# GSM based smart vehicle system for prevention and reduction of road accidents

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## Abstract

*This project presents the design and implementation of four technologies to prevent and reduce road accidents. The first module presents the detection of driver's drowsiness through eye blink sensor and alerting the driver if eyes are closed for more than a threshold time. The second module presents alcohol detection with Engine locking for vehicles. The system monitors the alcohol presence in the vehicle surrounding and automatically turns off the engine if alcohol concentration is above a threshold level. The third module presents the concept of collision avoidance with the help of proximity sensor. If any obstacle comes in front of vehicle unnoticed by driver due to some conditions, then automatically brakes will be applied. The fourth module detects the CNG leakage in the vehicle and alerts the driver with the help of a buzzer, as well as sending message to owner. The project helps in preventing and reducing road accidents efficiently.*
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**Key Words:** *Arduino UNO, DC Motor, IR sensor, MQ Sensors, Buzzer, SIM900A,.*

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## 1.INTRODUCTION

Road accidents are a serious problem that affects millions of people every year. They are serious threat to us in many ways. They can cause physical injuries, emotional trauma, and financial loss to the individuals involved and their families. According to the World Health Organization (WHO), road traffic accidents result in about 1.35 million deaths each year, with 90% of these deaths occurring in low and middle-income countries. In 2020, approximately 1.35 million people died as a result of road accidents, while millions more suffered serious injuries. The causes of road accidents are complex and multi-faceted, ranging from reckless driving, speeding, and driving under the influence of drugs or alcohol, to poor road infrastructure, vehicle malfunctions, and weather conditions. Reckless or drunk driving, distracted driving, driving under the influence of drugs, and other forms of human error can cause road accidents. The lack of alertness in driver is usual cause of accidents. Out of many other causes of road accidents, four major causes have been examined and studied and these are taken into consideration in this project. The four causes include driver's drowsiness, driving under the influence of alcohol, accidents due to collision and accidents due to CNG leakage in CNG fuel-based vehicles.

Drowsy driving is a serious problem that can lead to a range of accidents and incidents on the road. When a driver is tired, their reaction time is slowed, and their decision-making ability is impaired. Accidents due to obstacles on the road can occur when a driver is not fully alert and in control of their senses. The driver may not be able to react quickly enough to avoid an obstacle in the road, leading to an accident. CNG is highly flammable and can pose a safety risk if not properly handled. Accidents due to CNG leakage can occur if a CNG fuel system in a vehicle develops a leak, which can lead to fire and explosions. This project presents a technological system that deals in prevention and reduction of road accidents due to the four causes mentioned.

## 2. LITERATURE SURVEY

A. This work presents the design and implementation of gas leakage detection technique. With the help of GSM module, it alerts the owner to avert problems due to leakage. SIM800A and MQ2 sensor are used in this system. **[1]**

B. This work presents the design and implementation of an alcohol detection system with engine locking for cars using the ultrasonic sensor and Arduino UNO as Master Control Unit (MCU). The system continuously monitors the level of alcohol concentration and turns off the engine vehicle if the alcohol concentration is above threshold level. The project provides solution to control accidents due to drunk driving.**[2]**

C.   This work carried out a fire and gas detection system for home and industrial safety. This system makes use of microcontroller along with sensing circuit which will detect gas leakage and fire with the help of an alarm system that gives alert about fire or leakage. MQ-6 and MQ-9 sensors are used to build the system. **[3]**

D.   The objective of this system is to reduce collisions so as to reduce death of persons, death of wildlife, automobile damage and damages to property upon collision and thus eliminate the related cost. A system based on Atmega 328 was implemented which gives warning by means of on board warning systems and engaging brake at a minimum separation distance. **[4]**

E.   This paper presents a system for driver's eye recognition from near infrared rays. The system is organized in a cascade of two classification modules. The first one is responsible for initial eye detection and validation. **[5]**

F.   This system presents the concept of reduction of accidents with the help of eye blink sensor using IR rays. It consists of IR transmitter and IR receiver. The alarm inside the vehicle will go on for a period of time until the driver is back to his senses. **[6]**

## 3. METHODOLOGY

The proposed project deals with design and implementation of different sensors with microcontroller. The system uses sensors for our modules in the project. IR module is used to determine the driver's drowsiness with the help of infrared rays. This project presents the design and implementation of an Alcohol Detection with Engine Locking for cars using the Ultrasonic Sensor and Arduino UNO as the MCU (Master Control Unit). Our proposed system will be constantly monitoring the driver's breath by placing it somewhere the driver such that breathe can be constantly monitored by it. So, if a driver is drunk and tries to drive, then the system will detect the alcohol presence in his/her breath and gets the engine lock so that the vehicle fails to start. Proximity sensor is used for object detection which is efficient to detect any object around vehicle unknown to driver. CNG gas leakage detection is also monitored with the help of sensors. An alarm will ring if CNG gas leakage is detected which will ensure the driver about the gas leakage in the vehicle. So here we are proposing a system to detect CNG gas leakage scenarios and provide a security alert to intended users.
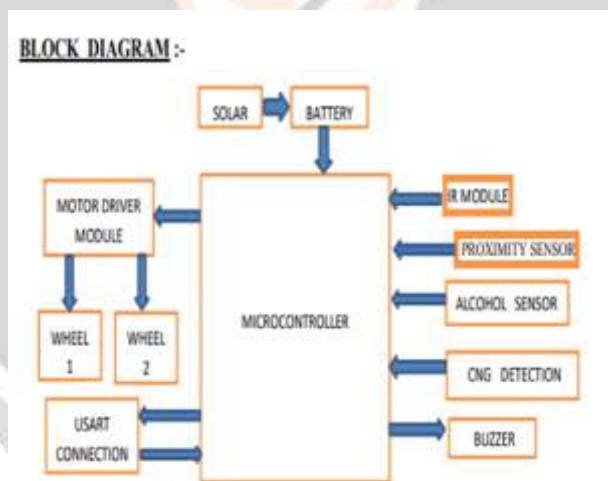


FIG 1. HARDWARE MODULE

### 3.1 ARDUINO UNO

Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller. It is designed for hobbyists, students, and professionals to create interactive electronic projects easily. The board comes with a set of digital and analog input/output (I/O) pins that can be programmed to interact with various electronic components such as sensors, LEDs, motors, and more. The Arduino Uno board has a USB port that allows it to be connected to a computer for programming and power supply. The arduino results to numerous various functions like Microcos sheets which seems like arduino-uno which can be conservative/very useful for each task.

FIG 2. AURDUINO UNO



FIG 3. PIN DIAGRAM

### 3.2 MQ-3 SENSOR

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 is having a clear interface type. On the sensor, port pins 1, 2 and 3 tends to the yield, GND and VCC independently. The particular of the sensor is depicted in table underneath.



FIG 4. MQ3 SENSOR TABLE

The MQ-3 sensor is used to detect the presence of alcohol level in the surrounding and give reading to Arduino which determines whether the consumption level is in limit or not.

### 3.3 BUZZER

The buzzer acts an alarm for alerting the driver. The buzzer is activated when the driver's eyes are closed for more than threshold time period. It activates when the alcohol and CNG are sensed in the vehicle. It is basically for alerting the driver.



FIG 5. BUZZER

### 3.4 DC MOTOR

The DC motor is connected to L293D motor driver which in turn is connected to Arduino and is given a 5V supply. DC motor works on the principle of Lorentz Law. It is used to stop the wheels when a mishappening is about to happen.
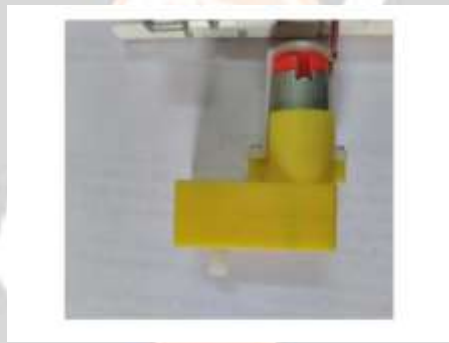


FIG 6. DC MOTOR

### 3.5 SIM900A

SIM900A is a GSM/GPRS module that allows communication between devices over the mobile network. It is manufactured by SIMCom Wireless Solutions and is widely used in various applications, such as remote control, security systems, telemetry, and vehicle tracking systems. The SIM900A module supports the GSM/GPRS 900/1800 MHz bands and has an embedded TCP/IP stack that allows it to communicate over the internet. It also supports AT commands, which can be used to configure and control the module. The module can be connected to a microcontroller or other devices through its serial interface. The SIM900A module requires an external power supply and an antenna for communication. It can be programmed using the AT command set or by using the SIM900A library provided by SIMCom. The library simplifies the communication between the module and a microcontroller and allows users to easily send and receive data through the module.



FIG 7. SIM900A

## 4. RESULT

If the driver closes the eyes more than specified time while driving, then an alarm will ring and the vehicle will stop. If alcohol is sensed inside the vehicle, then also an alarm will ring and the engine will turn off and SMS alert will be delivered to owner. If an unnoticed object comes in front of the vehicle, then driver will be alerted by alarm and automatic braking will take place. If CNG leakage is detected inside the vehicle, then also alarm will ring to alert the driver about upcoming crisis. Any kind of accident can be prevented using this system. All equipments are totally tested and connected as required thereby giving the much needed result.
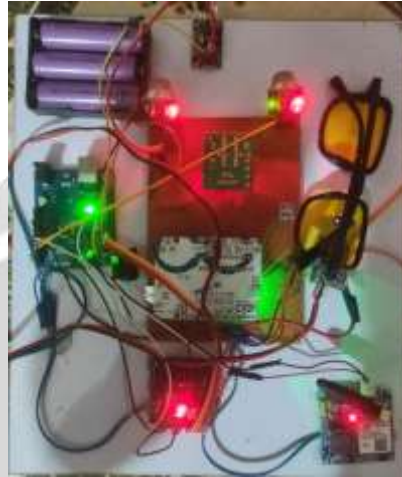


FIG 8. MODEL

## 5. APPLICATIONS AND ADVANTAGES

The applications of this project are wide and easily visible as four modules are combined in one system.

- The system can be implemented in any four wheelers to prevent and reduce accidents.
- The alcohol detection system is useful for police department.
- CNG detection system is implemented in CNG fuel-based vehicles and CNG fuel stations for avoiding any calamity due to CNG leakage.
- Collision can be avoided with this system as automatic braking is used.
- Accidents due to driver's drowsiness can be prevented.
- The abnormal behaviour can be corrected with the help of alarm.

## 6. CONCLUSION

The system gives an incredibly capable way to deal and to develop a smart system for vehicles to reduce the number of accidents caused by driver's fault, alcohol or CNG leakage inside vehicle and driver's drowsiness. It is quite efficient system as different causes for accidents are studied and thus different modules are combined. This system improves the security of vehicle and helps in reducing the loss of lives dur to road accidents. Future degree can be monitoring pulse and heart beat of driver along with the expressions to give more accurate idea of driver's drowsiness and can give more advance results.

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