Driver Drowsiness and Alcohol Detection

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Abstract:- This paper presents a design of an alerting system for the person in case of alcoholic and drowsiness stage. This system facilitates the driving person and avoids accidents. This system comprises of a Microcontroller based monitoring system along with EYE BLINK SENSOR to detect the blinks of eye. When the eye blinks very faster in drowsiness, this system alerts the driver by giving a buzzer sound. This system also capable of detecting whether the driver is drunk or not by using Alcohol sensor. The modules used in the project are eye blink sensor, Alcohol sensor, LCD module and Microcontroller. The input and output modules are interfaced to the microcontroller and the microcontroller is programmed using Embedded C language. The system detects drowsiness whenever our eye blinking rate goes abnormal than in normal state and alcohol consumption whenever the level of consumption is above the threshold value set. Whenever it detects the low blinking rate than normal or alcohol level above threshold value set the output of this sensor is given to the Microcontroller for further processing. Microcontroller takes necessary action like alarm, stopping engine .

Keywords:- *Alcohol detection system, Vehicle control, Arduino,Eye blink sensor.*

I. INTRODUCTION

Drunk driving is causing a lot of accidents these days. Because drunk drivers are not in a stable state, their hasty driving causes inconvenience to other road users and is also a matter of life and death for the inebriated drivers and others. The solution employs a small circuitry based on Arduino software and non-volatile memory capable of storing password data for more than ten years. Embedded C is used to create the programme. The major goal behind this project is "Drunken driving detection and Drowsiness detection". Many accidents occur these days as a result of the person driving the vehicle having consumed alcohol.As a result, in most nations around the world, drunk driving is the leading cause of accidents. The purpose of an alcohol detector in an automobile is to keep passengers safe. This project should be implemented within the vehicle. A safe car ride can be achieved by using this design, as well as the regulation of drunk drivers. The government must enact legislation requiring that such circuitry be installed in every car, as well as regulations requiring that such circuitry be preinstalled when the vehicle is being built. If this is accomplished, alcohol driving-related deaths will be reduced to a bare minimum. The future scope of this type of device could be a safe landing of an automobile away from other vehicles. India holds the terrible distinction of having the world's greatest number of road accident fatalities. Road safety is becoming a major public health threat, particularly in India. Drunk driving is currently a serious public health issue that is expected to become one of the most serious issues in the near future. The entire control system has the benefit of delivering relevant information about the accident car, minimising the likelihood of an accident occurring due to intoxicated driving or tiredness. This technique increases vehicle safety while also bringing innovation to existing technology, proving to be an ineffective advancement in the automobile business.We're working on an auto-lock system for this project. The system's input comes from a detecting sensor, which could be an alcohol sensor or another method. For the output from these sensors, the controller keeps locking. The device will lock the engine if there are any indications of alcohol beyond the stated limit or if the eyes flicker abnormally. We're mimicking the procedure by triggering the relay because autos are beyond the scope of this research.

II. COMPONENTS

- Micro Controller ATMEGA328
- Crystal Oscillator
- Regulated power supply
- Led indicator
- Alcohol Sensor
- Eye blink sensor
- LCD display
- DC Motor
- Relay

III. MICRO CONTROLLER

A. ATMEGA328:

- Advanced RISC Architecture
  - ➢ 131 Powerful Instructions
  - ➢ Most Single Clock Cycle Execution
  - ➢ 32 x 8 General Purpose Working Registers
- AVR® 8-Bit Microcontroller with High Performance and Low Power
  - ➢ Fully static operation
  - ➢ Throughput up to 20 MIPS at 20 MHz2-cycle on-chip Multiplier
- Longevity 4/8/16/32K Bytes of In-System Self-Programmable Flash Program Memory
  - ➢ Non-Volatile Memory Segments
  - ➢ 256/512/512/1K Bytes EEPROM
- Data retention: 20 years at 85°C/100 years at 25°C
  - ➢ Write/Erase Cycles: 10,000 Flash/100,000EEPROM (1)
  - ➢ Optional Boot Code Section with Independent Lock Bits for In-System Programming Programming Lock for Software Security
  - ➢ Boot Program True Read-While-Write Operation

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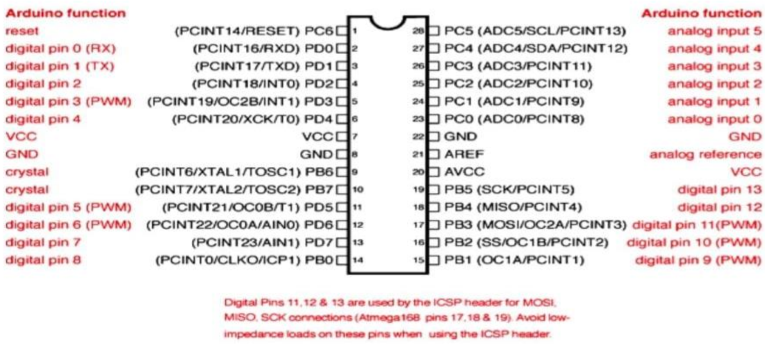

Fig. 1: PIN Description

B. CRYSTAL OSCILLATOR

To achieve an inverse piezoelectric effect, this electronic gadget employs crystal as a frequency selective element. The mechanical resonance of the vibrating crystal, which possesses piezoelectric qualities, is used to generate a high-precision frequency electric signal. Crystal oscillators outperform ceramic resonators in terms of stability, quality, cost, and size. To achieve an inverse piezoelectric effect, this electronic gadget employs crystal as a frequency selective element. The mechanical resonance of the vibrating crystal, which possesses piezoelectric qualities, is used to generate a high-precision frequency electric signal. Crystal oscillators outperform ceramic resonators in terms of stability, quality, cost, and size.

C. LED INDICATOR

Light-emitting diodes are semiconductor light sources (LED). In a variety of applications, LEDs are extensively used for lighting and as indicator lamps. Early LEDs emitted low-intensity red light, while subsequent LEDs produce extremely intense visible, ultraviolet, and infrared light. A led's internal structure and components are seen here.

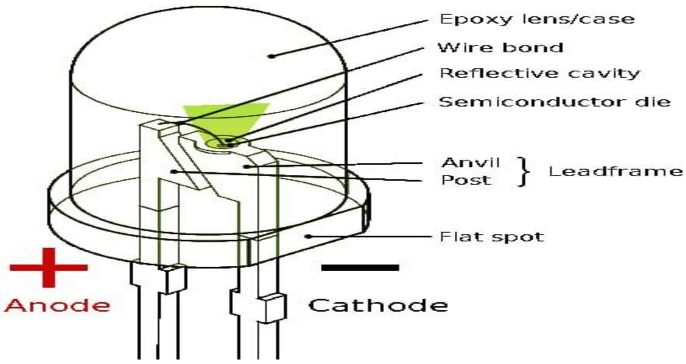

Fig. 2: LED

IV. ALCOHOL SENSOR

To ensure sensor accuracy and system integrity, alcohol detector sensors must be calibrated and tested on a regular basis. MQ303A is an alcohol detection semiconductor sensor. It is useful for portable alcohol detectors because of its high sensitivity and quick response to alcohol. MQ303A reflects the influence of voltage variations on fixed and adjustable resistance, as well as gas load resistance relationships. Normally, numerous concentrations and minutes of preheating are required for the sensor to enter into stable operation after being electrified; otherwise you might provide 2.20.2V high voltage for 5-10secs before testing, which would make the sensor quickly stable. MQ303A is a semiconductor alcohol sensor. It has a high sensitivity to alcohol and responds quickly, making it ideal for use in portable alcohol detectors.

Fig. 3: Alcohol Sensor

V. DESCRIPTION

A semiconductor sensor's sensing element is a micro-ball, with a heater and metal electrode within, and the sensing element is housed in an anti-explosion double 100 mesh metal container. The sensor should be examined weekly for the first 30 days. After then, a maintenance programme, including calibration periods for Hazardous Alcohol detection monitors, should be devised. A monthly calibration is usually sufficient to assure each sensor's efficacy and sensitivity; this monthly check will also allow us to maintain the system's correctness.

The calibration method and processes should be developed right away. The calibration technique should be basic, straightforward, and straightforward enough for regular staff to perform. Unlike laboratory analyzers, which require a high level of precision, calibration here is just a safety check. Simple, consistent, and cost-effective standards must be met for area air quality and safety Alcohol detection monitors.

The technique should be repeatable and consistent. Calibration will take place in the field, where sensors have been deployed, and can take place in any type of environment. There are two methods to calibrating the Alcohol Detector Sensor. The "zero" must be set first, followed by the "span" calibration. Metal oxide, most often SnO2, is used as the sensing material in TGS Alcohol detection sensors.

Negatively charged oxygen is adsorbed on the surface of a metal oxide crystal, such as SnO2, when heated to a high temperature in air. After that, the donor electrons are transferred to the adsorbed oxygen, leaving positive charges in a space charge layer. As a result, the surface potential is formed, serving as a potential barrier to electron flow. Inside the sensor, electric current passes through the junction regions of SnO2 small crystals. Adsorbed oxygen generates a potential barrier at the interface, preventing carriers from readily flowing. This potential barrier is responsible for the sensor's electrical resistance. The surface density of negatively charged oxygen reduces in the presence of a de-oxidizing Alcohol detector, lowering the barrier height in the grain boundary(conjunction portions). Sensor resistance is minimised due to the lower barrier height. When exposed to an Alcohol detector, the Sensor resistance drops quickly, and when withdrawn from the Alcohol detector, it quickly returns to its previous value.The response time and reversibility will differ depending on the sensor model and the alcohol detector used.

Model No.			MQ-3
Sensor Type			Semiconductor
Standard Encapsulation			Bakelite (Black Bakelite)
Detection Gas			Alcohol gas
Concentration			0.04-4mg/l alcohol
Circuit	Loop Voltage	V_c	≤24V DC
	Heater Voltage	V_H	5.0V±0.2V AC or DC
	Load Resistance	R_L	Adjustable
Character	Heater Resistance	R_H	31Ω±3ΩRoom Tem.
	Heater consumption	P_H	≤900mW
	Sensing Resistance	R_s	2KΩ-20KΩ(in 0.4mg/l alcohol)
	Sensitivity	S	Rs(in air)/Rs(0.4mg/L Alcohol)≥5
	Slope	α	≤0.6(R_{300ppm}/R_{100ppm} Alcohol)
Condition	Tem. Humidity		20±265%±5%RH
	Standard test circuit		Vc:5.0V±0.1V V_H: 5.0V±0.1V
	Preheat time		Over 48 hours

Table 1: Technical Data

VI. EYE BLINK SENSOR

Infrared is used by the Eye Blink sensor to detect eye blink. As each eye blinks, the variation throughout the eye changes. The production is high while the eye is closed, but it is low otherwise. 3 pin female header Eye Blink Sensor EYE Sensor kit The Eye Blink sensor uses infrared to detect eye blink. As each eye blinks, the variation throughout the eye changes. The output is high while the eye is closed, but low when it is open. An infrared sensor is used to detect eye blinking. On the top, in front of the driver, is the eye blink sensor. While driving, the eye blinks normally, which means that when the eye closes to a specific second, a buzzer will sound to alert him to wake up. This sensor is a dead zone-free short-range obstacle detector. It has a rather The dual version allows you to enlarge the detecting area. To improve the range, raise the brightness of the IR LEDs or add more IR LEDs. My test setup is shown below, with two phototransistors in parallel for the receiver and some IR LEDs (dark blue) as a light source. We could utilise one of each, but we wanted to spread them out over a bigger area. This setup works in the same way as a Frits LDR, but with IR. It has a range of about 10-15cm when my hand is the identified item. A 1M resistor connects my two phototransistors in series. You could use only one transistor, but I wanted to cover more ground, so my transistors are slightly differently. More current will be permitted to flow if either detects IR.

Because voltage equals current times resistance, even a tiny increase in current causes a reasonable increase in voltage across the 1M resistor. Unfortunately, many AD converters' low input impedance will work as a small resistor in parallel with the 1M resistor, decreasing the output to the CPU greatly.Our BC549 transistor comes to the rescue in this scenario.It amplifies the signal with the 1K and 10K resistors so that the analogue input on your CPU receives a robust signal. Any general-purpose signal transistor should suffice in place of the BC549 When measured with a multimeter, my transistor had a hfe of 490.

The leds and transistors can then be bent outward to cover a larger region. Junior's reverse sensor will cover a broad area to protect him from crashing into anything. I'll make individual Led/Phototransistor sensors for the frontleft and right. The phototransistors are in front of the blue LEDs. This makes it impossible to detect stray LED light.

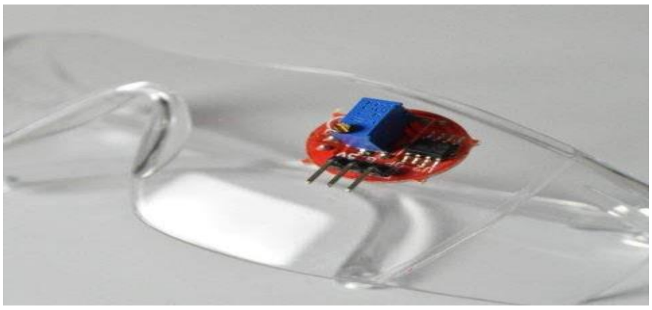

Fig. 4: Eye Blink Sensor

VII. LCD DISPLAY

A liquid crystal display (LCD) is a type of flat panel display that employs liquid crystals to operate. LEDs are widely used in consumer and business electronics such as televisions, cellphones, computer monitors, and instrument panels.LCDs were a tremendous step forward in comparison to the technologies they superseded, such as gas-plasma displays and light-emitting diodes. LCD displays are significantly thinner than CRT displays. Because LCD panels block rather than transmit light, they utilise substantially less energy than LED and gas-display displays. A backlight is used in an LCD to create a picture in which an LED emits light.

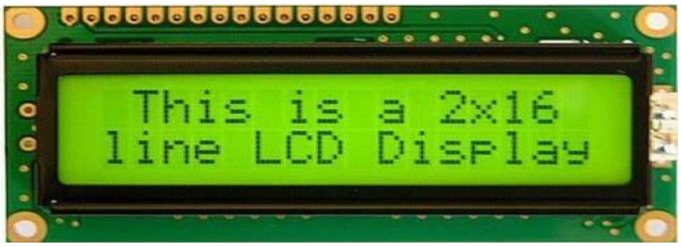

Fig. 5: LCD Display

VIII. DC MOTOR

The interplay of magnetic fields and current-carrying conductors in a dc motor produces mechanical energy. An alternator, generator, or dynamo is a device used to convert mechanical energy into electrical energy. Generators and electric motors can be used interchangeably.A DC motor's input and output are current and voltage, respectively (speed). The armature, which rotates, and the field coils, which are immobile. The stator refers to the stationary component.The diagrams show a typical DC motor, a typical DC armature, and a typical stator.As seen in the diagram, the armature is made up of wire coils wrapped around a core with an extended shaft that revolves on bearings. You'll also see that the armature's ends of each coil of wire are connected at one end. The brushes make electrical contact with the commutator, which allows electrical current to flow from the machine's fixed to rotating parts.

Fig. 6: DC Motor

IX. RELAY

Electricity controls a relay. In many relays, an electromagnet controls the switching mechanism, while different mechanisms are also used. Relays are used to control several circuits with a low-power signal. Long-distance telegraph circuits were the first to use relays, which repeated and re-transmitted signals from one circuit to another. Relays were employed to execute logical processes in both phone exchanges and early computers.A contactor is a form of relay that can handle the high power needed to run an electric motor directly.Solid-state relays employ a semiconductor device that is triggered by light to regulate power circuits. To protect electrical circuits from overload or faults, relays with calibrated operating characteristics and, on occasion, several operational coils are utilize in modern electric power systems, digital instruments still referred to as "protection relays" perform similar roles.

Fig. 7: Relay

X. BUZZER

A buzzer, often known as a beeper, is a mechanical, electromechanical, or piezoelectric audio signalling device. Alarm clocks, timers, and to confirm human input such a mouse click or keyboard employ buzzers and beepers frequently.

- **Electromechanical**: Early devices used a similar electromechanical technology to that of anelectric chime, but without the metal. A relay, for example, may be wired to interrupt its own actuating current, causing the contacts to buzz.As a sounding board, these units were commonly mounted on a wall or ceiling. The term "buzzer" comes from the rasping sound produced by electromechanical buzzers.
- **Piezoelectric:** These days, a Son alert or another high-pitched ceramic-based piezoelectric sounder is more widely utilised. These were generally attached to "driver" circuits that altered the pitch or pulsed the sound on and off.

A piezoelectric element can be powered by a piezoelectric audio amplifier, which is driven by an oscillating electronic circuit or another audio signal source. When a button is pressed, a click, a ring, or a beep is heard.A piezo buzzer is a sound-generating electrical gadget. Because of its light weight, simple construction, and affordable price, it can be utilised in a range of applications, including car/truck reversing indicators, computers, and call bells.

Fig. 8: BUZZER

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XI. ARDUINO IDE SOFTWARE

USB or external power can be used to power the Arduino Uno. The power supply is automatically selected. An AC-to-DC adaptor (wall-wart) or a battery can be used to provide external (non-USB) power. A 2.1mm center-positive connector can be used to connect the adapter to the board. The POWER connector's Gnd and Vin pin headers can be utilised to connect battery leads. The board can be powered by a 6 to 20 volt external supply. The 5V pin may only produce five volts if less than 7V is supplied, leading the board to become unstable. The voltage regulator may overheat and destroy the board if you use more than 12V. 7 to 12 volts is the recommended voltage range. The following are the power pins:

- VIN: When powered by an external source, the Arduino board's input voltage. This pin can be used to supply or access voltage if voltage is supplied via the power jack.
- 5V: The microcontroller and other circuit elements are powered by a regulated power source. This can be supplied by Vin or another regulated 5V supply, or by USB or another regulated 5V supply.
- 3V3. The on-board regulator generates a 3.3-volt supply. There is a maximum current draw of 50 milliamperes.
- Grinding pins (GND) For storing code, the Atmega328 has 32 KB of flash memory.
- By using the pin Mode(), digital Write(), and digital Read() functions, each of the Uno's 14 digital pins can be utilised as an input or output. They are powered by a 5 volt battery. Each pin has an inbuilt pull-up resistor of 20-50 kOhm and can handle up to 40 mA.
- Several pins have specific purposes as well:
- 1 (TX) and 0 (RX) in serial (TX). This device receives (RX) and transmits (TX) TTL serial data. These pins are connected to the equivalent pins on the ATmega8U2 USB-to-TTL Serial chip.
- #2 and #3 External Interrupts A low value, a rising or falling edge, or a change in value can all be used to trigger an interrupt on these pins. For more information, see the attach Interrupt() function.
- PWM : 3, 5, 6, 9, 10, & 11. An 8-bit PWM signal is produced using the analogue Write() function.
- SPI: SS, MOSI, MISO, and MISO (SCK). These pins support SPI communication, which the Arduino language does not presently support despite the fact that the underlying hardware supports it.
- LED: 13. Digital pin 13 is connected to a built-in LED by a cable. The LED turns on when the pin is HIGH and turns off when the pin is LOW.

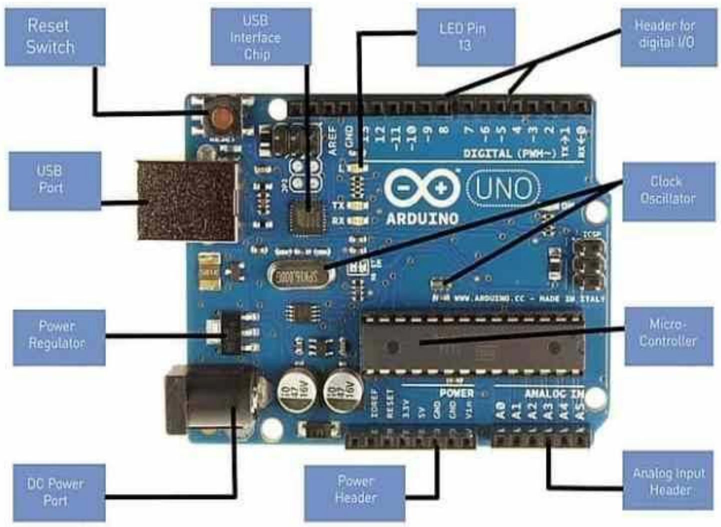

Fig. 9: ARDUINO

XII. PROJECT OVERVIEW

A software and hardware combination that performs a specific purpose is known as an embedded system. The most prevalent embedded devices are microprocessors and microcontrollers.

Microprocessors are regarded as general-purpose processors since they only accept data, process it, and output the results. A microcontroller, on the other hand, takes data as input and manipulates, interacts, regulates, and so produces the result.

The project "DRIVER DROWSINESS AND ALCOHOL DETECTION" utilising an ATMEGA328 Microcontroller is a one-of-a-kind project that can regulate and monitor a motor using alcohol sensors according to the instructions provided by the microcontroller. Driver sleepiness is detected via an eye blinking sensor worn by the driver.One of the system's biggest flaws is that drivers do not wear the eye blinking sensor all of the time since it irritates their eyes. The problem is solved by employing a camera. Determine whether or not the eyes are open.

XIII. SYSTEM ARCHITECTURE & WORKING

In today's world, embedded system devices play an important role.These are made up of both hardware and software, with the latter being known as hardware embedded software. Among the most popular important features of these systems is that they provide output within a set time limit. As a result, embedded systems are increasingly being used in both simple & complicated products. Microwaves, calculators, TV remote controls, home security systems, and crowd control systems are just a few examples of embedded system applications.Figure 10 depicts an embedded system block diagram. Embedded devices are classified into numerous types based on the hardware and software used, as well as the microcontroller used (8, 16, or 32 bits).

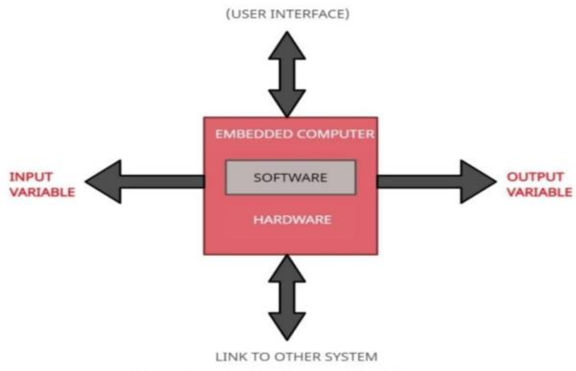

Fig. 10

This proposed device uses an Arduino UNO to continuously monitor the driver's breath and tiredness. When a driver tries to drive while inebriated or tired, the system detects ethanol in his or her breath or sleepiness and locks the engine. The Arduino UNO is a microcontroller-based board that manages all of the devices attached to it.

Connect the DC motor to the relay and the relay to Arduino pin A0. Now, using the USB cord, upload the code to Arduino. Connect the USB cable to the computer and open the Arduino software. Enter the code, compile and execute it, then choose the arduino port and press the upload button.Connect the batteries and test the eye blink sensor and alcohol sensor output. The car (motor) will be halted if the blink of an eye lasts more than 2 seconds or if the amount of alcohol detected above the threshold value.

The Alcohol sensor and Eye blink sensor identify whether the person in the automobile has drunk alcohol or is drowsy. The microcontroller atmega328 receives the signal from the sensor. The CPU of the entire circuit is the microcontroller. The buzzer is switched on when the microcontroller sends a high pulse to the circuit. The relay is also disabled at the same moment. As a result, the vehicle's ignition is turned off.

The project extends the Alcohol and Drowsy Detection System with Buzzer Indication by adding an ignition key to the input and a DC motor to the output. The microcontroller receives the input Ignition key. It is up to us to discover whether or not the car has been started. The alcohol detecting process is triggered whenever a key is put into the ignition lock.

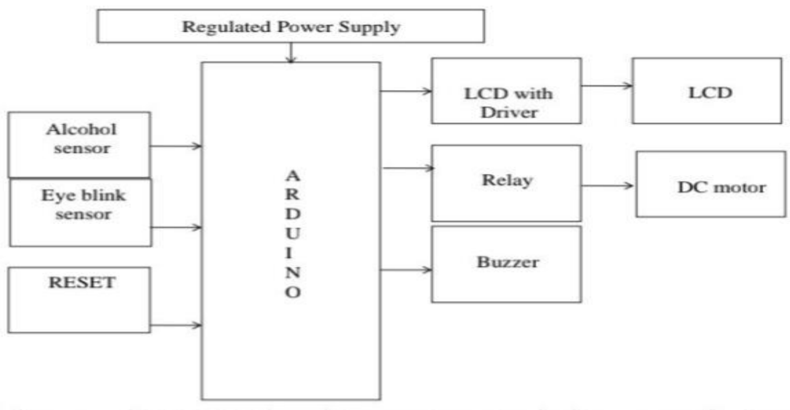

Fig. 10: Block diagram of ARDUINO based Automatic engine locking system for Drunken Drivers

The components interfaced with the Arduino board are MQ3 sensor,Eye blink sensor,an LCD, a buzzer and a DC Motor along with relay which is used to drive the motor. When the driver who is in drunken state or in a state of drowsy want to drive the vehicle, and as soon as person reaches the contiguity of the sensor which placed in the vehicle near the

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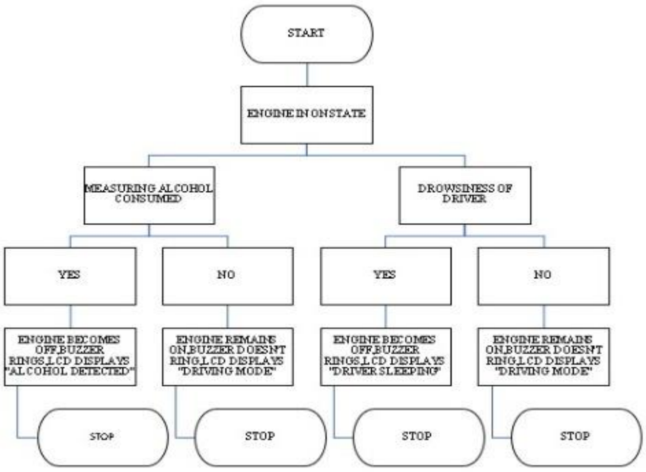
driver, where person breathe and eyeblinks are continuously reach the sensor, then MQ3 alcohol sensor sense the alcohol concentration, an Eyeblink sensor senses the drowsiness and sends the recorded signal/value to the Arduino board, and then the comparison is done between recorded valve and predetermined threshold value (set by the designer) in it. If there are any traces of alcohol above the fixed threshold value, then the system displays "ALCOHOL DETECTED" on LCD, the buzzer rings and the engine is locked automatically by reducing the speed of the engine gradually, thereby determining the engine locking mechanism.If there are any traces of abnormal Eyeblinks then fixed normal value, then the system displays "DRIVER IS SLEEPING" on LCD, the buzzer rings and the engine is locked automatically by reducing the speed of the engine gradually, thereby determining the engine locking mechanism.

If the alcohol or the drowsiness is not detected then the system will display "SAFE TO DRIVE" and the working of engine is not interrupted. The working of the entire system can be easily understood through the algorithm representation of the work flow, in which its flow represents the working operation of the system.

The flow chart of this system is in the figure below:



Flow chart 1

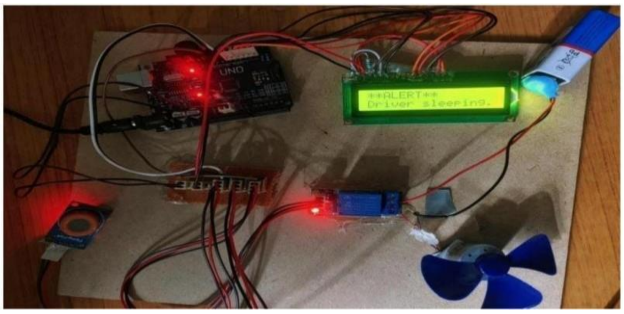


Fig. 11: When Driver is Drowsy

In this state the system detects the drowsiness through eye blink sensor, as the sensor is interfaced with Arduino, it compares the normaleye blink count with the preset value and it warns the driver through buzzer and it locks the engine .

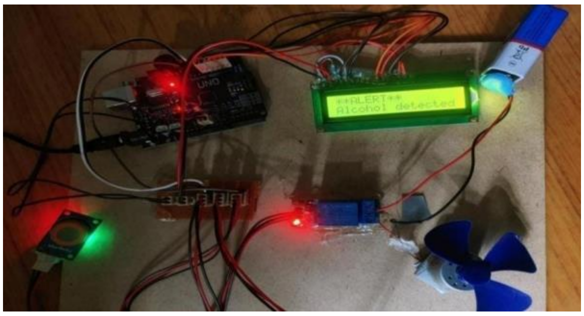


Fig. 12: When Driver is in Alcohol state

In this state the system detects the alcohol through alcohol MQ3 sensor, as the sensor is interfaced with Arduino, it compares the alcohol value with the preset value it warns the driver through buzzer and it locks the engine.

XIV. CONCLUSION

A safe journey can be achieved by adding this technology into a vehicle, resulting in fewer injuries and a decreased accident rate due to drunk driving. Accident prevention technology is also included in this system, which helps to reduce car accidents in congested areas. Instead of halting the vehicle directly, the proposed technology will detect alcohol through the driver's breath and stop it by interrupting the ignition. We can put in place a system to stop the car. The system's experimental examination revealed that when alcohol is detected, the alcohol sensor can respond quickly. The alcohol sensor's ability to work over a lengthy period of time is also a feature of the suggested system.

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