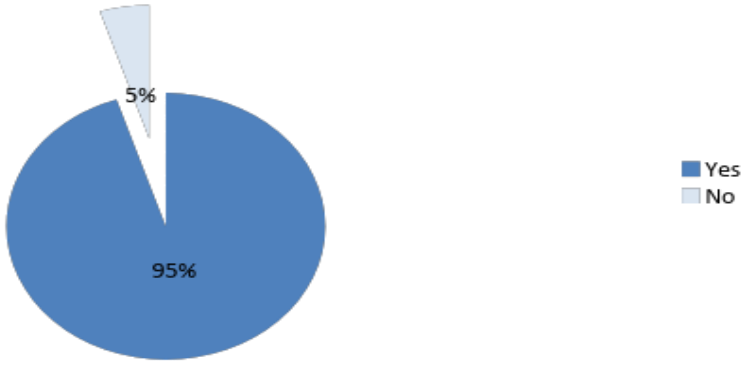

Fig 1.2 Need of Intelligent Vehicle System [9]

1.4.3 Outline

The idea will be to place a breath analyzing sensor on the steering wheel of the vehicle which will detect the level of alcohol content present in driver's breath. If the level exceeds a set threshold, which according to the government is 0.03% or per say 30 mg/dL[10], then the engine will not start and a text message will immediately be sent to the driver's friend or relative, along

with his exact location. If the driver is intoxicated before, but starts consuming alcohol while on the move, the sensor will keep measuring and the moment the level crosses the set threshold, the vehicle will start slowing down and get stationed at a location.

1.5 Comparison with the existing system

There are various advanced vehicle systems installed in the vehicles which can monitor the performance and speed of the vehicles but this system is entirely different from those as it monitors the driver's state while he is driving the vehicle.

Here is a table given below which gives the basic comparison between the project and the existing system used in advanced vehicle systems.

Table 1.1 Comparison of Proposed System with the Existing System

Existing systems used in vehicles	**Proposed Accident prevention system**
Existing advanced systems like anti-lock braking system, immobilizers, parking sensors, cruise control concentrate on mechanical performance of the vehicle but are unable to detect driver's state.	This accident prevention system using alcohol sensor can detect the driver's state or condition which is the major reason of accidents.
These systems use bulky mechanical parts so they are much expensive.	It does not use mechanical parts instead of that it uses electronic components and sensors for sensing the driver's state. So it is very cost effective.
These are very bulky and big in size.	It uses compact size components.

Difficult to fabricate.	Easy to fabricate.
Alcohol detection techniques used presently like skin sensors, handheld sensors are contact based or need subject's participation.	Alcohol detection techniques used in the proposed sensor does not need subject's participation rather it senses the alcohol content from a distance.
Some of these existing systems do not possess the feature of early alert and auto shut down of vehicle.	Helps drivers to prevent road accidents beforehand by alerting them and automatically shutting down the vehicle ignition system if alcohol is detected.

1.6 Features provided by the project

This project provides a solution to avoid these accidents up to a certain extent. Accident prevention using alcohol detection serves the solution for accident prevention with the following features:

- System offers accident prevention by detecting the consumed alcohol level using alcohol sensor and takes necessary measures to avoid accidents.
- This system provides the alert system facility along with the automatic shutdown facility of the vehicle.
- This project deals with the detection of the driver's state unlike other intelligent systems which works on the mechanical aspects of the vehicle.
- This project provides a cost effective, reliable and feasible system for accident prevention.

Although despite of all these advantages, the system has some limitation or scope for future development.

CHAPTER 2: LITERATURE SURVEY

A few approaches that reflect light on alcohol level detection system are:

2.1 "Alcohol Detection in Real-Time To Prevent Drunk Driving" [1]

In this paper, an alcohol level detection system is presented along with its pros and cons. Highlighting the increasing number of accidents due to rash and reckless driving, it promotes the use of this system to minimize cases like these. An MQ-3 alcohol sensor along with the microcontroller Atmega328 will detect the driver's breath alcohol content. Some of the scenarios are listed as follows:

1. When the driver enters the vehicle in drunk state: In such a case, the sensor will sense the liquor level as soon as the driver sits inside & the vehicle will not start.

2. When the driver intakes alcohol after the vehicle starts or while driving: The system is designed in such a way that it will continue to run during the entire course of driving and will keep on checking the alcohol content continuously time to time. The moment the level goes beyond the set legal-limits, it triggers the desired action.

3. Passengers are drinking alcohol while the automobile is on the run but not the driver: In such a case, it will not detect since the system is installed on the steering wheel and has a set range of approximately two-meters.

2.2 "Crash Risk of Alcohol Involved Driving: A Case-Control Study"[2]

Drunk driving was recognised as a major traffic safety threat in the early twentieth century and still continues to be a major road safety issue. The case study inspected the relative accident dangers related with driver's blood alcohol conc. The obtained value, is characterized as the ratio

of proportion of extent of crash drivers to the extent of, control drivers in a BAC grouping, compared to a similarly formed proportion of drivers with zero percent BACs.

2.3 "Vital Signs: Alcohol-Impaired Driving Among Adults"[3]

Approximately 1/3 of all vehicles, crash accidents involve drunk driving. In 2009, 10,839 people died in crashes in which at least one driver had blood alcohol concentration greater than or equal to 0.08 g/dL. Rates of self-revealed alcoholic driving have declined in the past years. However, still the rates remain disproportionately high among the youths, binge drinkers and individuals who do not wear seat belts.

To reduce the excessive drink and driving cases, states and countries ought to consider increasing alcohol taxes, directing alcohol outlet density, and enacting on these laws strictly. States without seat belt laws ought to consider enacting on them to help lessen fatalities due to drunk driving.

2.4 "Driver Alcohol Detection System for Safety (DADSS) – Preliminary Human Testing results" [4]

BAC (Blood Alcohol Concentration) remains the standard for calculating the amount of liquor in the body. The data clearly supports the proof of the idea that two different passive technologies namely breath and touch can detect alcohol levels in a human body very quickly and are not influenced by numerous situations in many scenarios that are known to shift blood alcohol concentration (BAC).

2.5 “IOT-ENABLED ALCOHOL DETECTION SYSTEM FOR ROAD TRANSPORTATION SAFETY IN SMART CITY” [5]

In this paper, an alcohol level detection system was invented for road safety in smart cities using Internet of Things (IoT) technology. The system not only checks alcohol impaired driving by automatically locking down the car which the drunk person is operating but even enables the traffic experts to effectively discover the shutdown vehicles utilizing the coordinates of the vehicle by sending it to a web server. The advancements which are implanted in this framework are adequate to guarantee the shut down and furthermore a pick-up of the driver of the vehicle through the location sent by means of message or mail.

2.6 “Drunk-Driver Detection and Alert System (DDDAS) for Smart Vehicles” [6]

This paper discusses design, live performance test of drink and drive identification and alert cum vehicle control prototype to reduce road accidents due to drinking and driving. The critical part of the system design is variation in distance from the source. The aim is to make the vehicle smart enough to find out the drunk state of the driver and take preventive actions before any mishap happens on road. Based on recent smart gas sensing and integration of satellites and mobile wireless communications technologies, the system senses the drunk state and on-vehicle audio alarm is turned on to warn people on road and vehicle control system is triggered to lock the ignition or stop fuel inflow to the car. Additionally with the help of GPS and GSM cellular network, location is sent to family, friend or police.

2.7 “Novel drunken driving detection and prevention models using Internet of things” [7]

Drunk driving is one of the major reasons behind majority of the deaths in the world. In this paper, Novel based IOT module is proposed to save the people from deaths caused by road accidents due to drunk driving. The Proposed system uses Internet of things tech. device as Raspberry Pi 3 model B as a core. It mostly includes alcohol concentration detection sensor, Touch sensor, Heart beat rate, Facial recognition, eye detection system, etc. to safeguard the tipsy driver. Various kinds of protecting things, for example, Triggering a caution GPS module and Automatic start off and so forth are utilized.

2.8 “Road Accident Avoiding System using Drunken Sensing Technique”[8]

Drunk Driving is responsible for almost one third of road accidents, the alcohol impairs person’s ability to calculate distance, judgment, reaction time, and vision. The Alcohol sensor (MQ2) is integrated with microcontroller and detects the presence of liquor in human breath. An engine with spark plugs is made as a framework to act as ignition starter over the car’s engine. The ignition system will operate based on the Blood Alcohol Content (BAC) level in human breath identified by the alcohol sensor MQ-3.

CHAPTER 3: SYSTEM DEVELOPMENT

3.1 Goals:

- To minimize the number of fatalities happening on road because of drunk driving.
- To make sure that the driver reaches his/her home safely.
- To ensure the safety of not only the driver but also the people sitting inside the car as well people outside.
- To minimise the damage caused to public property due to the increasing accidents.

3.2 Block Diagram

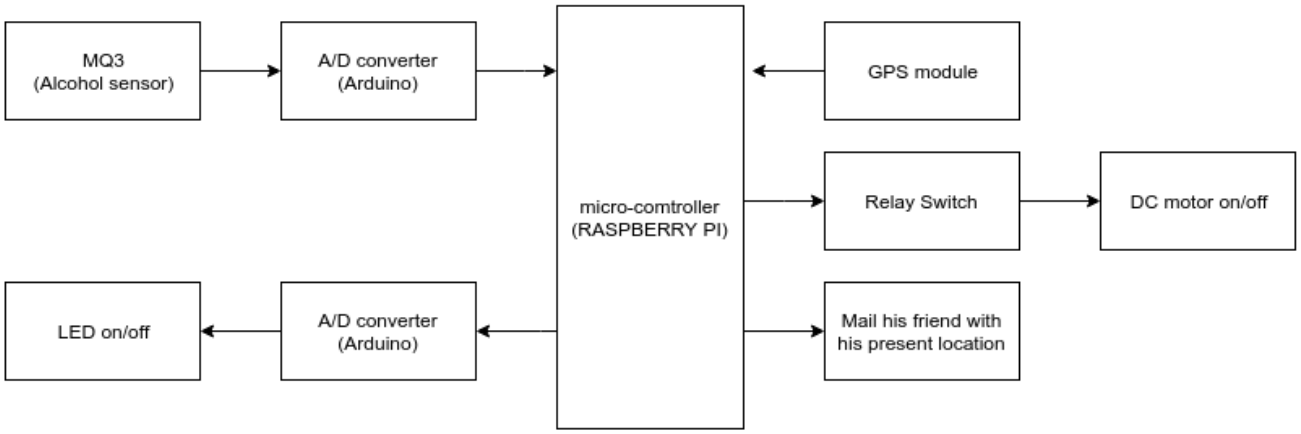

Fig 3.1 Block Diagram

3.3 FLOW CHART

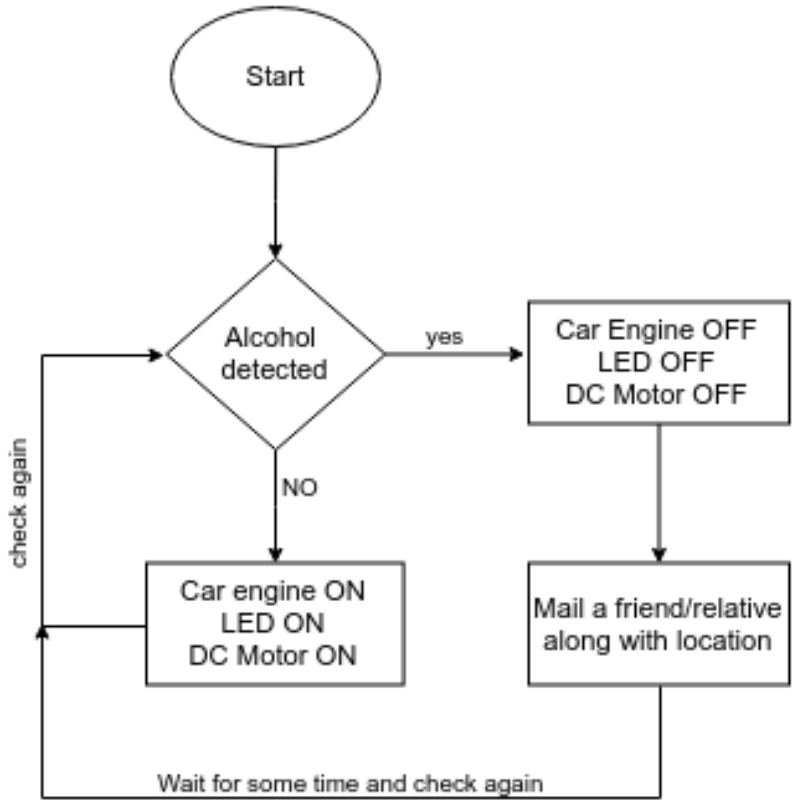

Fig 3.2 Flow Chart

3.4 FLOW OF PROPOSED SYSTEM:

As shown in the flowchart above, the system comprises of three main steps. Firstly, to check the driver's breath, then pass on the decision made on the basis of the measurement and lastly to mail the present condition of the driver to his friend/relative.

1. The driver sits inside the car and the sensor placed on the steering wheel detects his breath.
2. The sensor detects the breath and sends the analog output which is converted to digital through arduino and the output is then sent to the microcontroller.
3. If the output reading exceeds a certain set threshold, the driver is declared drunk.
4. If the output is far more than the threshold, then the driver is heavily drunk.
5. The car engine does not start and an additional mail is sent to the relative/friend of the driver sharing his present location by using GPS.
6. If the person starts drinking while driving, the sensor will again sense his breath and stop the vehicle.
7. If alcohol is not detected during the whole drive, the car will run smoothly.

CHAPTER 4: HARDWARE DESCRIPTION

Given below is the image of the project which clearly shows the components being used in order to justify the proposed theory.

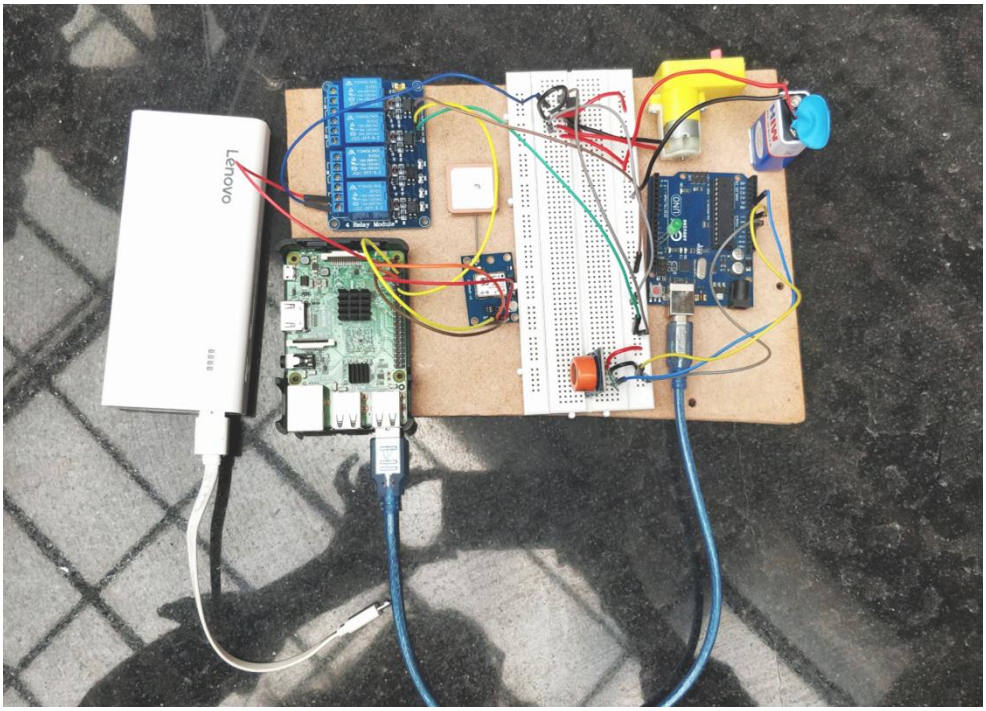

Fig. 4.1 Hardware Implementation of Alcohol level Detection system

4.1 MQ-3 ALCOHOL DETECTION SENSOR

MQ-3 is a cost effective semiconductor sensor that detects the presence of alcohol gases in a person's breath, from 0.05 mg/L up to 10 mg/L concentrations. The material used for sensing here is SnO2(Tin dioxide), whose conductivity in clean air is low and the conductivity increments with the concentration of alcohol gases present in breath. It is highly sensitive to alcohol and has some resistance to disturbance caused due to gasoline, vapour and smoke. The

sensor provides both analog and digital outputs. MQ-3 liquor sensor can be effectively interfaced with Microcontrollers, Arduino Boards, Raspberry Pi, and so on.

The alcohol sensor detects the concentration of alcohol in a person's breath, like a common breath analyzer. The circuit is quite simple and all it needs is a resistor. MQ-3 alcohol sensor has 4 pins but we use 3 pins only. The pins A and H are used for the heating purpose and the other two are used for power input and ground. The sensor has a heating framework inside which is made up of aluminium oxide, tin dioxide. It has heat coils to generate heat, and so it is used as a heat sensor module.

4.1.1 Construction and Interfacing:

MQ-3 sensor consists of a sensitive thin layer of tin-dioxide (SnO2), measuring electrodes and a heater fixed into a crust made up of plastic and stainless steel net with six terminals (H-H, A-A, B-B) to produce excitation and obtain the desired output. The sensor is fixed on to a board with proper signal to convert sensor output to standard voltage range. One of the electrodes (A or B) and one of the heater terminals(H) are given DC excitation of 5V. Other electrode (A or B) is acting as the output terminal and is connected in series to a variable resistor (around 200k ohms) to measure output voltage, connected to other heater terminal H. The MQ3 alcohol sensor board provides 4-terminals (Vcc, Gnd, A0, D0) for interfacing to microcontroller, out of which here we use only three out of four terminals. The sensor is given input power through the microcontroller and the output voltage over the resistor is interfaced to the simple information channel (A0) of the microcontroller which has worked in 10-bit ADC. As the liquor fixation expands, ADC check that is read on the serial monitor also increases.

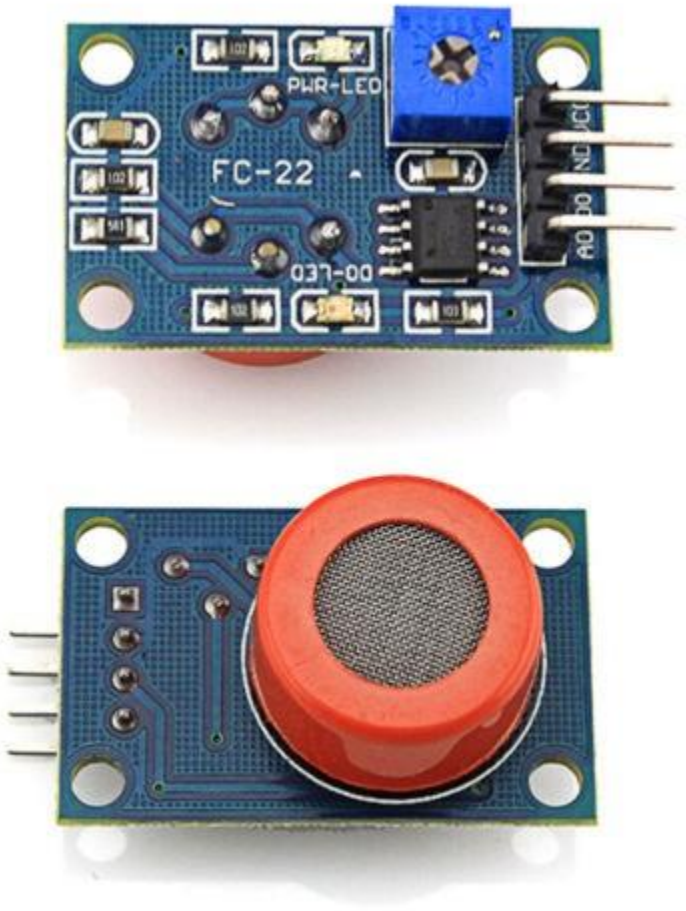

Fig 4.2 Alcohol Gas Sensor Module

4.1.2 Working Principle

The core system is cubical in shape. An Alumina tube covered by SnO2(tin dioxide) and between them, there is a Gold(Au) anode. When alcohol molecules in the air come in contact with the electrode, i.e. between alumina and tin dioxide, a chemical reaction occurs in which acetic acid is formed by burning of ethanol and then more current produces and on the basis of that current it determines the alcohol level and generate the analog output.

4.1.3 How an Alcohol Detector Works

To get reading, the person has to blow into the sensor for a few seconds. As soon as he blows the sensor senses the vapors in your breath to calculate the level of alcohol in the system. This is merely because the alcohol is not digested in the body and is barely absorbed through the different parts. Hence, the amount of material can still be distinguished few minutes after drinking which makes it possible for the sensor to calculate the alcohol concentration. In drunk state, alcohol concentration in driver's breath, increases the concentration of alcohol in the air around driver. This increase in alcohol concentration is detected by the sensor and due to this the conductivity of the sensor increments and subsequently the resistance diminishes nonlinearly.

The change in the conductivity of the sensor occurs due to the reversible reaction that is taking place at the interface of the tin-oxide layer with molecules of alcohol. As soon as the alcohol molecules interact with the oxygen molecules present on the surface of metal-oxide particles, a chemical reaction occurs, the depletion layer starts varying at the grain boundaries of the sensor which in turn lowers the height of the energy band gap and free charge carriers start to flow, which leads to increase in the conductivity of the semiconductor and decrease in its resistance. The output current of the sensor starts changing as the electrons start flowing to the outer circuit. The current output results in proportional voltage change across the variable load resistor. The microcontroller measures the change in voltage as its equivalent analog count.

4.1.4 Chemistry involved

At anode, ethanol is oxidized to acetic acid:

$$\mathbf{CH3CH2OH(g) + H2O(l) \rightarrow CH3CO2H(l) + 4H+(aq) + 4e-}$$

At the cathode, atmospheric oxygen is reduced:

$$\mathbf{O2(g) + 4H+(aq) + 4e- \rightarrow 2H2O(l)}$$

Overall. there is oxidation of ethanol to acetic acid and water.

$CH_3CH_2OH(l) + O_2(g) \rightarrow CH_3COOH(l) + H_2O(l)$

The overall current produced by the above reaction is measured by a microcontroller and displayed as blood alcohol content (BAC).

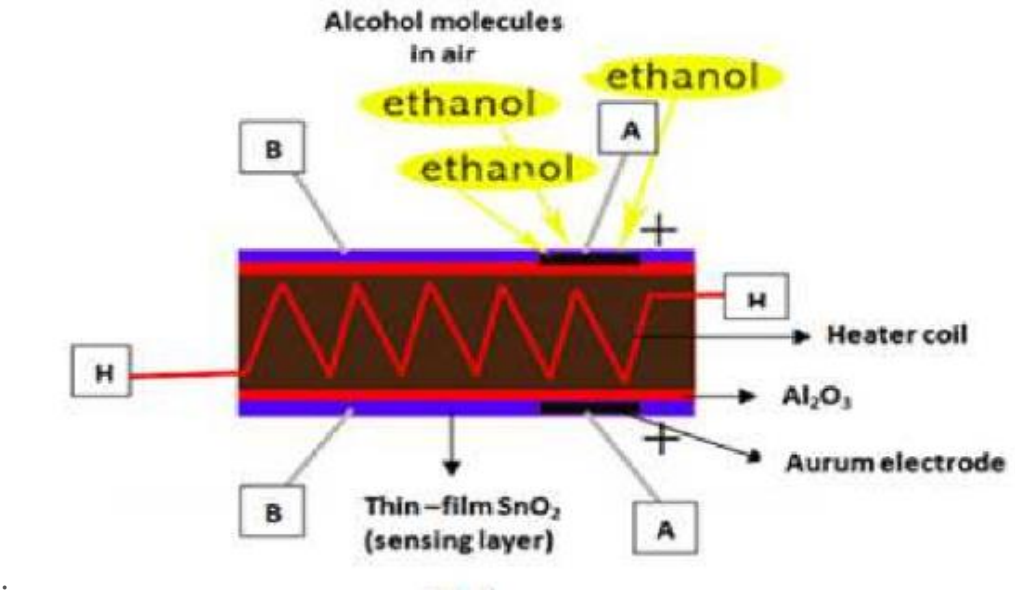

Fig 4.3 Cross Sectional View of thin-film MQ3 sensor

4.1.5 Features:

- Highly sensitive to alcohol
- Long life and stable
- Fast response
- Simple circuit
- Easily available and cheap

4.1.6 Technical Specifications:

- Gas Detected: Alcohol
- Concentration: 0.4mg/L – 4mg/L
- Supply Voltage: <24V
- Heater Voltage: 5.0V ± 0.2V (H.igh), 1.5V ± 0.1V (Low)
- Load Resistance: Adjustable
- Heater Resistance: 31Ω ± 3Ω
- Heater Consumption: <900mW

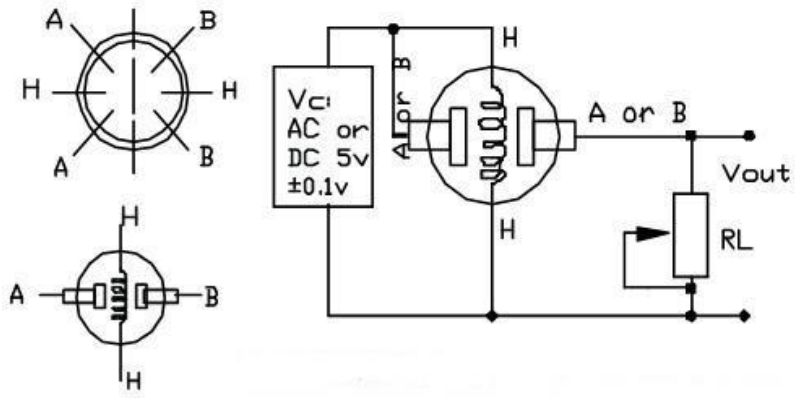

Fig 4.4 MQ3 Sensor

4.2 RELAY

Relay is basically a simple switch that can control the circuits electro mechanically. It makes or break the contact with the assistance of a signal on its own so as to switch it ON or OFF. The devices where we need to control a high powered circuit using a low power signal we use Relay.

4.2.1 Basic design and operation

The basic relay design has soft iron core (a solenoid) around which we have a coil of wire, a movable iron armature, an iron yoke that provides low reluctance path for magnetic flux and few additional sets of contacts. The armature is hinged to the yoke and also linked to atleast one or additional sets of moving contacts.

All the components are placed on top of the core. When the coil gets some power or energy, it attracts the armature. The armature is movable and hence acts as common terminal and needs to be connected to the external circuit. The relay has 2 pins, one is normally closed (NC) and the other is normally opened (NO), the normally closed pin is connected to the armature or the common terminal and the normally opened pin is not connected and is left free (when the coil is not energized). Once the coil gets energized the armature moves and attaches itself to the normally opened contact and stays there until the energy is flowing. As soon as it is de-energized it goes back to its initial position.

4.2.2 Advantage:

The advantage is that Relay does not require a huge amount of electrical power to operate the coil, but can be used to control electrical parts that draw a lot of electrical power comparatively such as heaters, motors, lamps or AC circuits.

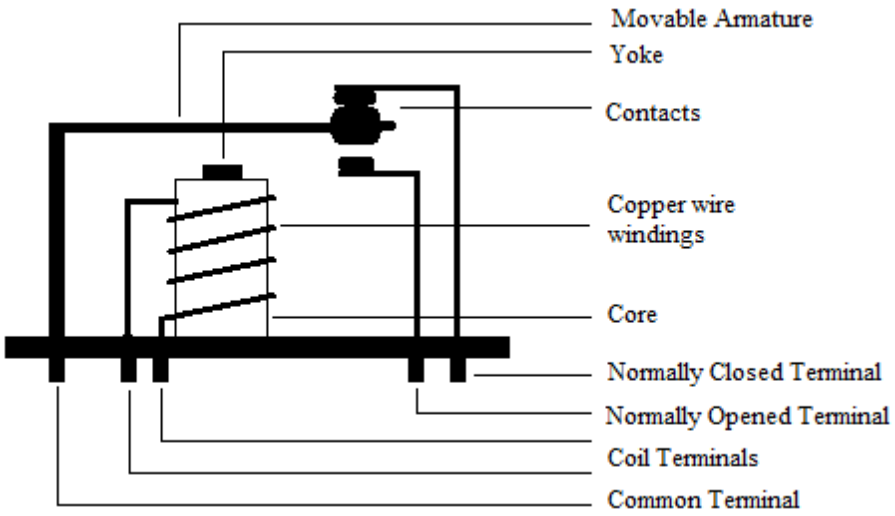

Fig 4.5 An electromagnetic Relay

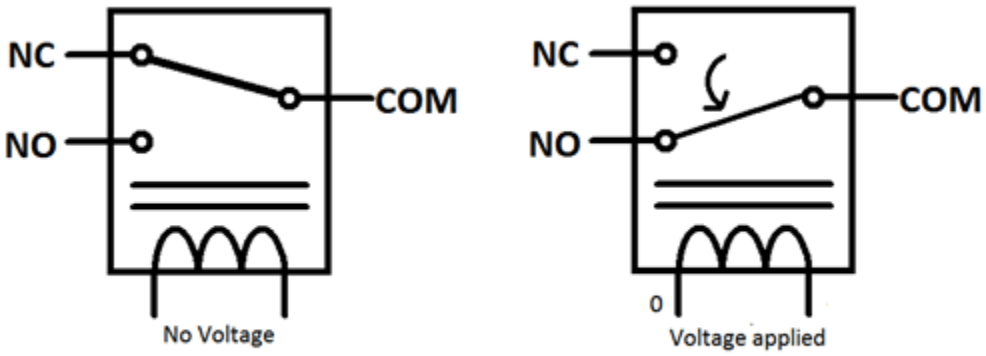

Fig 4.6 General Circuit representation of a Relay

4.3 ARDUINO BOARD

Arduino is an open source platform mostly used for building projects. It contains both hardware and software that runs on our computers. From smallest things like home automation systems to robots, Arduino can be used everywhere to make everyday life easier. Arduino board is a microcontroller. It has 14 digital pins(out of which 6 can be used as PWM outputs) and 6 analog pins, the microcontroller or the main chip that allows us to program the Arduino so that it can take commands and execute accordingly, USB port through which not only we can communicate with computer but also the Arduino can be powered through it, power jack, reset button and more. It contains everything expected to help the microcontroller.

4.3.1 FEATURES:

Microcontroller:	ATmega328
Operating Voltage:	5V
Input Voltage:	7-12V
Digital I/O Pins:	14
Analog Input Pins:	6
DC Current per I/O Pin:	40 mA
DC Current for 3.3V Pin:	50 mA
Flash Memory:	32 KB (ATmega328)
SRAM:	2 KB (ATmega328)
EEPROM:	1 KB (ATmega328)
Clock Speed:	16 MHz

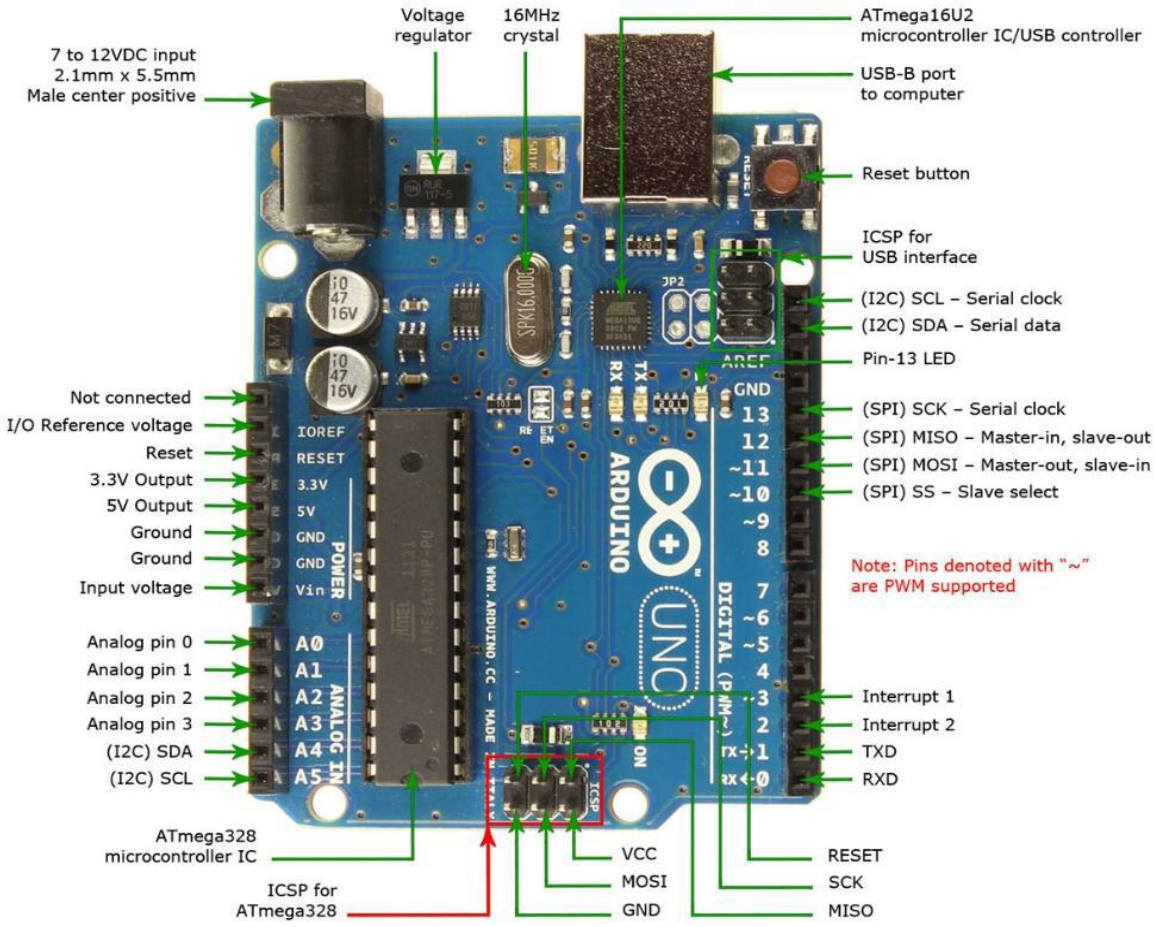

Fig.4.7Arduino Board

4.4 RASPBERRY PI

The Raspberry Pi is a collection of small single-board computers. That implies it is a finished PC based on a solitary circuit board, with microprocessor(s), input/output(I/O), memory and other attributes required of a functioning computer. Basically, it is a on chip PC.Itis a cheap, credit-card sized chip that can be plugged into a PC monitor or TV. It can be connected to a keyboard

and a mouse. It empowers people of all ages to explore computing, and to figure out how to program in dialects like Scratch and Python.

In spite of the fact that Pi is slower than a cutting edge workstation or work area yet it is a finished Linux PC and is sufficient to give all the normal capacities that infers at a low-control utilization level.

The Raspberry Pi is an open hardware, except for that essential chip on it, the Broadcom SoC (System on Chip), which runs an extensive lot of the primary parts of the raspberry board– CPU, graphics, memory, USB controller, and so on so forth.

4.4.1 What kind of OS does the Raspberry pi run?

The Raspberry Pi is meant to run on Linux OS, and a number of Linux distributions currently have an adaptation streamlined for the Pi. The most prevalent choices are Raspbian, which is based on the DebianOS, and Pidora which is based on Fedora OS.

4.4.2 Alternative for Raspberry pi

The Raspberry Pi isn't the sole tiny gadget of its type, two most distinguished are within the society square measure, the **Arduino** and **BeagleBoard**. Although both the systems are almost similar, the Raspberry Pi is completely a different thing. On the hardware side, the Pi is predicated around an ARM System on chip(SoC) that is especially closed source. Then again, the Arduino and BeagleBoard frameworks depend on completely open source equipment. The BeagleBoards does utilise ARM processors (TI OMAP 3530 SoC), but very different GPUs. The Arduino boards are even further divergent because of using 8-bit and 16-bit Atmel micro-controller chips.

The distinction factor between the Pi and the Arduino is in the planned utilisation. The Arduino is expected to be utilized as a development board with micro-controllers that can be programmed and then in turn connected to bigger machines and allowed to work on their own. But, infact, the Raspberry Pi is meant to be operated as a traditional desktop and used as a final product.

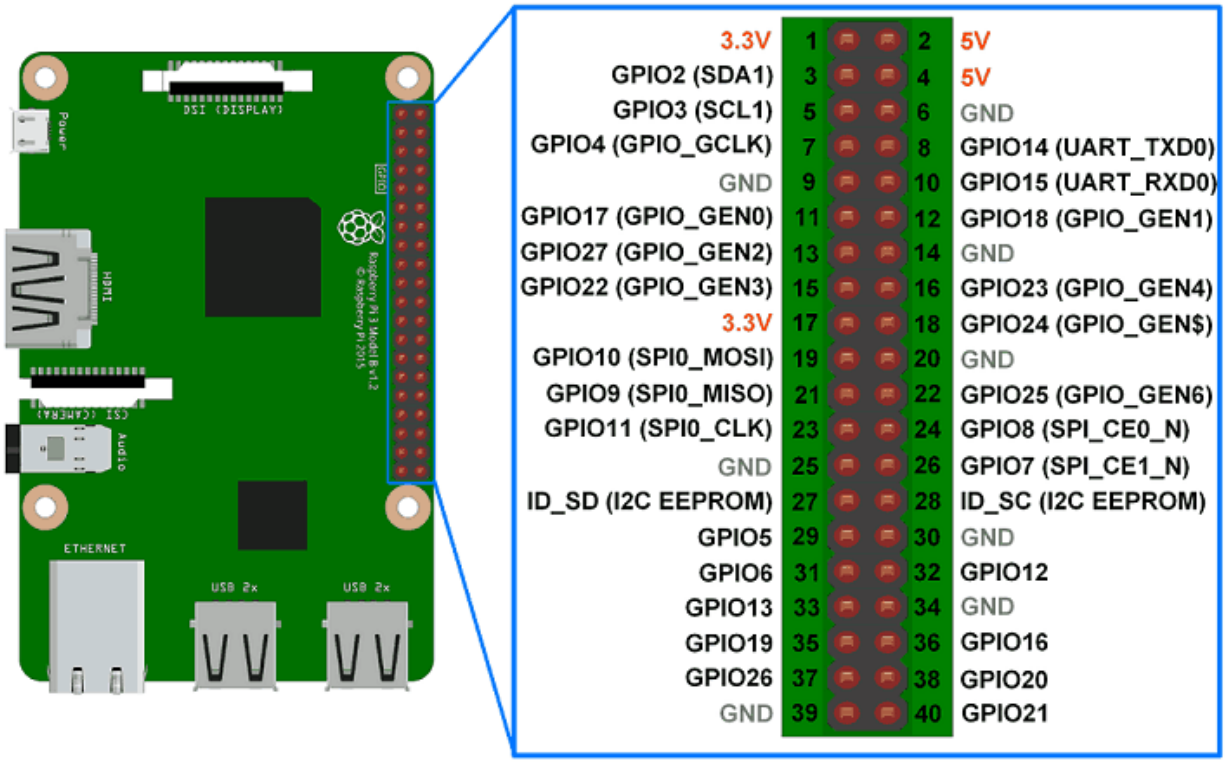

Fig 4.8 Raspberry pi Pin Diagram

4.5 GPS Module

GPS or global positioning system is used to find the specific location of objects. It gives location as latitude and longitude. The proposed system has a GPS module to send the position information to friends and relative of the person(who is driving) when high amount of alcohol is detected in his breath. GPS is a satellite-based route system and has a system of 24 satellites situated into the orbit. It can works in any climate conditions and at any place. A GPS antenna must be locked on to the signal of at least 3 satellites to calculate 2D location and track movement. With four or more satellites in the sight, GPS is able to calculate the user's 3D

location (latitude, longitude and altitude). Once the position of our vehicle is calculated, the GPS can find other attributes like, speed, distance to destination etc.

4.5.1 How GPS Works?

GPS receiver makes use of set of satellites along with ground stations to find the accurate location. These satellites transmit data signal over radio frequency (1.1 to 1.5 GHz) to the receiver. With the help of this received info, position and time can be calculated.

GPS receiver gets data signals from satellites and figures its distance from satellites. This is done by estimating the time needed for the sign to make a trip from satellite to receiver. By eliminating the sent time from the received time, we can calculate the time taken to travel.

To find out the distance, the GPS receiver and satellite generate the same pseudocode signal at the same time. The satellite transmits signal; and received by the GPS receiver. Both these signals are subtracted and the difference between the signals is the travel time.

If the receiver knows the distance from at least 3 satellites and their location (sent by the satellites), it can compute the present location of vehicle.

4.5.2 GPS Module

The Neo-6M GPS Module is a series of independent GPS receivers including the u-box 6 positioning motor. They have a simple design, power and memory alternatives. The GPS is a space-based satellite route system that can give location and time data in any condition and place that provides unrestricted pathway to at least four GPS satellites. The system is very useful in areas like military, common and business clients around the world. GPS receiver module gives output in standard NMEA string format and provides serial o/p on Tx pin with a default Baud rate of 9600.

This string o/p from GPS receiver contains attributes like latitude, longitude, altitude separated by commas.

Fig 4.9 GPS Module

Pin Description:

Pin 1: VCC: Power Supply(3V3 – 6V)

Pin 2: RX: Receives data serially. It is to configure GPS module

Pin 3: TX: Transmits data in a serial manner, gives information regarding location, time etc.

Pin 4: GND: Ground

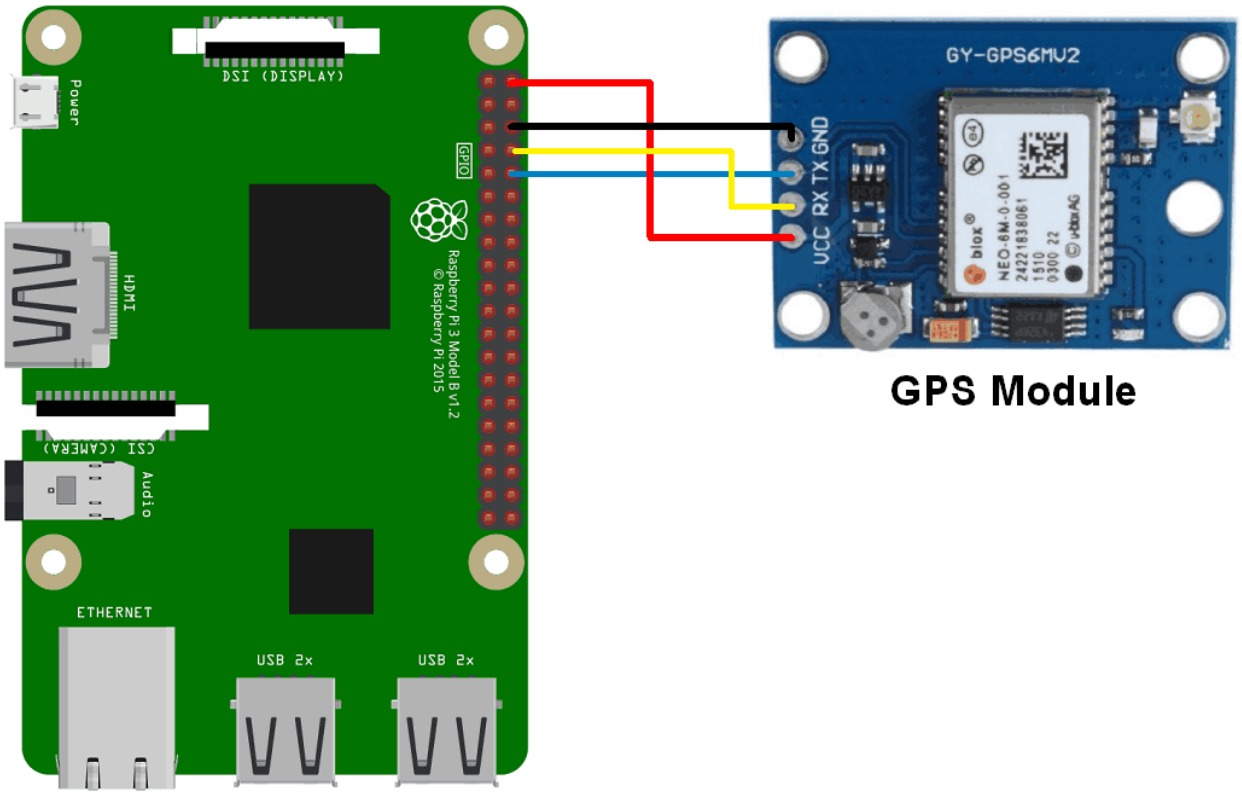

Fig 4.10: Interfacing of GPS Module with Raspberry Pi

4.6 DC MOTOR

A DC Motor converts electrical energy into mechanical energy. It operates on the principle of electromagnetism that is when a current carrying conductor is placed in a magnetic field, it experiences a force which causes it to rotate. The armature coil and the stator are the two main parts of DC motor. The armature is the rotating part whereas the stator is the stationary part. The armature coil is connected to DC supply. It consists of commutators and brushes. The commutator converts the AC current induced in the armature into DC current. The brushes

transfer the current from the rotating part to the stationary external load. The armature is placed between the north pole and south pole of the permanent or electromagnets.

When DC supply is given to the armature, current starts flowing through it. This current develops its own field around the coil. By the interaction of fields, resultant field is developed across the conductor. The resultant field regains its original position. The field exerts force around the end of the conductor and the coil starts rotating.

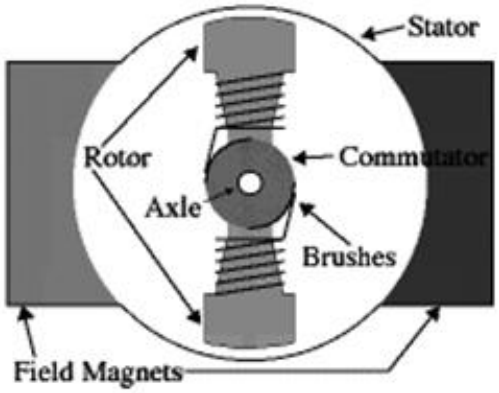

Fig 4.11 DC Motor

4.6.1 Advantages of DC Motor:

1. It provides good speed control for acceleration and deceleration
2. Simple design
3. Cheap

4.6.2 Connecting DC Motor with Microcontroller

Motors cannot be driven directly through microcontroller. We use these motor drivers as an interfacing device between motors and microcontrollers. Motor drivers take a low current control signal and provide a high current signal which is used to drive the motors hence they act as current amplifiers. Using L293D chip is a simple way to control the motor using a microcontroller. The internal circuit has two H-bridge driver circuits.

This chip is so designed as how to control the two motors. L293D has two sets of arrangements where one set has input 1, input 2, output1, output 2, with enable pin. Whereas, the other set has input 3, input 4, output 3, output 4 with another enable pin.

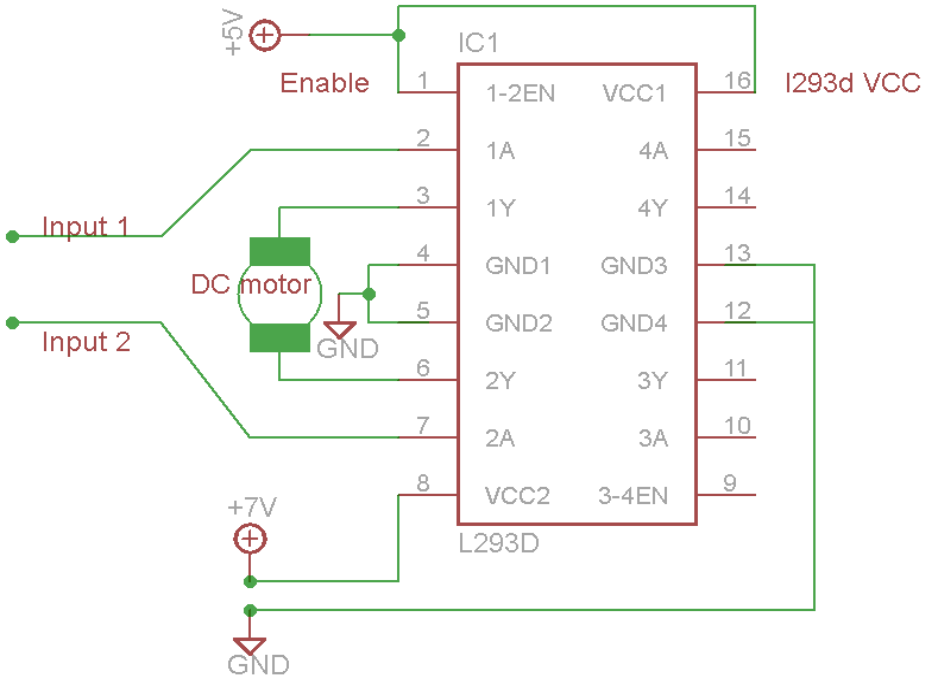

Fig. 4.12 Driver IC circuit diagram for DC motor

4.7 LIGHT EMITTING DIODE (LED)

LED or Light emitting Diode is a semiconductor device that discharge infrared light or visible light when subjected to electric current. LEDs are utilized in a large number of gadgets as marker lights, in cars as window and brake lights, and on numerous boards and signs.

It is a two-lead semiconductor light source. LED is a simple p-n junction diode and is specially doped. When voltage is applied and diode is forward biased,the electrons from n and holes from p move toward the junction and there occurs combination and energy is released as photons, the color of the emitted light (corresponding to the energy of the photon)depends on the band gap energy of the semiconductor.

4.7.1 Applications

1. Used as bulbs in homes, industries.
2. LED's are used in vehicles like motor cycles and cars.
3. Used in various toys.
4. Displaying messages on mobile phones.
5. LED lights are used in traffic signals.

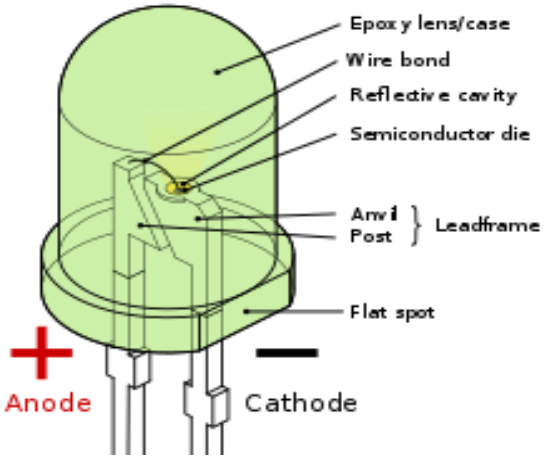

Fig. 4.13 Structure of an LED

CHAPTER 5: SOFTWARE DESCRIPTION

The software design consists of a free running program that can easily manipulate input from the alcohol sensor and by programming of the given unit. The program code is written in a user friendly language named Python.

Firstly, we will use **Putty** software in windows and open Raspberry pi **Terminal** in **SSH** mode. SSH uses **port22** to connect to the raspberry pi.

Raspberry pi and arduino are communicating through **Firmata** which uses **serial communication** to communicate with raspberry pi.

Raspberry pi and GPS module communicate via **UART (**UNIVERSAL ASYNCHRONOUS RECEIVER-TRANSMITTER**)** port. It is a physical circuit in a microcontroller, or a stand-alone IC. To transmit and receive serial data is its main purpose. Only two wires are used to transmit data between devices. For communication, two UARTs can easily communicate directly with each other. The transmitting UART converts the parallel data from a controlling device like CPU into a serial form. It then transmits the serial data to the receiving UART, which again converts the serial data back to parallel data ready for the receiving device. Data flows from the Tx pin of the transmitting UART to the Rx pin of the receiving UART.

UARTs transmit data asynchronously, which basically means that no clock signal is generated to synchronize the output of bits received from the transmitting UART to the sampling of bits by the receiving UART. Instead of a clock signal, the transmitting UART adds start and stop bits to the data packet being transferred.

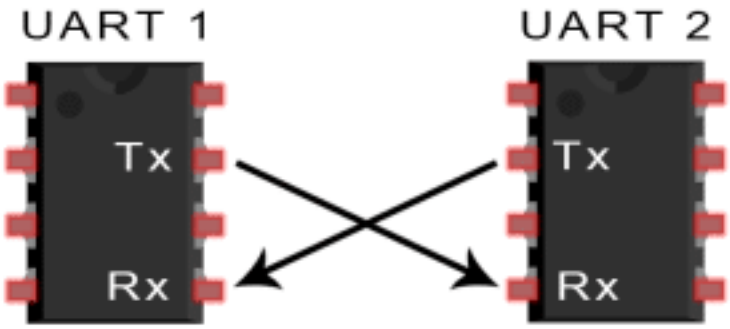

Fig. 5.2 UART communication

All the programming is done in **Python 2.7**. To run the code type **python arcohol.py**

pi@raspberrypi: ~/proj/te

```
 GNU nano 2.2.6                File: alcohol.py

#import matplotlib.pyplot as plt
#%matplotlib inline
#plt.switch_backend('Agg')
from pyfirmata import Arduino, util
from twilio.rest import Client
import RPi.GPIO as GPIO
import os
import serial
import string
import pynmea2
#import matplotlib.animation as animation
#from matplotlib import style
import smtplib
import time


GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
GPIO.setup(18,GPIO.OUT)
                [ Read 131 lines (Converted from DOS format) ]
^G Get Help  ^O WriteOut  ^R Read File ^Y Prev Page ^K Cut Text  ^C Cur Pos
^X Exit      ^J Justify   ^W Where Is  ^V Next Page ^U UnCut Text^T To Spell
```

Fig.5.1 Libraries included in the code

Some of the libraries used in the coding section are as follows:

PyFirmata: We will use PyFirmata firmware to give commands to Arduino using Raspberry Pi python script. It is basically a pre built library package of python programming which can be installed in Arduino to allow serial communication between a python script on any computer and an Arduino. This package can give access to read and write any pin on the Arduino.

Pynmea2: This is a Python library for parsing NMEA(National Marine Electronics Association) data into usable objects. NMEA is a standard data format supported by all GPS manufacturers.

Serial: This library enables communication between the Arduino board and a computer or other devices. All Arduino boards have at least one serial port (also known as a UART or USART)

String: String Module contains numerous useful constants and classes, as well as functions that are also available as methods on strings. Python's built-in string classes support str, unicode, list, tuple, bytearray, buffer, xrange section, and also the string-specific methods.

GPIO: A very powerful feature of Raspberry Pi is the row of GPIO (general-purpose input/output) pins on the top edge of the raspberry board. A 40-pin GPIO header is found on all currently available Raspberry Pi boards. Any of the GPIO pins can be labelled (in software) as input pin or output pin and used for a wide range of purposes. A GPIO pin designated as an input pin can be read as high (3V3) or low (0V). A GPIO pin designated as an output pin can be set to high (3V3) or low (0V)

If the driver is too drunk, then the car will not start and a mail will be sent to his friend or relative giving them his/her location and asking them to drop him home safely. To mail, **Gmail** is used, and to login with Gmail, **SMTP** library is used. The same library is used to send mail to his relative or friend.

SMTP: Simple Mail Transfer Protocol handles sending and routing e-mails between mail servers. Python provides smtplib module, which defines SMTP client session object that can be used to send e-mail to any Internet machine with an ESMTP or SMTP listener daemon.

CHAPTER 6: LIMITATIONS

No system can work perfectly and is liable to several constraints and limitations. The MQ3 alcohol sensor based system for detection of alcohol too is liable to failure.

1. In the event the driver is wearing a mask or has his mouth covered by any means, the measure of breath breathed out is less to trigger sensor activity.
2. In the event that the driver has covered the MQ3 sensor by a handkerchief or bit of fabric, it won't work appropriately as the contribution to the sensor is currently blocked. Thus, regardless of whether he is drunk the vehicle keeps on running regularly.
3. In the cases when windows are open the sensor won't almost certainly distinguish whether the driver is drunk or not as the gases and the air currents will not allow the sensor to function normally and if he is drunk the accurate alcohol concentration won’t be detected. The open windows results in the insufficient functioning of the sensor due to disturbance.
4. When duct of the sensor gets polluted then too the sensor will not perform efficiently.

CHAPTER 7: RESULT

As we know that the flow of our proposed system depends on whether the driver is drunk or not, therefore, if LED is GREEN it means that he is not drunk and the vehicle will keep moving as shown in the image below.

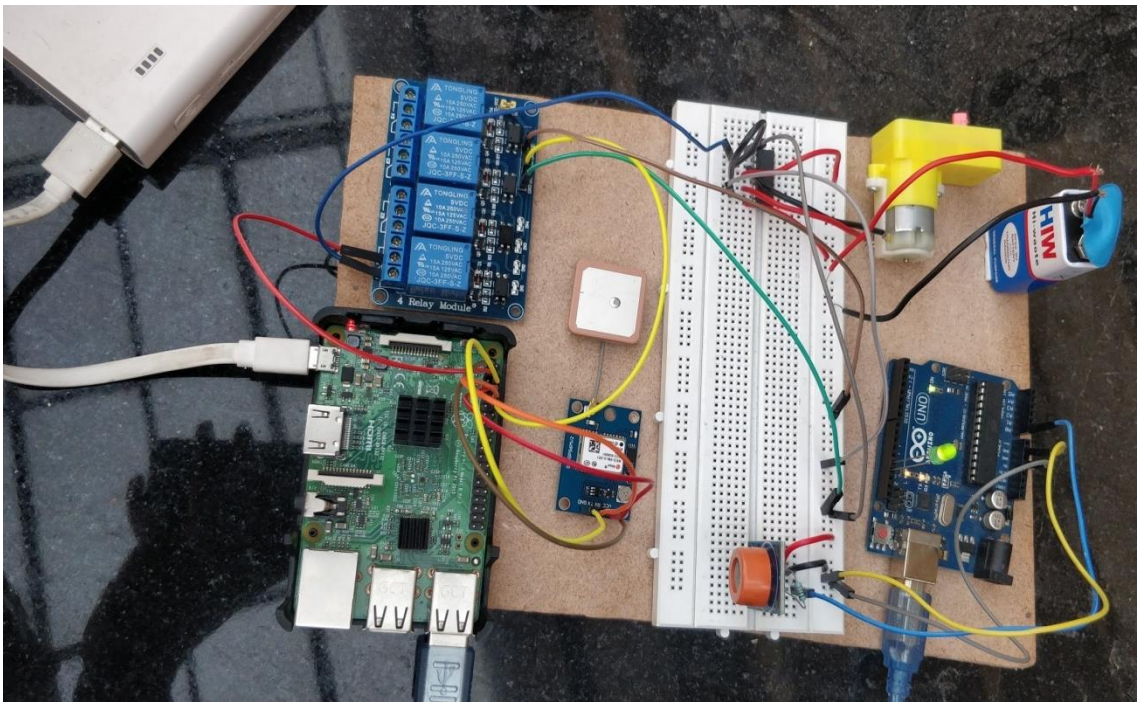

Fig.7.1 Green LED is ON and the motor is working

Set Threshold	>200 mg/ml	200-270 mg/ml	270-350 mg/ml	< 350 mg/ml
State	Normal	Slightly Drunk	Drunk	Heavily Drunk
Ignition System	On	Off	Off	Off

Indicator	Green Led On	Red Led ON	Red Led ON	Red Led ON
Mail along with the location	Not sent	Not sent	Sent	Sent

Table 7.1 Level of drunkness

After we start the system, the MQ-3 sensor which is placed somewhere near steering wheel starts sensing the person's breath. If it doesn't find any percentage of alcohol in the breath then the output will be as follows and the vehicle will keep on running.

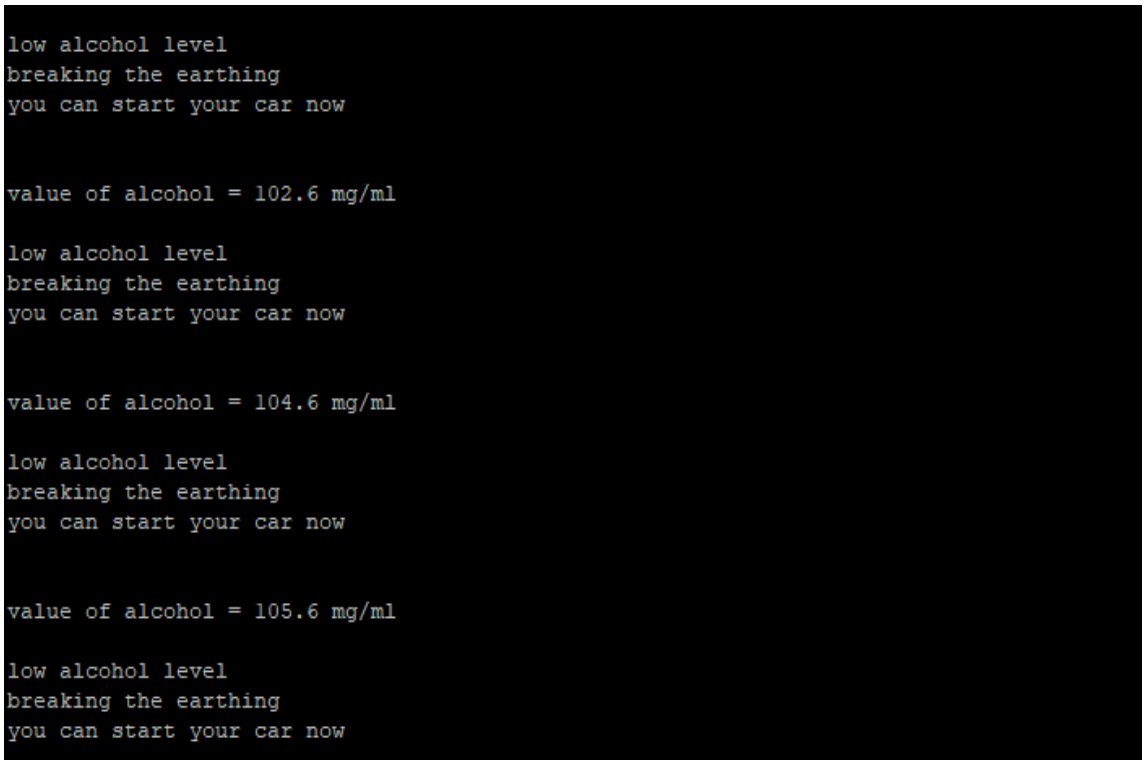

Fig. 7.2 When the alcohol content is below the set threshold

But, when the driver is drunk and the reading crosses the set threshold i.e. 200 then the car will stop moving and a mail will be sent regarding the current status of the driver to his friend/relative. The output will be as given below.

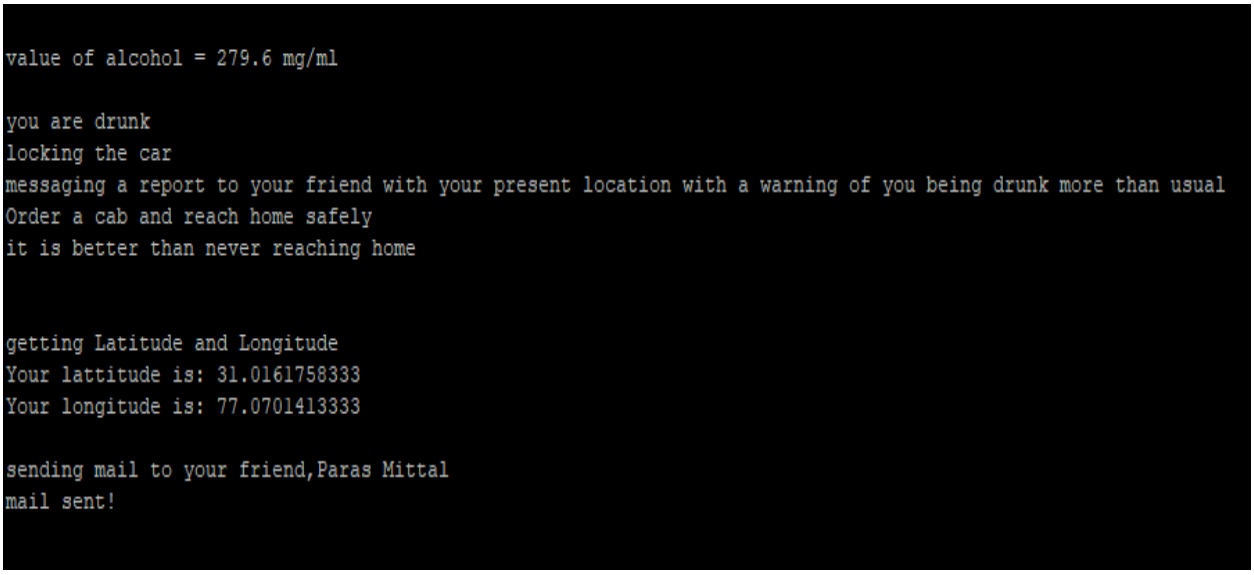

Fig. 7.3 When the alcohol content exceeds the set threshold and the driver is drunk

When the driver is heavily drunk, then also a mail will be sent along with his location in order to pick him up from his deceased state, and then the output will be as follows.

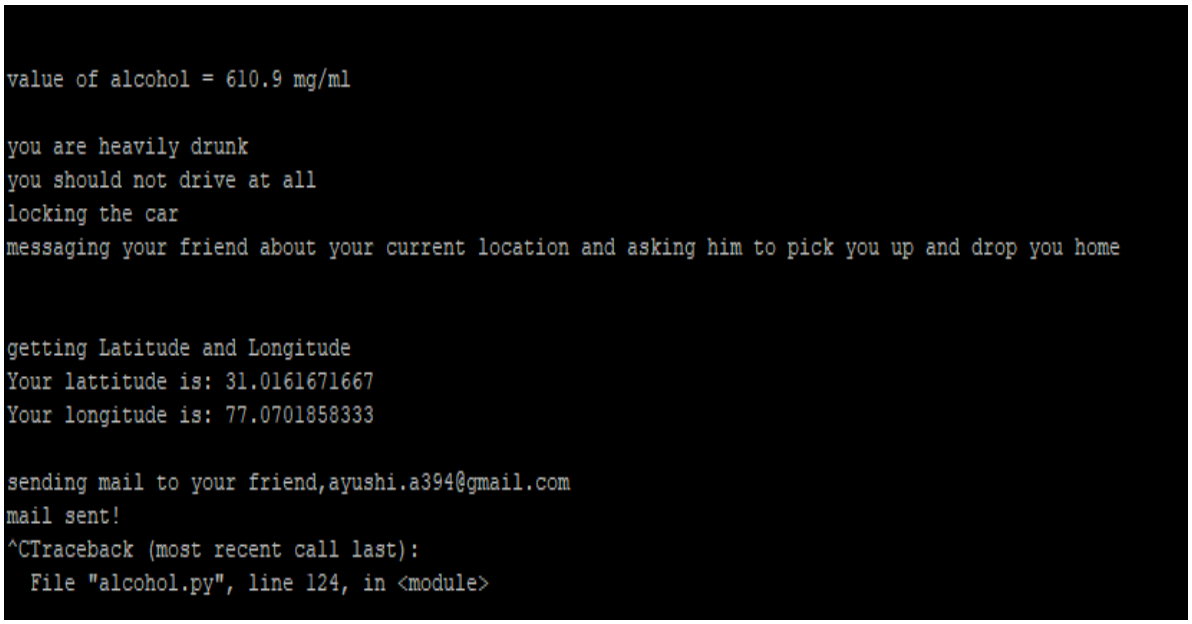

Fig.7.4 When the alcohol content exceeds the set threshold and the driver is heavily drunk

Given below is the kind of mail which will be sent concerning the drunk driver's condition to his relative/friend along with his exact location mentioned so that he is able to reach home safely.

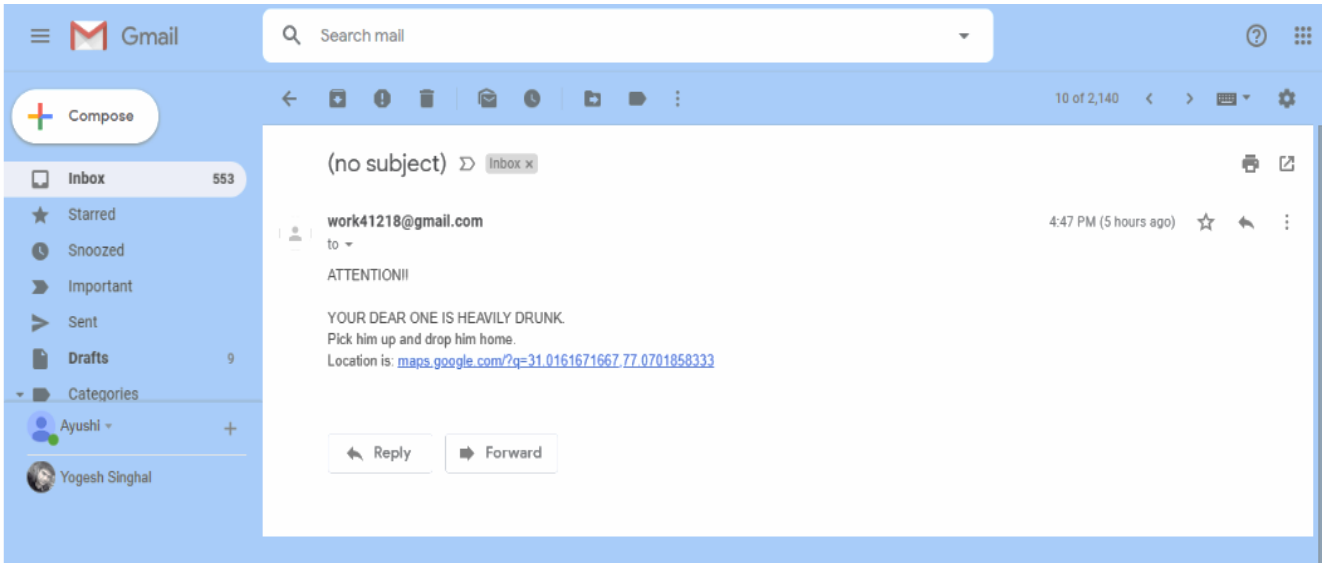

Fig 7.5 Mail sent to the relative/friend of the driver who is heavily drunk

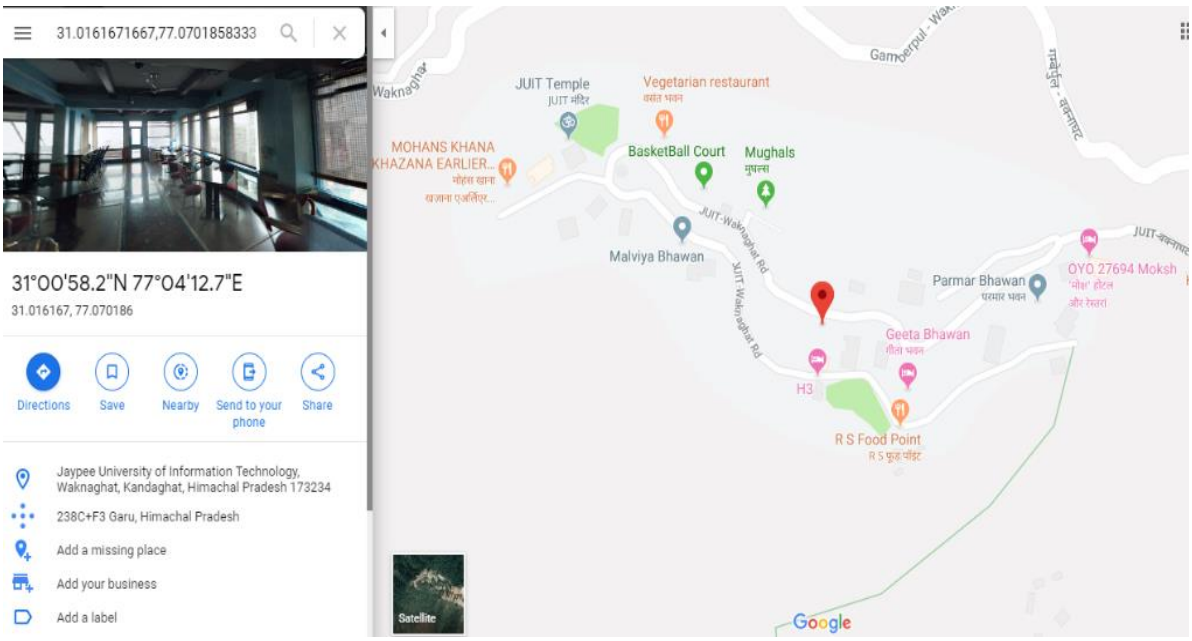

Fig. 7.6 Latitudes and Longitudes mentioning the exact location of the driver

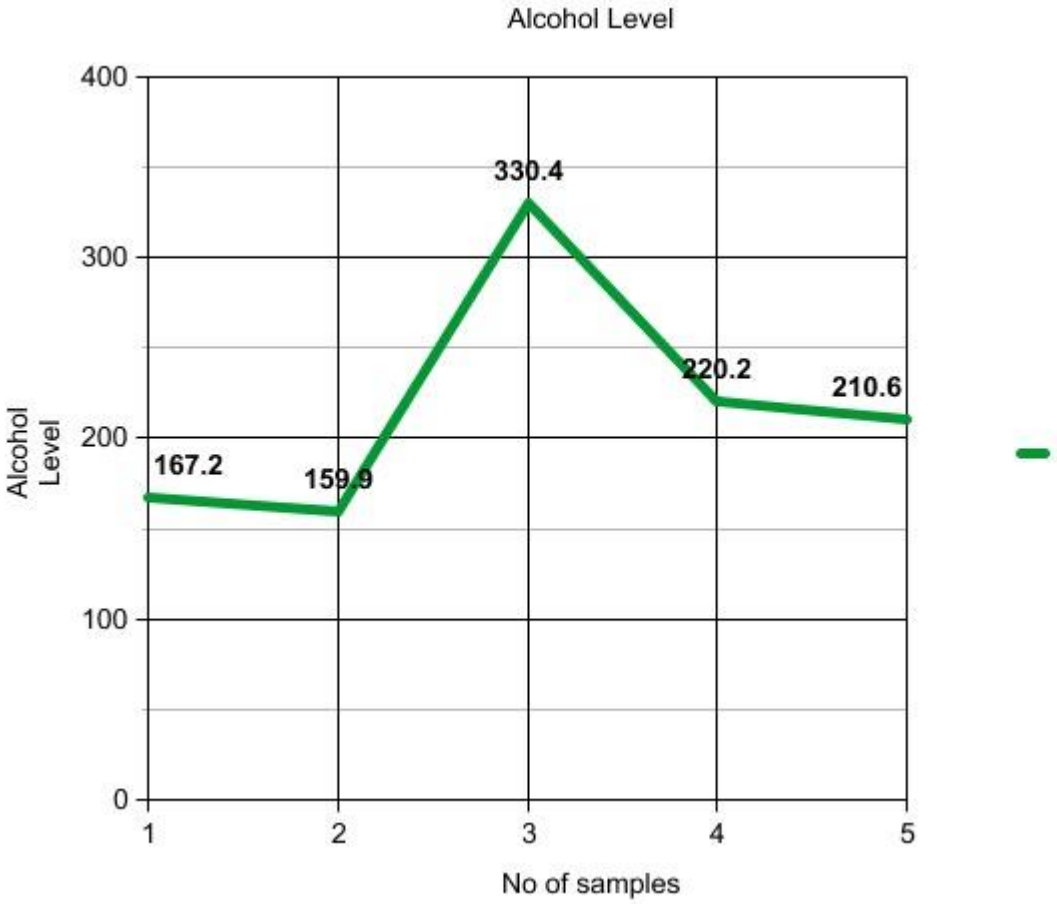

Fig. 7.7 Variation in alcohol detection

Chapter 8: Conclusion

The system proposed here is an IoT application which will help prevent drunk and drive cases to a much larger extent as well as protect and safeguard the lives of “innocent” pedestrians from getting harmed due to this unwarranted menace on road. The proposed design has a myriad number of limitations and can further be improved by usage of more and more newer versions of technology based applications. This model has the potential to become more successful and safe and can be used by automobile manufacturers by integrating it in the manufacturing process of vehicles. It should be made mandatory by the regulatory authorities to make this system integrated into every possible automobile. If this is achieved, the accidents due to drunk drivers can be brought down to a minimum level.

The alcohol consumption level of the driver is detected using alcohol sensor and if the alcohol percentage is more than 0.03% or 30mg per 100ml of blood [10], then vehicle ignition is automatically shutdown and a mail is sent to his family or friend to pick him up from his exact location. The resistance value of MQ3 alcohol sensor used in this project is different for different concentration of gases. Therefore the sensor is needed to be calibrated carefully and its sensitivity should be adjusted using potentiometer. Temperature and humidity should also be considered while using alcohol sensor.

As the system has limitation like it can only be implemented in the cases when the windows of the car are shut as air currents would disturb the detection level of the MQ-3 alcohol sensor, this case can be considered as a future scope for upgraded sensor technology. It can be concluded that this accident prevention system using alcohol sensor and GPS module is a cost effective, reliable, power efficient and feasible solution for prevention of accidents.

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