ALCOHOL DETECTION WITH ENGINE LOCKING

A MINI PROJECT REPORT

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BONAFIDE CERTIFICATE

Certified that this project report **"ALCOHOL DETECTION WITH ENGINE LOCKING"** is the bonafide work of **"GAYATHRI R (190701024), GOKUL R (190701027) and HARINI M (190701034)"** who carried out the project work under my supervision.

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INTERNAL EXAMINER EXTERNAL EXAMINER

ABSTRACT

We usually come across drunk and driving cases where drunk drivers crash their cars under the influence of alcohol causing damage to property and life. So here we propose an innovative system to eliminate such cases. Our proposed system would be constantly monitoring the driver's breath by placing it on the steering wheel or someplace where it can be constantly monitored. So if a driver is drunk and tries to drive, the system detects the presence of alcohol in his/her breath and locks the engine so that the vehicle fails to start. In another case, if the driver is not drunk while he starts the vehicle and engine is started. However, if he/she drinks while driving, the sensor still detects alcohol in his/her breath and stops the engine so that the car would not accelerate any further and the driver can steer it to the roadside. In this system we use Arduino UNO interfaced with an alcohol sensor along with an LCD screen and a dc motor to demonstrate the concept. So here the alcohol sensor is used to monitor the driver's breath and constantly sends signals to the microcontroller. The microcontroller on encountering a high alcohol signal from the MQ3 sensor displays alcohol detection note on LCD screen, LED glows, buzzer rings and also stops the dc motor to demonstrate engine locking. If alcohol is detected at the time of starting the engine the engine does not start at all. If alcohol is detected after starting the engine, the system locks the engine at that time.

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LIST OF ABBREVIATIONS

LCD	LIQUID CRYSTAL DISPLAY
LED	LIGHT EMITTING DIODE
DC	DIRECT CURRENT
I2C	INTER-INTEGRATED CIRCUIT
IDE	INTEGRATED DEVELOPMENT ENVIRONMENT
PIC	PERIPHERAL INTERFACE CONTROLLER

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Drunk driving is a very dangerous behaviour caused as a result of excessive consumption of alcohol, therefore, causing distortion in the thought pattern of its victims. The investigation done by the World Health Organization in 2008 shows that about 50%-60% of traffic accidents are related to drunk driving. In present times, the cases of traffic accidents caused by drunk driving have increased rapidly. More and more people have realized that drunk driving does great harm to public security. An embedded system consisting of an alcohol sensor tries to reduce the possibility of accidents caused by drunk driving. Embedded systems applications in the transportation sector take the form of intelligent transportation systems, intelligent transportation systems include sensing technologies such as infrastructure sensors (in road reflectors) embedded on roadsides, automatic number plate recognition technologies, use of gas sensors in the detection of dangerous/harmful gases in vehicles, etc. all to reduce the increasing rates of accidents of all forms and causes.

The alcohol-triggered vehicle engine lock system is a prototype device that is developed with the primary purpose of drastically reducing the number of fatal road accidents due to drunk driving by motorists. The system is made up of an alcohol sensor (MQ3 Sensor), Arduino Uno, DC Motor as a model for the vehicle engine, LCD, and a buzzer alarm. The system detects alcohol molecules in the air surrounding the consumer of the alcohol via the MQ3 sensor (alcohol sensor) and sends the analog value of the molecules to the ATMega328 micro controller which processes the value and compares it with the a given threshold which is

included in the codes uploaded into the micro controller. If the value of the alcohol molecules detected is greater than the set threshold, the system automatically prevents the DC motor from operating (i.e. locking the vehicle engine) with the buzzer alarm also going off too and warning state messages popping up on the LCD. But if the value of the alcohol molecules detected is less than the set threshold, the system would allow the DC motor to continue its operation or start up (i.e. not locking the vehicle engine) with the buzzer alarm not going off and the LCD displaying normal state messages.

1.2 EMBEDDED SYSTEM

An embedded system is a computer system—a combination of a computer processor, computer memory, and input/output peripheral devices— that has a dedicated function within a larger mechanical or electronic system. It is embedded as part of a complete device often including electrical or electronic hardware and mechanical parts. Because an embedded system typically controls the physical operations of the machine that it is embedded within, it often has real-time computing constraints. Embedded systems control many devices in common use today. In 2009 it was estimated that ninety-eight percent of all microprocessors manufactured were used in embedded systems.

Modern embedded systems are often based on microcontrollers (i.e. microprocessors with integrated memory and peripheral interfaces), but ordinary microprocessors (using external chips for memory and peripheral interface circuits) are also common, especially in more complex systems. In either case, the processor(s) used may be types ranging from general-purpose to those specialized in a certain class of computations, or even custom designed for the application at hand. A common standard class of dedicated processors is the digital signal processor (DSP).

CHAPTER 2

LITERATURE REVIEW

One major reason for deaths on Indian roads is accidents due to drunken driving. This happens because drunk people are not able to take control of vehicles even after being drunk. The Indian Ministry of Statistics reported thousands of road accidents in 2016. An investigation done by the Planet Health Organization in 2008 shows that 50%-60% of traffic accidents are associated with drink-driving. Moreover, WHO information on road traffic deaths disclosed that 1.25 million traffic deaths were recorded globally in 2013, information collected showed that several of economic vehicles drivers in Bharat admitted to drinking alcohol throughout operating days. Bharat sets a legal limit of 30mg/100mL blood alcohol concentration (BAC), any level higher than that's the same to be ineligible. In this paper, the author [1] has designed a system consisting of an MQ-2 sensor, to detect the presence of alcohol by analysing a person's breath. Most of the traditional systems are likely to be more dependent on the operator & may fail due to various factors like battery life, power consumption, and unavoidable external disturbances[2].This project's ability to impair the driver's ability to drive makes it stand out from previous methods or devices developed to reduce road accidents due to drunk driving[3].The system will continuously monitor the level of alcohol concentration in the alcohol detection sensor and thus turn off the engine of the vehicle if the alcohol concentration is above the threshold level. The model will also send the message of the whereabouts of the vehicle through SIM900A[4].

In our project, we propose a system which automatically switches off the vehicle's engine whenever alcohol of a certain quantity is detected in the driver's breath. As soon as the presence of alcohol is detected, the micro controller stops the engine of the vehicle and a siren is blown to alert nearby people convey that something is wrong with the vehicle, so that nearby people can interpret the gravity of the situation and inform the concerned authorities to avoid any kind of incident. When implemented in vehicles, this system will not only avoid deaths and property loss due to drunken driving but will also help reduce the total number of accidents that occur. Moreover, people in other vehicles or pedestrians will be much safer because the vehicle is stopped right away.

CHAPTER 3

PROPOSED WORK

In this study, we proposed an alcohol detection with engine locking system using Arduino UNO microcontroller. The system uses hardware as well as software. Thehardware components are Arduino UNO, MQ3 Sensor, DC motor, buzzer, LED,resistors, LCD, I2C module, Relay module, Jumper wires and breadboard.

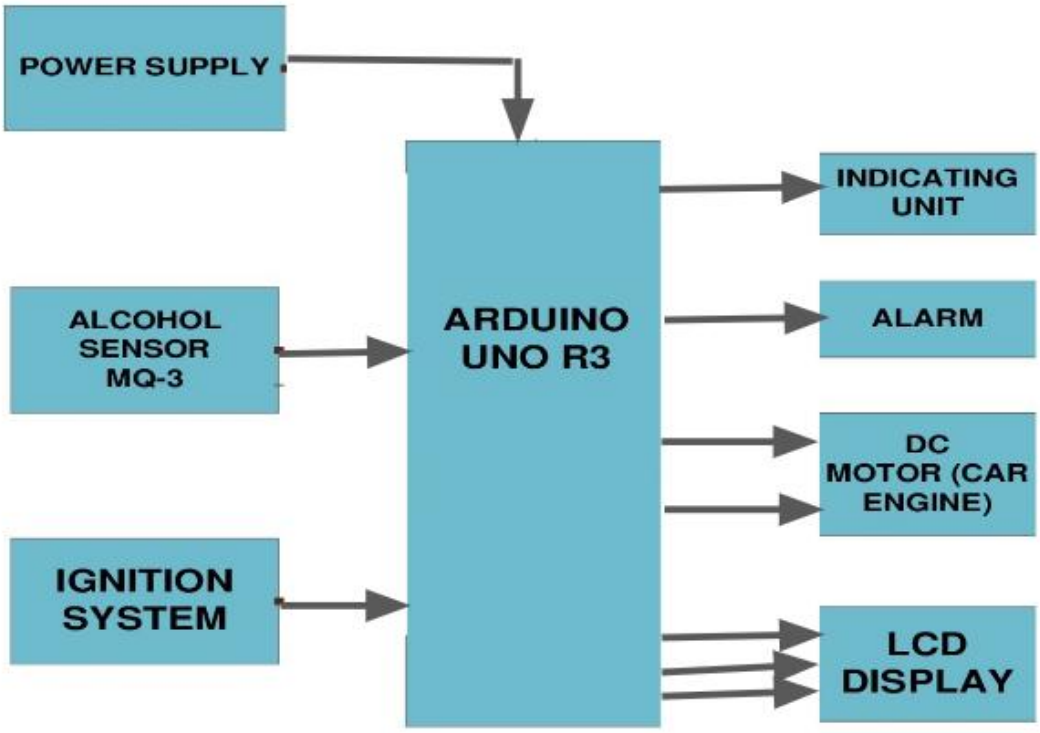

Fig 3.1 Block Diagram

Step 2: After the connections are given, the code for the project is written and dumped into the microcontroller using the Arduino IDE shown below.

Step 3: Once the connections and the dumping of code in the microcontroller is done, the output is displayed in the LCD display. If the alcohol level is higher than the threshold value, the engine stops.

We have implemented the system using Arduino UNO and MQ3 Sensor. The ATMEGA328P microcontroller stores the code and accordingly we can detect the alcohol and lock the engine. As it is a basic project, we had a very good study of the Arduino UNO and the MQ3 Sensor, their Pin configurations, Specifications behaviour and features of them.

3.1 METHODOLOGY

Whenever the ignition of the engine is started, the sensor measures the content of the alcohol in the breath of the driver or in the air around the MQ-3 sensor close to the driver and automatically switches off the engine if the driver is found to be drunk.

The sensor provides an output on the basis of the concentration of the alcohol, if the alcohol concentration is higher the conductivity of the MQ-3 sensor increases. The output of the sensor is fed to the ATmega328P for comparison. If the measured value reaches or exceeds the threshold, the motor stops automatically and the buzzer produces a sound and a warning LED comes up.

Fig 3.2 Demo

3.2 THEORETICAL BACKGROUND

In recent years, the increase in traffic accidents associated with drunk driving has become a serious social issue. The enormity of the dangerous driving transcends boundaries. However, effective observation of inebriated drivers could be a challenge to the policemen and road safety officers. Wearing a smart helmet to prevent drunk driving has been effective in the past but it has certain restrictions

Firstly restrictions on the use of helmets to only 2-wheelers. Also, they have used a PIC microcontroller which is expensive when compared to Arduino Uno which is open-sourced and more affordable. Therefore, there is a need for an in-vehicle system for four-wheelers that can detect whether the driver is under the influence of alcohol. So we came up with alcohol triggered vehicle engine lock system developed with the primary purpose of drastically reducing the number of fatal road accidents due to drunk driving.

Fig 3.3 Practical Implementation

CHAPTER 4

SYSTEM REQUIREMENTS

4.1 SOFTWARE REQUIRED

- ARDUINO IDE

4.2 HARDWARE REQUIRED

- ARDUINO UNO
- MQ3 SENSOR
- DC MOTOR
- 5V RELAY MODULE
- BUZZER
- LIGHT EMITTING DIODE
- 16X2 LCD DISPLAY
- I2C MODULE
- 220V RESISTORS
- JUMPER WIRES
- BREADBOARD

CHAPTER 5

COMPONENT DESCRIPTION

5.1 ARDUINO UNO

Arduino Uno is based on the ATmega328P microcontroller. It consists of 20 pins out of which 14 are digital pins and the rest 6 are PWM. It can be programmed using a computer on Arduino IDE. Arduino being open sourced, has a really good community which makes development very convenient and any kind of problems are taken care of by the community. It can handle a large number of operations making it very convenient to use.

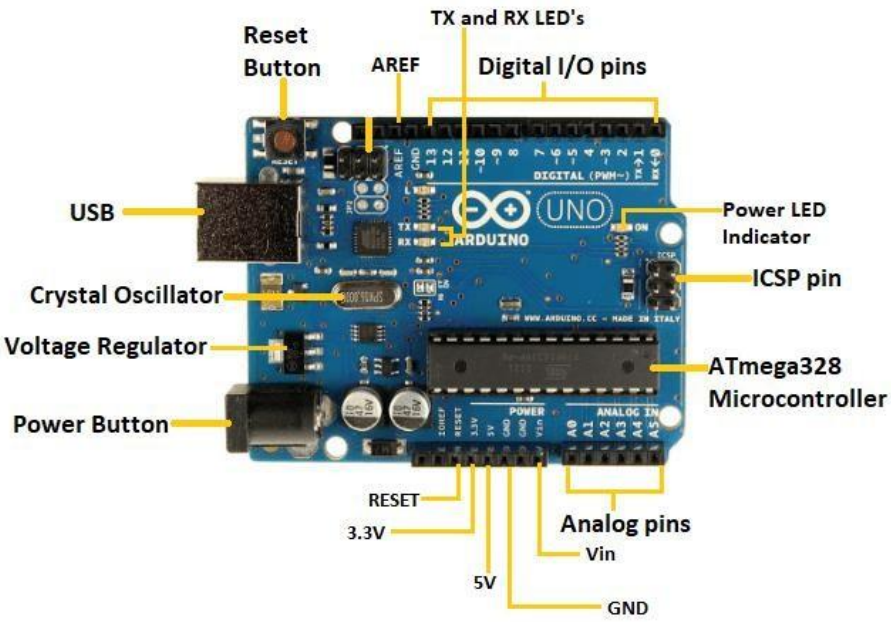

Fig 5.1 Arduino UNO

5.1.1 PIN CONFIGURATION AND DESCRIPTION OF ARDUINO UNO AND ATMEGA328P MICROCONTROLLER

As it has been mentioned before, there are 28 pins of this microcontroller IC. ATmega328P is a high performance yet low power consumption 8-bit AVR microcontroller that's able to achieve the most single clock cycle execution of 131 powerful instructions thanks to its advanced RISC architecture.

It consists of two 8-bit Timer/Counter with separate Prescaler, compares modes. and one 16-bit Timer/Counter with separate Prescaler, compare mode, and capture mode. This picture shows the pinout diagram of Arduino UNO.

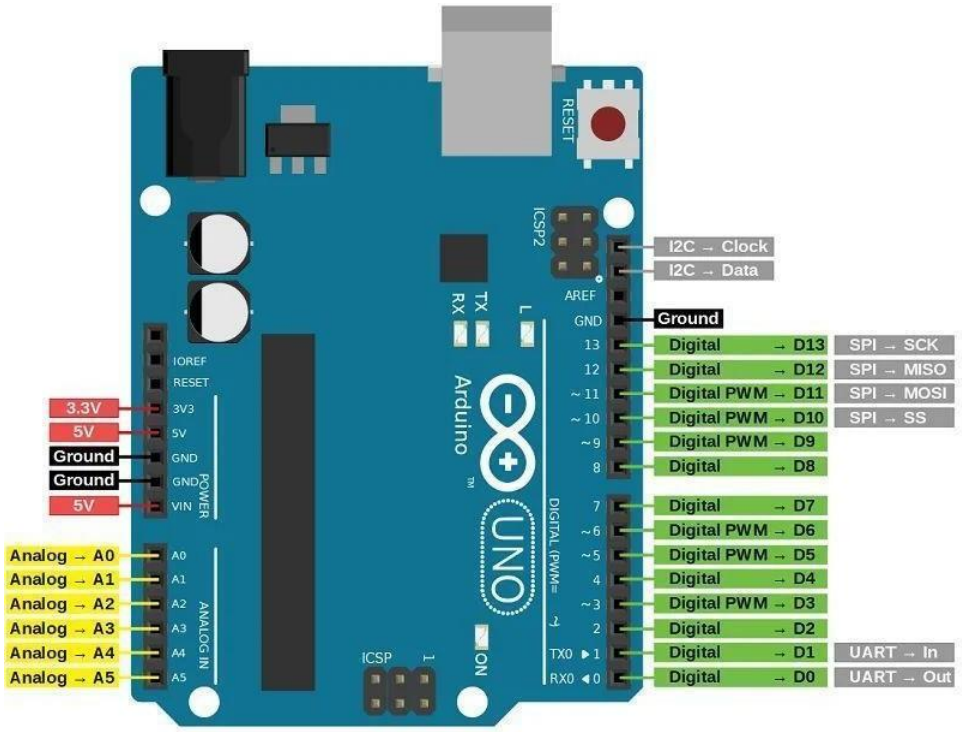

Fig 5.2 Pin Configuration of Arduino UNO

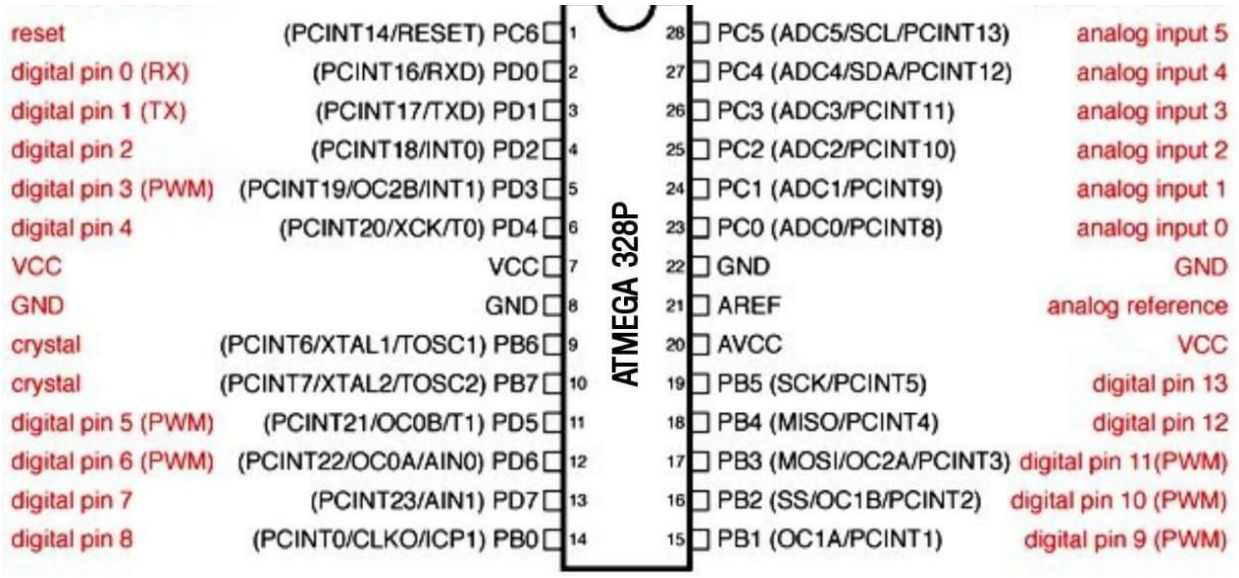

Fig 5.3 Pin Configuration of Atmega328p Microcontroller

5.2 MQ3 SENSOR

The alcohol sensor used here is MQ-3 which helps to detect whether the driver has consumed alcohol. The sensor is highly sensitive towards alcohol, while that towards benzene, gasoline, smoke and vapour is less. The range of this sensor is up to 2 meters and it can be used for detecting alcohol with varying concentration levels.

The MQ-3 sensor is made of Tin Dioxide (SnO2) delicate layer. It is sorted out in such a structure to give high affectability to liquor and low affectability to Benzene. It has an immediate drive circuit to give lively reaction, quality, and longer lifetime. It has a clear interface type. On the sensor, port pins 1, 2, 3 and4 tend to the analog output, digital output, GND and VCC independently. The sensitivity was adjusted using a 10K potentiometer and integrating the presence of the potentiometer in the code to set the threshold.

Fig 5.4 MQ3 Sensor

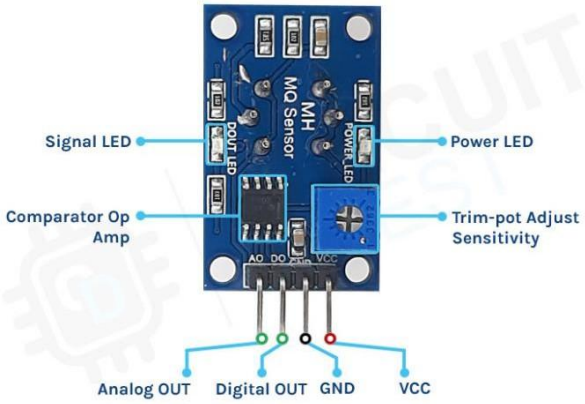

Fig 5.5 Pin Configuration of MQ3 Sensor

5.2.1 PIN CONFIGURATION

PIN	DESCRIPTION
AO(Analog Out)	This pin outputs 0-5V analog voltage based on the intensity of the gas
DO(Digital Out)	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer
VCC	This pin powers the module, typically the operating voltage is +5V
GND(Ground)	Used to connect the module to system ground

Table 5.1 Pin Configuration

5.3 DC MOTOR

The DC motor symbolizes the engine of the car. The motor comes to stand in the course of alcohol detected. The engine motor resumes normality in case the level of alcohol is below the predefined threshold.

The DC motor is connected to a relay module which in turn is connected to Arduino and is given a 5V supply. DC motor works on the principle of Lorentz Law.

The features of DC Motor include,

- Frame sizes from 8 to 35mm
- Speeds from 5,000 to 14,000 rpm
- Continuous motor torque - 0.36 to 160 mm

Fig 5.6 DC Motor

5.4 5V RELAY MODULE

A single channel 5V relay module generally includes a coil, and two contacts like normally open (NO) and normally closed (NC). A 5v relay is an automatic switch that is commonly used in an automatic control circuit to control a high-current using a low-current signal. The relay module with a single channel board is used to manage high voltage, current loads like solenoid valves, motors, AC load & lamps.

Fig 5.7 5V Relay Module

The features of the 5V relay include the following.

- Normal Voltage is 5V DC
- Normal Current is 70mA
- AC load current Max is 10A at 250VAC or 125V AC

5.5 BUZZER

A buzzer is used in the system to alert the people nearby so that they can analyse the situation and take necessary action accordingly. It gets activated whenever the MQ3 sensor detects alcohol.

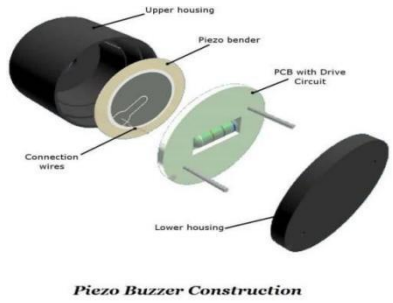

Fig 5.8 Piezo Buzzer Construction

5.6 LED

A light-emitting diode (LED) is a semiconductor device that emits light when current flows through it. Here we use green and red LEDs.

Fig 5.9 LED

5.7 16x2 LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizer.

In our project LCD is used to display the message when alcohol is detected. Immediately after exceeding the limit, the message is displayed on the screen.

Fig 5.10 LCD Display

The LCD screen present in the vehicle will display “Alcohol Detected” so that people are aware of the situation and hence can take the necessary action that may be required.

5.8 I2C MODULE

I2C is a synchronous, multi slave, multi master packet switched, single-ended serial bus. ie. multiple chips can be connect to the same bus. I2C uses only two bidirectional open collector or open drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL), pulled up with resistors.

I2C_LCD is an easy-to-use display module, It can make display easier. Using it can reduce the difficulty of make, so that makers can focus on the core of the work. We developed the Arduino library for I2C_LCD, users just need a few lines of the code to achieve complex graphics and text display features.

Fig 5.11 I2C Module

CHAPTER 6

SOFTWARE DESCRIPTION

ARDUINO IDE:

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

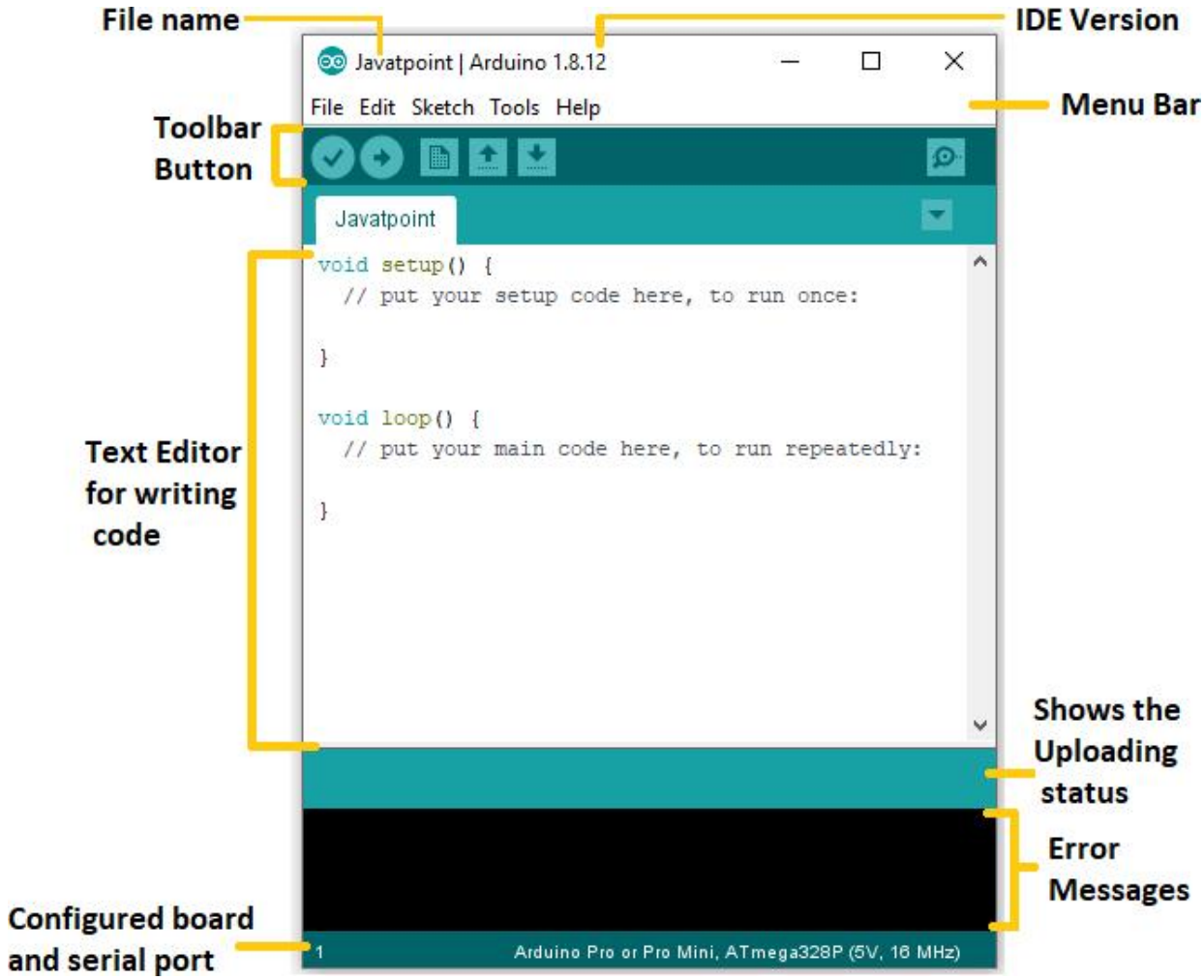

Fig 6.1 Arduino IDE Description

Programs written using Arduino Software (IDE) are called **sketches**. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom right hand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the **Sketch > Import Library** menu. This will insert one or more **#include** statements at the top of the sketch and compile the library with your sketch. Because libraries are uploaded to the board with your sketch, they increase the amount of space it takes up. If a sketch no longer needs a library, simply delete its **#include** statements from the top of your code.

CHAPTER 7

IMPLEMENTATION MODULE

7.1 FLOW CHART:

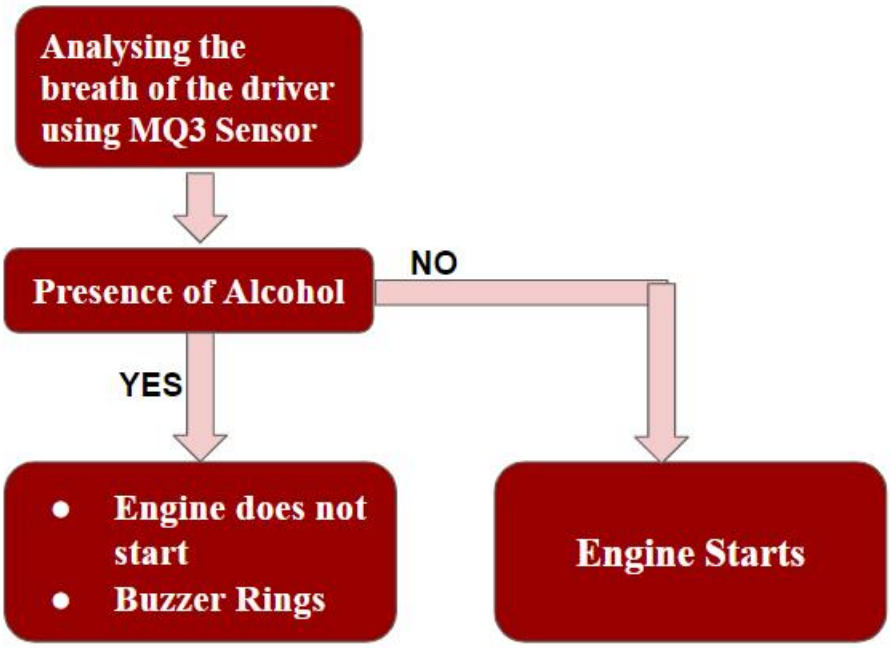

Fig 7.1 Flow Chart

7.2 CIRCUIT DIAGRAM:

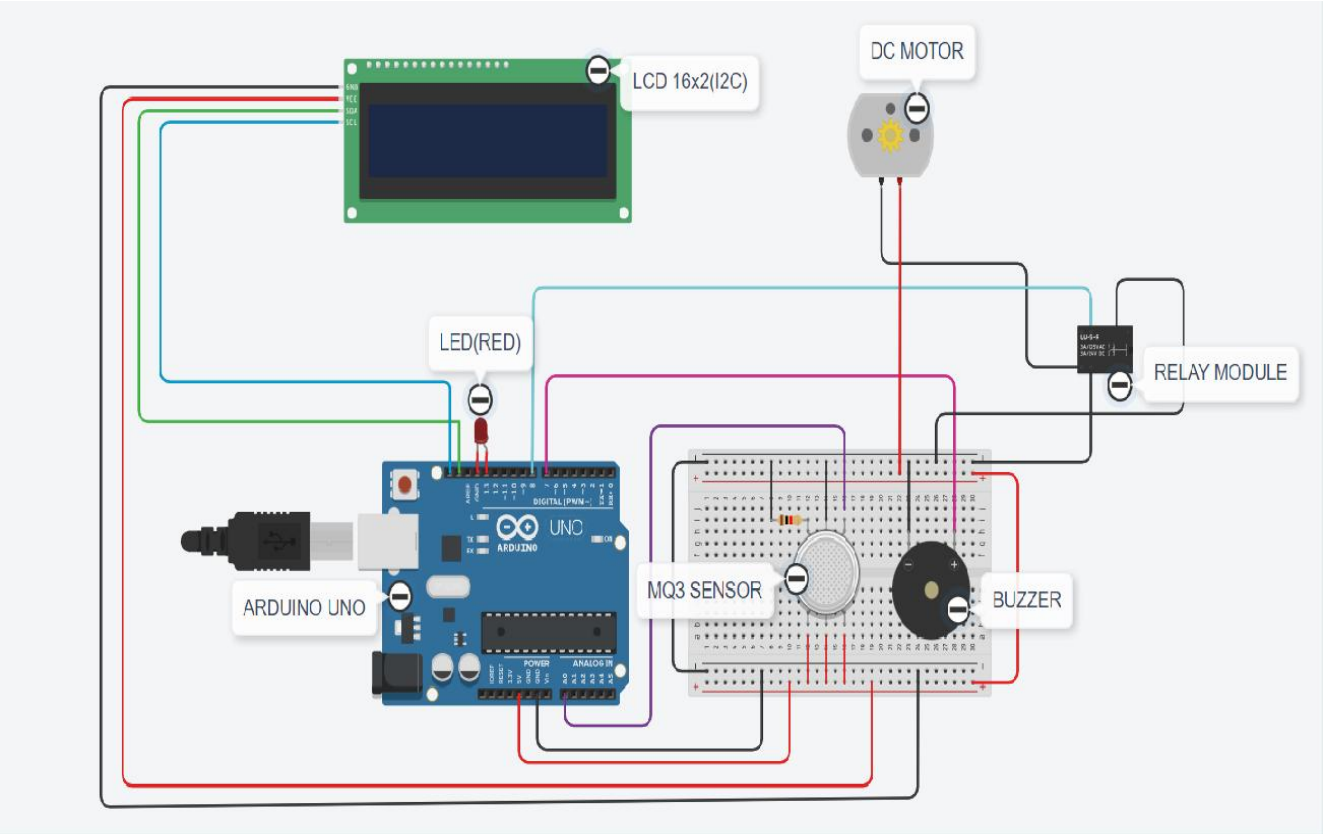

Fig 7.2 Circuit Diagram

7.3 SIMULATION USING TINKERCAD

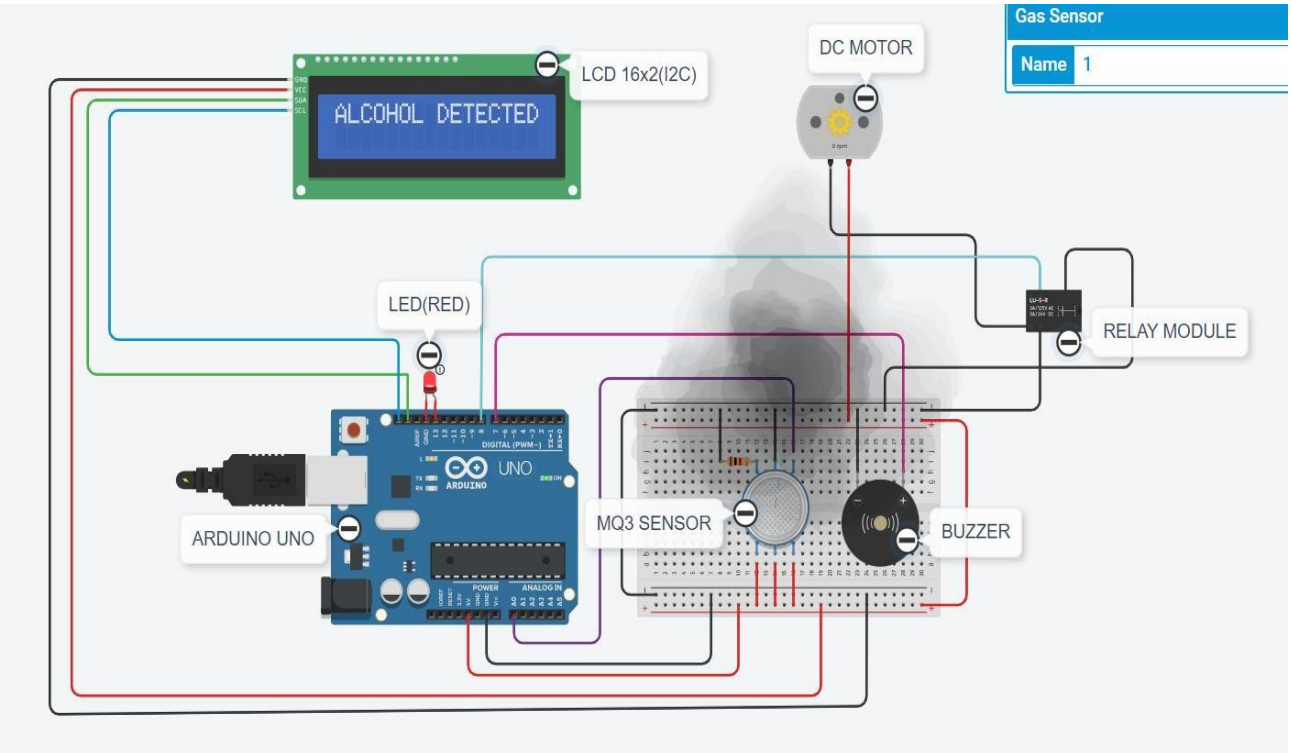

Fig 7.3 Simulation

7.4 SNAPSHOT OF MODULE

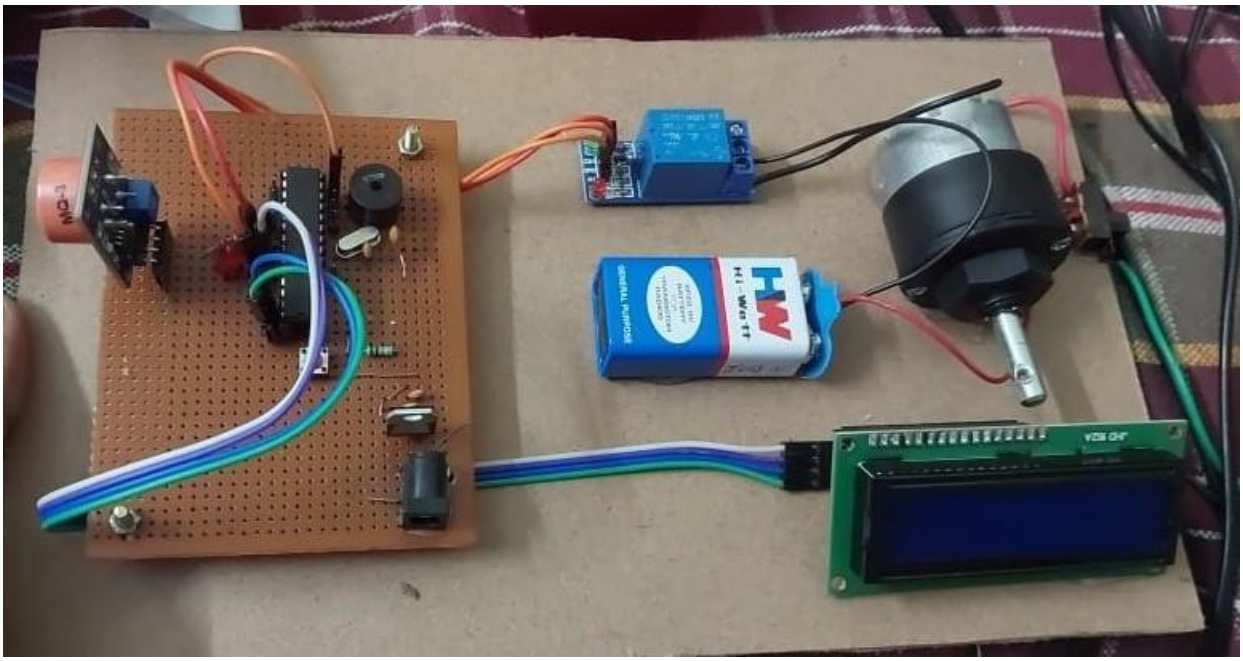

Fig 7.4 Snapshot of the module

CHAPTER 8

CONCLUSION

In this project, we have developed an efficient system to tackle the menace of drunken driving. Our main aim is to minimize the loss of lives and property which happen due to drunken driving. The sensor used in the project is very accurate and can be configured according to the requirements thereby increasing the efficiency. We have given an incredibly capable way to deal and to develop a smart system for vehicles to diminish the number of disasters caused in light of alcoholic driving.

As the creating insight among people is that vehicle security is dynamically critical. Future degree of this structure is to control the setbacks caused due to alcohol use. This system improves the security of individuals and in this manner gives the convincing progression in the vehicle business regarding decrease setbacks caused in light of driving. This system once implemented on a large scale will prove to be really helpful by shutting down the vehicle's engine andalerting the nearby people before any mishap takes place.

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