Alcohol Detection and Engine Control System Using Arduino

[1]Kusuma.S, [2]Madhura.R, [3]Meghana.R. [4]Prakash and [5]Usha Rani
[1,2,3,4,5]Dept. of ECE, AMC Engineering College, Bengaluru, India.
[1]skusuma433@gmail.com, [2]madhuraramachandra3@gmail.com, [3]megaravi123@gmail.com

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Abstract: The goal of our study article is to improve driver safety and prevent accidents caused by drunk driving. This proposal proposes detecting the driver's BAC level and locking vehicle's engine if the BAC concentration exceeds the threshold. The alcohol sensor detects the BAC inside the driver's exhaled breath and transmits signals to the Arduino(microcontroller) to turn off the engine as well as to GSM. The Global System for Mobile communication (GSM) sends a signal to a pre-registered cellphone number indicating that now the driver is intoxicated, and the buzzer begins to sound, followed by the engine being locked. The engine will only start if the amount of alcohol detected is below the threshold set.

Keywords*:* Arduino UNO, MQ3, GSM, LCD, Buzzer.

I. INTRODUCTION

Alcohol drinking is a frequent social activity that has been present in our culture for a long time and continues to be incredibly prevalent even today. [1] Drinking and driving, often known as impaired driving, occurs when the BAC (breath alcohol concentration) is high and may result in an accident. In 2015, there were 501,423 road accidents reported in India, with 16,298 (3.2%) related to driving while intoxicated of alcohol. [2] This prototype detects the presence of alcohol in the air and continually compares it to the minimal amount. If the alcohol percentage rises beyond a certain threshold, Arduino transmits signals to the relay and buzzer, as a result, the buzzer begins to beep and the motor attached to the relay stops running (here, the motor represents the engine), and orders are transmitted to the GSM module to deliver the data to the pre-registered contacts. This minimizes the likelihood of fatalities as a result of drunk driving accidents.

II. PROBLEM STATEMENT

Drunk driving has become one of the leading causes of accidents worldwide. [3] It is common to see a person then under influence of alcohol exhibit an evident loss of perception and awareness. As a result, the driver loses control of the car, resulting in accidents. Drinking and driving endangers not only the lives of the drivers, but also the safety of innocent road crossers or pedestrians.

III. CURRENT SYSTEM

Many researchers on driver tiredness have been undertaken. A significant number of traffic accidents are caused by driver fatigue caused by alcohol use. [4] An embedded system is built using the Arduino UNO and open CV software. Alcoholic drivers are identified in real time by utilizing the driver's weariness and intoxication, as alcohol use causes a significant percentage of road accidents. Despite the fact that several activities are being accomplished, they all concentrate on a particular characteristic, and the highest accuracy may be improved. Officers utilize a manual detecting device to analyse their breath to assess the alcohol levels.

IV. PROPOSED SYSTEM

Alcohol Level detection and engine control systems are a constantly evolving technology that can resolve accidents caused by drinking and driving.

Block Diagram

When the vehicle's engine starts, the alcohol sensor detects the alcohol level of the driver's breath; if the alcohol concentration exceeds the threshold value, the engine is disabled and the buzzer begins to buzz. [5] The relevant notification about the driver's status is presented on the LCD (Fig 1). In addition to engine locking, the GSM will send a text message to the pre-registered phone informing the driver's current status send SMS to the pre-registered number regarding the current status of the driver

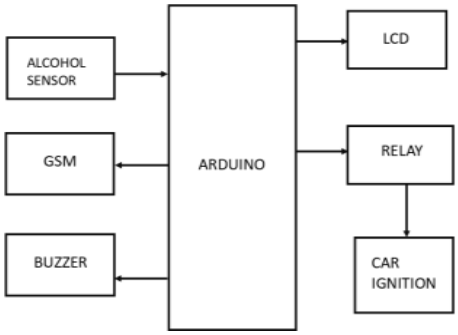


Fig 1. Block diagram.

V. HARDWARE ELEMENTS

Arduino-uno

Arduino-Uno (Fig 2) is an open-sourced microcontroller board designed by Arduino.cc that is built on the integrated Microchip ATmega328P microprocessor. [6] The Arduino board serves as the system's core processing unit. The microcontroller board Arduino uno is based on the ATmega328P. It is a programmable or tunable microcontroller that can be used to prototype electromechanical devices. It includes 14 digital input/output pins/ports (of which 6 may be used as Pulse with modulation (PWM output), 6 analogue inputs, and ceramic resonators operating at 16 MHz The Arduino varies from the previous boards in that, it does not have the FTDI USB- serial driver-based chip.

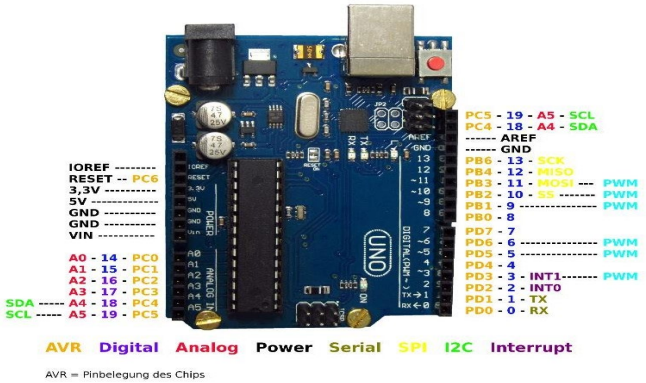


Fig 2. Arduino-uno

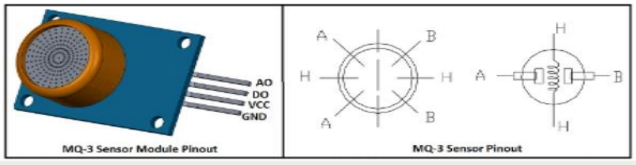
Features:

- The operating voltage is 5Volts
- The recommended I/P voltage will range from 7v-12V
- The I/P voltage ranges from 6v-20Volts
- Digital I/O pins -14
- Analog I/P pins - 6
- DC Current for each I/O pin - 40 mA
- DC Current for 3.3V Pin - 50 mA
- Flash Memory- 32 KB
- SRAM - 2 KB
- EEPROM - 1 KB
- CLK Speed - 16 MHz

MQ3 sensor

A MQ3 sensor (Fig 3) detects the level or concentration of an alcohol, ethanol, and smoke in the environment. [7] The sensor generates a proportional potential difference based on the level of alcohol by altering the resistance of the component inside of the sensor, which may be detected as output voltage. The nature and amount of the gas may be calculated using this voltage value. The capacity of an alcohol or ethanol sensor to sense gases is determined by the ability of the chemiresistor to flow current. Tin Dioxide (SnO2), an n-type semiconductor with unbound electrons, is the most often used chemiresistor (also called as donor). In most cases, the atmosphere contains more oxygen than flammable gases. The oxygen(O2) particles pull the free electrons in SnO2, pushing them to the SnO2 surface. Because there are no number of electrons available, the output current is zero. The animation below depicts the oxygen molecules (blue)

attracted the free electrons (black) within the SnO2 and blocking it from conducting electricity.



	Parts	Materials
1	Gas sensing layer	SnO_2
2	Electrode	Au
3	Electrode line	Pt
4	Heater coil	Ni-Cr alloy
5	Tubular ceramic	Al_2O_3
6	Anti-explosion network	Stainless steel gauze (SUS316 100-mesh)
7	Clamp ring	Copper plating Ni
8	Resin base	Bakelite
9	Tube Pin	Copper plating Ni

Fig 3. MQ3 sensor

Peizo Buzzer

A piezo-buzzer (Fig 4) is a type of electrical gadget that produces sound. Because of its light weight, easy construction, and low cost, it may be used in a variety of applications such as car/truck reversing indicators, computers, call bells, and so on. The piezo buzzer is based on the opposite principle of piezo electricity, which was discovered by Jacques and Pierre Curie in 1880. [8] When a tiny DC voltage is delivered to the I/P pins, it is first transformed to an oscillatory signal by a resistor and transistor combination. The inductor coil amplifies the oscillating impulses. When high voltage is present

When alternating signals are supplied to a piezo ceramic disc, mechanical contraction and expansion in the radial direction occur. As a result, the metal plate bends in the opposite direction. When a metal plate stretches and shrink in opposite directions indefinitely, sound waves are produced in the air.

Fig 4. Peizo Buzzer

LCD Display

The term "liquid crystal display," or LCD, (Fig 5) is self-explanatory. It is a mixture of two different states of matter: solid and liquid. A liquid crystal is used to create a viewable image on an LCD. [9] Liquid crystal displays (LCD) are ultra-thin display panels that are often seen in laptop computer monitors, televisions, cell phones, and handheld video games. When compared to cathode ray tube- (CRT) technology, LCD technologies enable screens to be significantly smaller. The liquid- crystal display screen operates on the idea of light blocking rather than light emission. LCDs, which do not emit light, require a backlight. We constantly utilize gadgets with LCD screens, which have replaced the usage of cathode ray tubes.

Pin No.	Name	Function
1	V_{ss}	Ground
2	V_{dd}	+ve supply
3	V_{ee}	Contrast
4	RS	Register Select
5	R/W	Read/Write
6	E	Enable
7	D0	Data bit 0
8	D1	Data bit 1
9	D2	Data bit 2
10	D3	Data bit 3
11	D4	Data bit 4
12	D5	Data bit 5
13	D6	Data bit 6
14	D7	Data bit 7

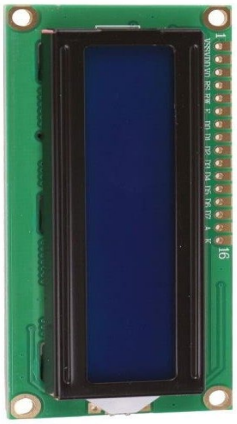


Fig 5. LCD Display

Relay

A relay (Fig 6) is a type of electrical switch. It is made up of an input terminal for a single or more control signals and an operational contact terminal. [10] The switch may contain an unlimited number of contacts in various contact types, such as make connections, break connections, or combination of the two.

Relays are employed when an independently low-power signal must control a circuit or when numerous circuits should be controlled by a single signal.

Fig 6. Relay

DC Motor

A direct current motor, sometimes known as a DC motor (Fig 7), is an electrical device which converts electrical energy directly into mechanical energy by producing a magnetic field generated by direct current. When a direct current motor is turned on, a magnetic field is formed in the stator. The field attracts but also repulses magnets on the rotor, causing it to revolve.

Fig 7. DC motor

GSM Module

GSM (Fig 8) stands for, Global System for Mobile Communications. It is a "European Telecommunication Standards Institute (ETSI)" standard that defines protocols for 2nd generation (2G) digital mobile networks. The GSM standard operates on three different frequency band: the 900 MHz bandwidth range, which was used by the first GSM system. The 1800MHz bandwidth, which was added to accommodate two or more and many subscribers and the frequency is 1900 MHz, is widely used in the United States. GSM standards define the required functionalities and interfaces but they do not address hardware.

Fig 8. GSM Module

VI. RESULT

When a drunk driver enters the car, the alcohol sensor detects the alcohol, causing the buzzer to ring and the LCD to display that alcohol has been detected, as seen in the image below, and the ignition of the vehicle to switch off automatically via the relay.

When no alcohol content detected in the air of the vehicle, ignition of the vehicle is ON (DC motor is ON), LCD displays “SOBER” message. And no SMS is sent through GSM module (Fig 9).

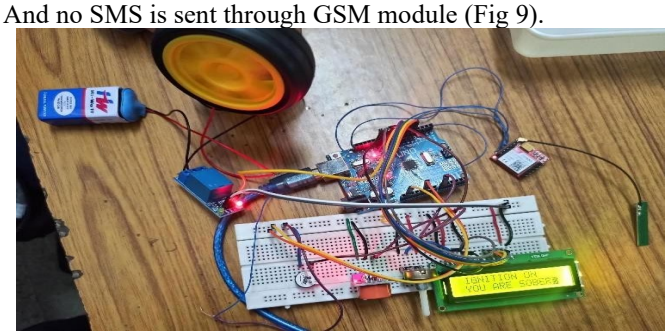


Fig 9. The alcohol sensor

When alcohol content detected in the air of the vehicle, ignition of the vehicle is OFF (DC motor is OFF), LCD displays "DRUNK" message. And SMS (Fig 10) is sent through GSM module to the pre-registered number. So, by this the purpose of our project succeeds.

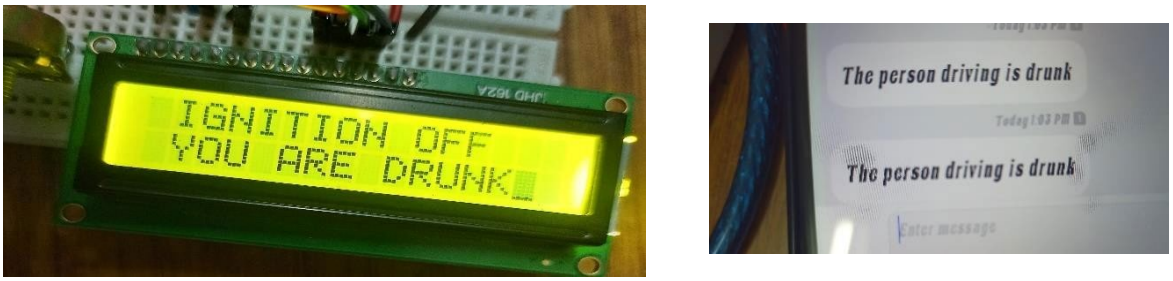


Fig 10. The LCD to display

Applications

Alcohol detection and engine control systems based on Arduino can be used in a variety of automobiles to determine whether or not the driver has ingested alcohol. This may also be utilized in numerous enterprises, organizations, and mines to identify employee alcohol usage.

VII. CONCLUSION

The majority of accidents that occur nowadays are the result of drunk driving. The Arduino-based alcohol detection and engine control system is intended to be cost-effective and technologically advanced. The key component in this project is an alcohol sensor. If the individual in the car has ingested alcohol, the sensor device will detect it. This signal is provided by a sensing device to an Arduino. Arduino is used to build integration possibilities for all hardware components. In this project, we created a real-time system that can automatically trigger and send text messages to the car's owner when an intoxicated driver attempts to drive or is carrying a large amount of alcohol. Car accidents are common these days, and they may be avoided. We can save/protect the lives of the driver, the vehicle, and the remaining passengers by adopting this model in automobiles. contrary to what appears to be an obvious conclusion, may save you both time and money while also making the roadways safer for everyone.

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