Design and Development of Alcohol Detection Monitoring & Ensuring Safe Drive in Automobiles

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ABSTRACT

The main purpose behind this project is "Drunk driving detection". Now a day, many accidents are happening because of the alcohol consumption of the driver or the person who is driving the vehicle. Thus, drunk driving is a major reason of accidents in almost all countries all over the world. Though there are laws to punish drunken drivers they cannot be fully implemented. Because traffic police cannot stand on every road to check each and every car driver or bike whether he/she has drunker not. This can be a major reason for accidents. So, there is a need for a effective system to check drunken drivers. Therefore, this study proposed an efficient technique for eradicating the upsurge in the number of cases of roads accidents caused by excessive intake of alcohol by the drivers.

Keywords : MQ-3 Alcohol sensor, Arduino Uno ATmega328 microcontroller, Blood Alcohol Content (BAC), LCD, voltage control really, bridge rectifier, buzzer, and 7085 voltage regulator DC motor.

I. INTRODUCTION

These days, majority of road accidents are caused by drink-driving. Drunken drivers are in an unstable condition and so, rash decisions are made on the highway which endangers the lives of road users, the driver inclusive. The enormity of this menace transcends race or boundary. Majority of road accidents are happening due to drunk and drive only. According to Indian Statistics report it is stated that road accidents are happening only by their rash driving, and that rash driving is mainly done by people who has drunk only .This study developed a prototype alcohol detection and engine locking system by using an Arduino Uno microcontroller interfaced with an alcohol sensor along with an LCD screen and a DC motor to demonstrate the concept. The system uses MQ-3 alcohol sensor to continuously monitor the blood alcohol content (BAC) to detect the existence of liquor in the exhalation of a driver. By placing the sensor on the steering wheel, our system has the capacity to continuously check alcohol level from the driver's breath. The ignition will fail to start if the sensors detect content of alcohol in the driver's breath. In case the driver got drunk while driving, the sensor will still detect alcohol in his breath and slow down the speed so that the car or a bike would not accelerate any further speed and the driver are suppose go in a low speed
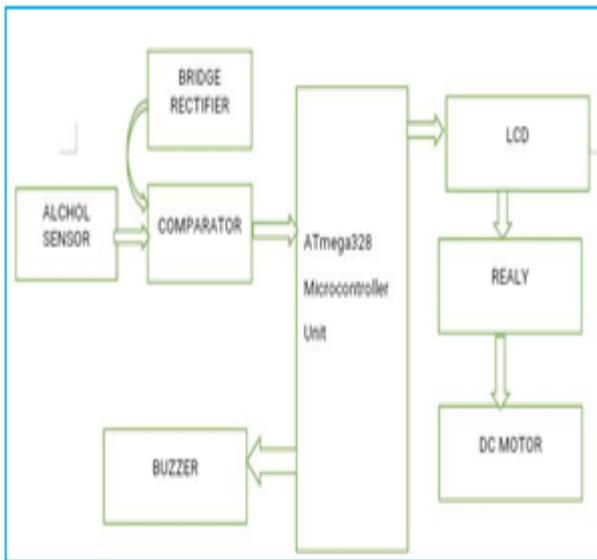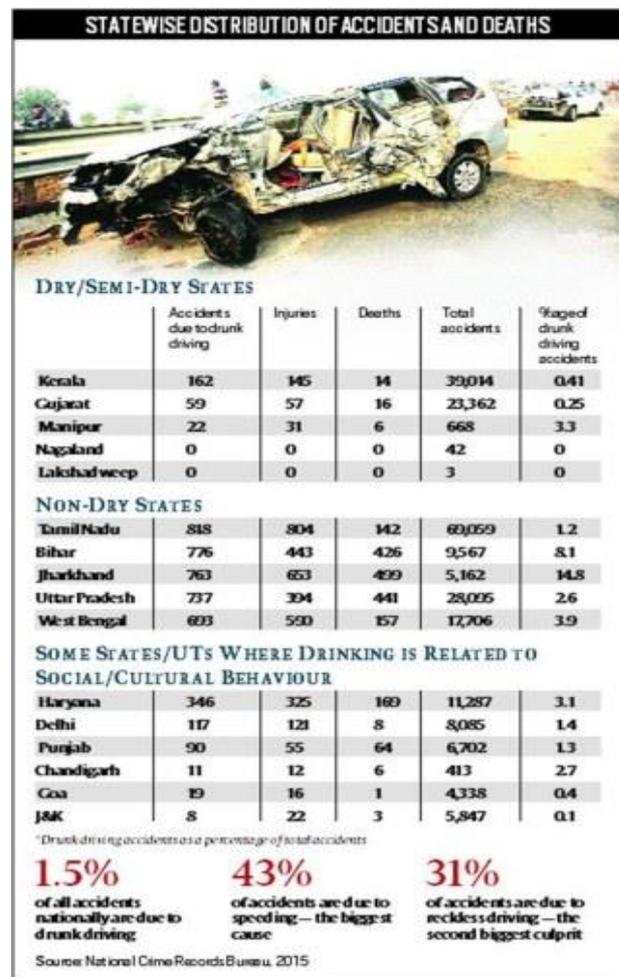
Fig.1 Block Diagram ofAlochol Sensor

II.DESCRIPTION

According to Indian Express latest data compiled by the National Crime Records Bureau (NCRB), drunk driving was responsible for only 7,061 — a mere 1.5% — of the 4,64,674 road accidents in India in 2015. Significantly, however, the share of drunk driving accidents was significantly lower than this national average in states and while drunk driving accidents had only a tiny share of accidents as a whole, they were the deadliest — there were more fatalities in accidents due to drunk driving than in accidents due to other causes

STATEWISE DISTRIBUTION OF ACCIDENTS AND DEATHS

DRY/SEMI-DRY STATES

	Accidents due to drunk driving	Injuries	Deaths	Total accidents	%age of drunk driving accidents
Kerala	162	145	14	39,014	0.41
Gujarat	59	57	16	23,362	0.25
Manipur	22	31	6	668	3.3
Nagaland	0	0	0	42	0
Lakshadweep	0	0	0	3	0

NON-DRY STATES

Tamil Nadu	818	804	142	69,059	1.2
Bihar	776	443	426	9,567	8.1
Jharkhand	763	653	499	5,162	14.8
Uttar Pradesh	737	394	441	28,095	2.6
West Bengal	693	590	157	17,706	3.9

SOME STATES/UTS WHERE DRINKING IS RELATED TO SOCIAL/CULTURAL BEHAVIOUR

Haryana	346	325	169	11,287	3.1
Delhi	117	121	8	8,085	1.4
Punjab	90	55	64	6,702	1.3
Chandigarh	11	12	6	413	2.7
Goa	19	16	1	4,338	0.4
J&K	8	22	3	5,847	0.1

Drunk driving accidents as a percentage of total accidents

1.5% of all accidents nationally are due to drunk driving

43% of accidents are due to speeding — the biggest cause

31% of accidents are due to reckless driving — the second biggest culprit

Source: National Crime Records Bureau, 2015

Drunk driving is a bigger problem than statistics show

Road Ministry's report shows higher deaths than National Crime Records Bureau's report of the two official analyses of road accidents; the National

Crime Records Bureau's report on Accidental Deaths and Suicides in India 2015 has been oft quoted by critics. The report suggests that about 1.5 per cent of all the total 4.64 lakh road accidents were caused by drunken driving or driving under influence of drug or alcohol, resulting in injuries to 6,295 people.

The offence, however, according to the report, resulted in 2,988 deaths — more than 8 deaths every day — accounting for just over 2 per cent of all fatalities in road accidents.Numbers would suggest drunken driving is only a drop in the macabre ocean of road accidents which resulted in 1.48 lakh deaths in 2015, though the Supreme Court called it one the major causes of road accidents.

In an earlier order in December last year, the Apex Court had said, "In regard to the figures of death or injury due to drunken driving there is a tendency to under estimate or under-report in order not to impede the right of victims and/or their legal heirs to receive compensation," suggesting the actual figures would be significantly higher.

The disparity is evident in another official report from the Ministry of Road Transport and Highways.

In 2011, the Ministry had admitted that drunken driving was one of the leading causes of road accidents and attributed as many as 27,152 accidents to it. In comparison, its 2015 report attributes 16,298 accidents to alcohol and the NCRB attributes only 6,970 accidents to it.

According to World Health Organization in 2008 shows that about 50%-60% of traffic accidents are related to drink-driving. More so, WHO data on road traffic deaths revealed 1.25 million traffic deaths were recorded globally in 2013 with the low- and middle-income countries having higher fatality rates per 100 000 population (24.1 and 18.4 respectively). Data collected showed that 67.2% of commercial vehicles drivers in Nigeria a certain volume of blood. It is measured as either grams of ethanol per deciliter of blood (g/fdl, commonly used in the United States), or milliliters of blood, (mg/ml, used in much of Europe). For BAC level from 0.4 to 0.6, drivers feel dazed/confused or otherwise disoriented, and it is generally not safe for a driver to drive a vehicle under such condition. Also, BAC level for 0.7 to 0.8 makes a driver's mental, physical and sensory functions to be that most drivers, especially commercial and heavy duty trucks drivers engage in drink-driving, which can lead to accident. Nigeria sets a legal limit of 0.5 g/100mL blood alcohol concentration (BAC), any level above that is said to be illegal. In this paper, the illegal limit is taken severely impaired. At this stage, a driver is inactive and incapable of driving. BAC level of 0.2 to 0.3 is still not safe but the driver still has a little degree of self-control admitted to drinking alcohol during working days. This shows as 0.4. The BAC depicts the quantity of alcohol in.

Our prototype system integrates the following hardware components in the design: An LCD, the MQ-3 alcohol sensor, DC motor, Buzzer and two LEDs are integrated to ATmega328 microcontroller. The proposed system was designed and simulated using Proteus VSM simulator. The software code to be burnt into the Arduino board was written in Arduino IDE sketch.

The Arduino ATMEGA328 controller board interfaced with MQ-3 alcohol sensor module, LCD and DC motor. The LCD acts as the display while the DC motor was employed as a model for specifying the ability of the mechanism to lock the engine every time ethanol is sensed. Automatic vehicle engine locked control system using Virtual Instrumentation. The proposed system used embedded c language to implement an alcohol breath analyzer. The method used an Arduino as the control unit interfaced with MQ-3 sensor as a breathalyzer. Other modules interfaced with the Arduino are buzzer, LED, LCD and DC motor. The LED and LCD served as the output device. ZigBee, IoT, embedded c language and LabVIEW software are the other tools implemented .Digital and analog

input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins and 6 Analog pins. It is programmable with the Arduino IDE.
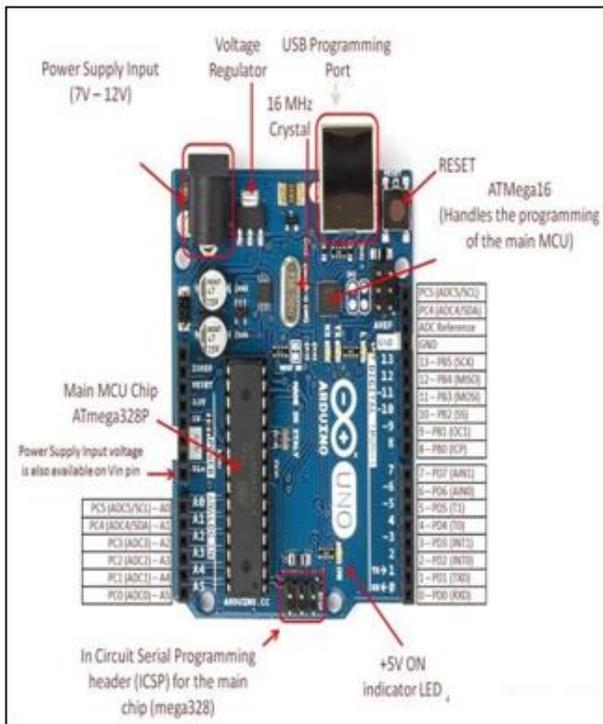

Fig.2 pin diagram of arduino.

The figure above shows the pin diagram of arduino. **LED**: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it'soff.

VIN: The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V

or 3.3V pins bypasses the regulator, and can damage the board.

3V3: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

GND: Ground pins.

IORef: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

Reset: Typically used to add a reset button to shields which block the one on the board.

Serial: pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

External Interrupts: pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

PWM (Pulse Width Modulation) 3, 5, 6, 9, 10, and 11 Can provide 8-bit PWM output with the analogWrite() function.

SPI(Serial Peripheral Interface): 10 (SS), 11 (MOSI),

12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

TWI(Two Wire Interface): A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wirelibrary.

AREF(Analog Reference: Reference voltage for the analog inputs.

MQ-3 Alcohol Sensor Unit: The sensor is made of Tin Dioxide (SnO2) sensitive layer. The sensor is configured with a high sensitivity to alcohol and small sensitivity to Benzene. It has a simple drive circuit with fast response, stability, and long life. It has an analog interface type. On the sensor, port pins 1, 2 and 3 represents the output, GND and VCC respectively. The technical specification of the sensor is portrayed in table 1.

The circuit diagram of the MQ-3 sensor is shown in figure 3 and 4. In the datasheet, the recommended value to be used ranges from 100k ohm to 470k ohm. Here, 200k ohm was used

Fig. 3: MQ-3 circuit diagram

Product	Names
Sensor type	Semiconductor
Detection gas	Alcohol gas
Concentration	0.04-4mg/l alcohol
Voltage	±5.0V
Load resistance (R_L)	Adjustable
Heater resistance (R_H)	31Ω ±3 Ω
Sensing resistance (**Rs**)	2KΩ-20KΩ (in 0.4mg/l alcohol)
Slope	200– 1000ppm
Temp humidity	20±2; 65%±5%RH
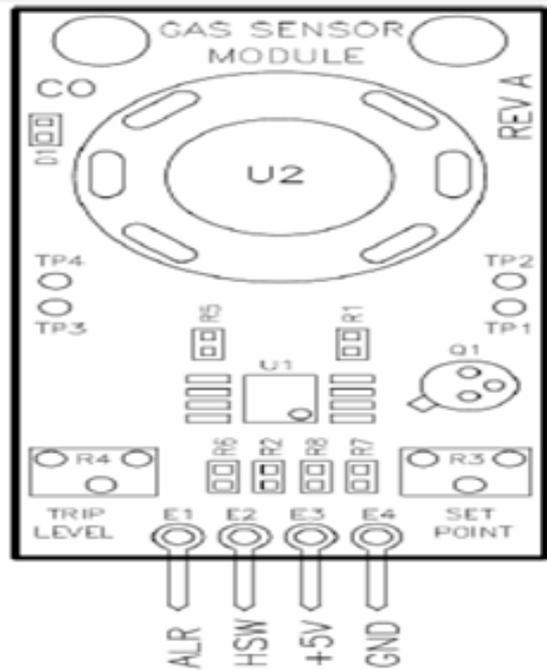
Fig. 3: MQ-3 circuit diagram
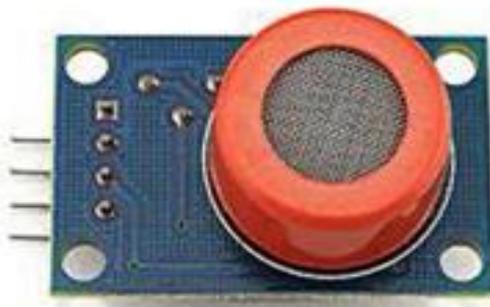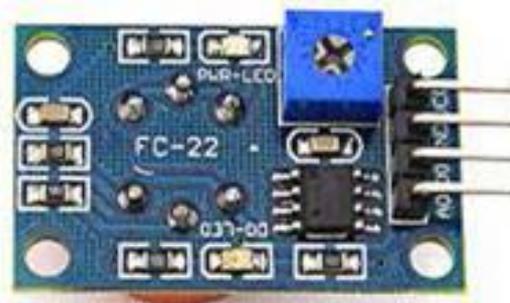
Fig. 4: Simplified circuit diagram of MQ-3 alcohol sensor
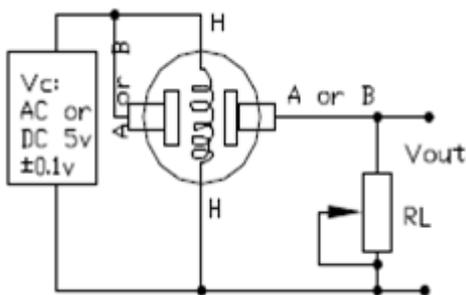
A.LCD Display Unit:

LCD display is used for displaying the message sent from the remote location. The LCD module (Fig. 5) displays alphanumeric, kana (Japanese characters) and symbols. It consists of 16 pins (8 data lines, 3 control lines, 2 power lines, 1 contrast line and 2 pins for back light LED connection). Data line and control line are connected to the microcontroller. The LCD display power rating is as stated below:

Current (IDD) $(VDD=5.0v)$…………1.0mA – 3.0mA max

Range of $VDD–V0$………………1.5~5.25V or 5.0±0.25
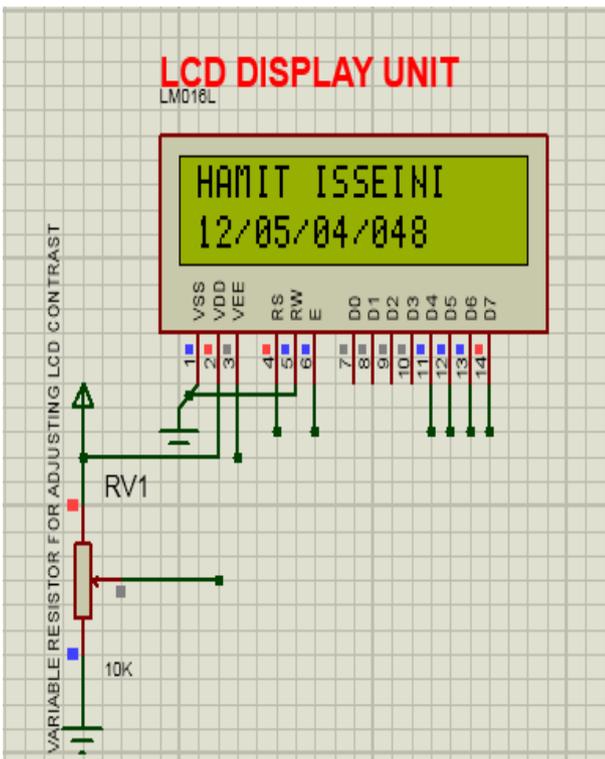
Fig. 5: 16x2 LCD display unit

B. Alarm and Indicating Unit:

The alarm unit used is a buzzer which indicates when alcohol is detected. The buzzer used belongs to the PS series. The PS series are high-performance buzzers that employ Uni-morph

piezoelectric elements and are designed for easy incorporation into various circuits. They have very low power consumption in comparison to electromagnetic units. It has a voltage requirement of 2V and is connected to pin 10 of the microcontroller. The standard resistor value of 220 Ω

C.DC Motor:

The DC motor is an electric DC motor used to demonstrate the concept of engine locking. Here in this work, the DC motor will be connected to pin 9 on the microcontroller, when alcohol is detected the DC motor stops in other to indicate that alcohol is detected and continue running when there is no alcohol detected.

D.System Flow chart:

The flow chart of the system is shown in figure 6. The system algorithm comprises of three main steps. First is to boot up the system, next is the measuring state, this stage measure the amount of alcohol level from the drivers. A prescribed set limit will be given as input to the microcontroller, once the alcohol level exceeds the limit the car will not start.
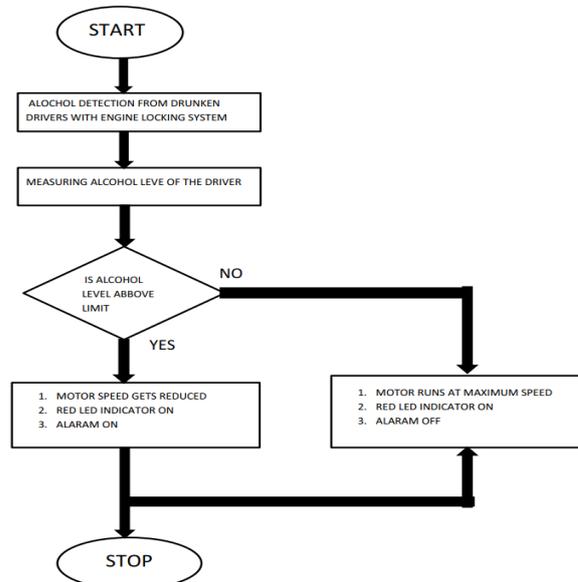

Fig.6 Flow Chart

STEP 1: Power on the system

STEP 2: checks for alcohol concentration

STEP 3: if alcohol is detected

STEP 3.1: reduce the speed off car/bike engine

STEP 4: Else

STEP 5: Car/bike engine running

STEP 6: Go to step 1

E.System Of Operation:

In this project it consist of comparator ,comparator consist of two inputs one input is Bridge rectifier input and other input is the person blow into the sensor. If person doesn't blow the motor does not start, blow is mandatory in this project. Now these two inputs are given to comparator, comparator check the both input as a result the motor gets started. The comparator output is given to micro controller. The detected analog voltage values are read by the microcontroller; the Arduino Uno board contains 8 channels, 10-bit device that changes an analog voltage on a pin to a digital number. If controller has found if the person has drunken at any time or starting time then controller will reduce the speed of a motor, though he increase the speed it does not go to maximum speed it runs in minimum speed only, if he try to increase the speed then buzzer will gives a signal to that person or a driver that the bike does not go upto maximum speed because of drunk. If sensor found if the person does not drunk then the driver can go in a maximum speed.

III. SOFTWARE IMPLEMENTATION

The software design consists of a free running program which manipulates input from the Alcohol sensor and programming of the indicating unit, LCD display, DC motor, alarm unit. The program code is written on Arduino sketch and uploaded to ATMEGA328 microcontroller program memory using Arduino development board. The hex file is generated using the Arduino sketch IDE environment. Figure 7 shows the device programming used for this research.
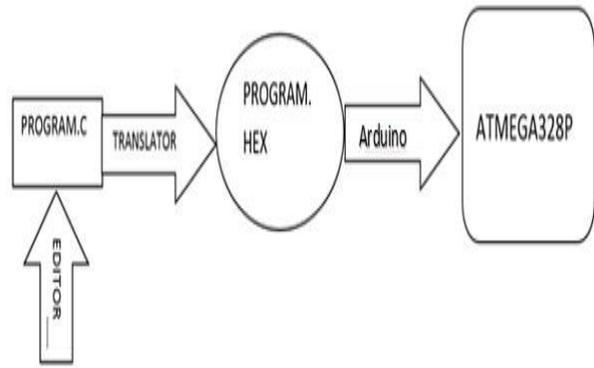

Fig.7 device programming

A. *Indicating unit:*

Two LEDs with different colors are used. The green LED indicate when the engine is running and also notify the driver that his alcohol level is below the limit, and the other red LED indicate when there is alcohol detected and also when the engine is not running. This unit is depicted in figure 8.
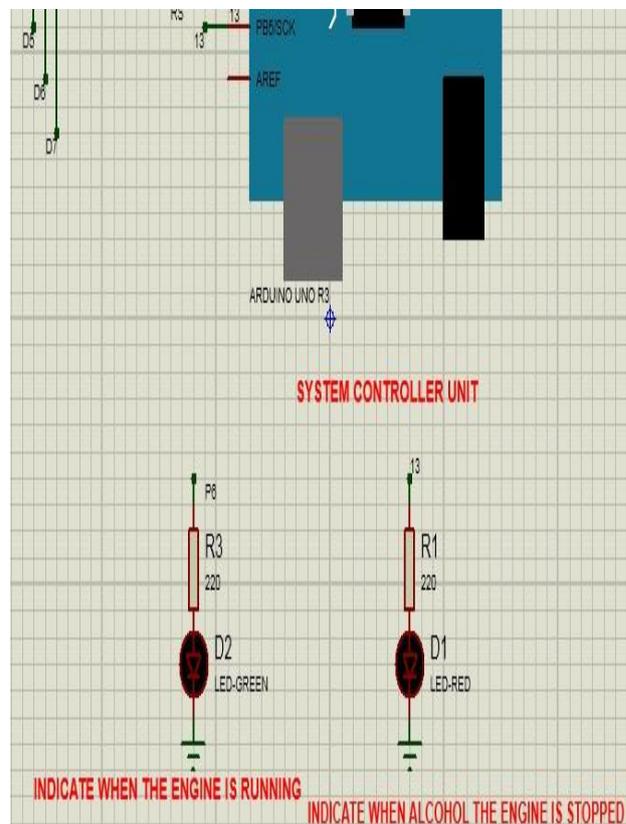

Fig .8 indicating unit

B. Alarm Unit

The alarm unit used a buzzer to produce sound whenever alcohol is detected. The purpose of the buzzer was to create awareness to passengers whenever alcohol is detected. The alarm unit is represented in figure 9.
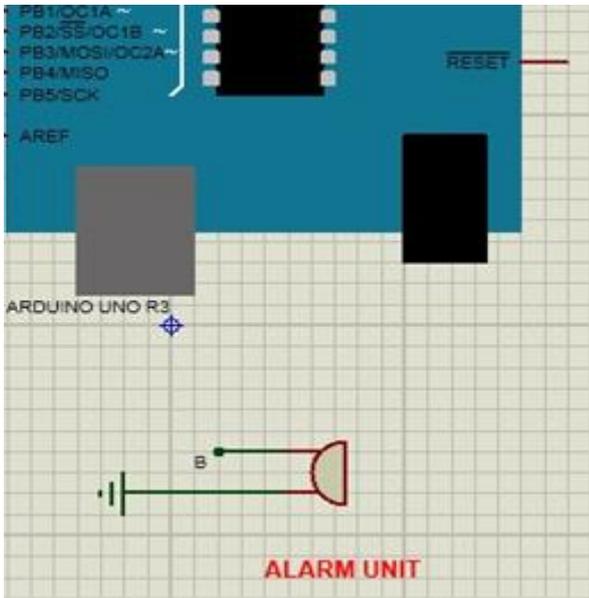

Fig 9. Alarm Unit

The DC motor is connected to pin 9 on the microcontroller and it operates from 1.5V to 6V and it operate from 1.5V to 6V

Fig 10. Engine Locking Unit

C. Alcohol detection unit

D. Engine locking unit:

The engine locking unit was built by the concept of using a DC motor to demonstrate as the car engine. The DC motor runs in minimum speed only, if he try to increase the speed then buzzer will gives a signal to that person.
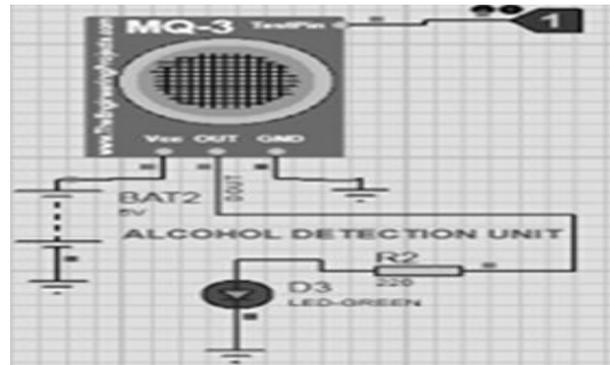
Fig.11 Engine locking unit

The alcohol sensor unit has four pins; test pin, vcc, dout and ground. The test pin is used to accept logic signals of 0 or 1 by using logic state pin as shown in figure 12. The LED is used to show when the sensor detect alcohol. in the simulation, when the logic state is 1 the led goes on to indicate that alcohol is present and off to show the absence of alcohol.that changes an analog voltage on a pin to a digital number. If controller has found if the person has drunken at any time or starting time then controller will reduce the speed of a motor, though he increase the speed it does not go to maximum speed it
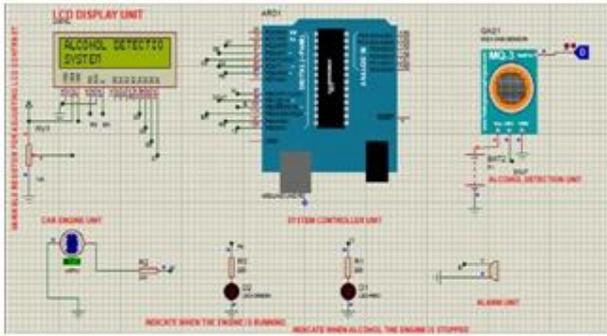
Fig.12 Circuit Diagram

IV. RESULTS

The main agenda of the project is to save the lifes from drunk and drive .When a person consumed the bike goes in low speed, he cannot extent maximum speed.if he hasn't drunk he can go upto the maximum speed.

Fig.13. the design output of project

LEVEL OF DRUNKNESS			
Voltage Output	200 - 300ppm	300 – 400ppm	400 – 500ppm
	1 – 1.5V	1.5 – 2V	2 – 2.5V
	20 – 30%		40 – 50%
		30 – 40%	
LCD Display	Intoxicated	Slightly Drunk	Drunkenness
Alarm	Off	Off	On
Ignition SYS Indicator	On	On	Off
	Led Green On	Led Green On	Led Red On
	Led Red Off	Led Red Off	Led Green Off

V. CONCLUSION

In this paper, we proposed a method to sense the presence of alcohol from the breath of drivers and lives. The system was designed and implemented successfully via the use of Arduino Uno ATMEGA328 microcontroller and MQ-3 sensor. Experimental evaluation of the system showed that the alcohol sensor was able to deliver fast response when alcohol is detected. Also, the ability of the alcohol sensor to operate over a long time is a feature of the proposed system

Cite this article as :

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