

Accident Prevention with Alcohol Sensing Alert: Study and analysis

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Abstract: There has been a rise in the number of road accidents across the nation as well as across the globe. Most of these accidents are caused due to drunk driving. Out of those cases most of the drivers are teenagers or the youth in their early 20s. Drunk driving accidents cause loss of lives as well as damage to the infrastructure and hence need to be prevented at all costs.

This paper has been written for the finding an effective solution to this issue which is being faced worldwide. The paper aims to prevent such accidents by making use of an alcohol sensors that can be placed on the steering wheel or the dashboard for monitoring the breath of the driver. It constantly monitors the breath of the driver and upon detection of alcohol it locks the engine of the car thus preventing the drunk person to drive their vehicle. This saves the life of the driver and also saves others on the road from being involved in any sort of accidents. The driver won't be able to start their engine if they are already drunk, and in case they start drinking while they are driving the car, even then the engine will get locked and prevent them from driving further till they are sober. The paper also notifies the driver's personal contacts in case of detection of an attempt of drunk driving. This ensures that their family is aware of the attempt of drunk driving and can advise them to practice responsible driving in future.

IndexTerms – Alcohol detection and prevention, GSM Module, Arduino

I. INTRODUCTION

Today, multiple accidents take place due to drink and drive cases. Many people risk their own as well as others' life by having high levels of alcohol in their bodies. This results in terrifying accidents which involve loss of human lives and infrastructure. In 2021, 48,144 cases of drunken driving were reported and the youth of our country were involved in majority of the cases. The minimum legal drinking age varies from state to state (it was lowered from 25 to 21 in Delhi). A research conducted by CADD (Community Against Drunken Driving) in 2018, however, revealed that nearly 62 per cent of the interviewed youth in the 14 to 21 age group, routinely consumed alcohol [1] [2].

The work suggested in this paper would prove to be very beneficial because it does not allow the drunk person to drive the vehicle and force them to find a sober driver or an alternative travel option like using a taxi.

It would also help in reducing the accidents caused by drunk driving, save human lives and reduce damage to property. Earlier, there was no technique to bolt the engine of the vehicle as soon as alcohol was sensed. Manual checking was conducted on the roads or the highways. However, these checks were not sufficient to stop the happening of the mishaps. To overcome these issues, the vehicle detection and alcohol sensing alert with engine locking system has been developed.

II. LITERATURE

Abhishek et al. had designed a system for accident prevention. In the work, system is designed in such a way that engine is turned off as soon as the alcohol limit of the driver goes beyond the permissible limit [3]. Jonas et al. focused on accident prevention by taking inputs or images from the driver's face and detecting the presence of CO₂ and alcohol. They implemented the task of alcohol detection and also in such a way that the system could be generated in bulk. However, there was no system of sending any alert message to family/friends [4]. This leads to better accident prevention. Further, Pratiksha et al. implemented an alcohol detection system. They also successfully implemented the messaging system in their project. However, tilt detection was not included [5].

Earlier in literature, work on alcohol detection and prevention has been done. However, most of the work focusses on alcohol detection only [6]. In this paper, the additional feature of sending SMS when someone is found drunk or the vehicle is tilted has been added.

III. MODULES USED IN THE WORK

a) Arduino

Arduino, an open-source platform, is used here. It consists of a programmable circuit board along with some software.

b) Alcohol Sensor



Fig. 1 MQ3 sensor

MQ3 sensor is used in the development of the circuit. The sensor is placed in simple voltage divider network to detect the alcohol concentrations.

c) Tilt Sensor

The project makes use of a tilt sensor to sense the tilt or orientation of the vehicle. With the help of the data sent by the tilt sensor, the project quantifies the tilt of the car and when the orientation of the car exceeds a certain amount it concludes that the car and the driver has met with an accident and it sends a notification to the personal contact indicating a possible accident.

d) DC Motor



Fig.2. DC Motor

A DC motor is used here to change the direction of current in parts of the motor. It relies on magnetic field.

e) SIM 900 GSM Modem



Fig.3.GSM Modem

SIM900 GSM/GPRS shield is a GSM modem and is used to make phone calls, SMS text messages, internet connectivity through GPRS etc.

f) 16x2 LCD Display Module



Fig.4. LCD Display

LCD 16x2 broadly used in devices, DIY circuits, electronic projects has been used in this work. Due to its low cost, ease of programming and ease of access, it is used here.

IV. WORKING OF THE MODEL AND IMPLEMENTATION

a) HARDWARE CONNECTIONS

Below is the actual image of all the components assembled together in the working condition.

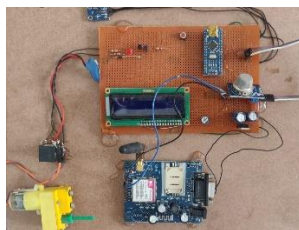


Fig. 5 Hardware connections

Below is the circuit diagram of the all the hardware for easy understanding of the system and working project.

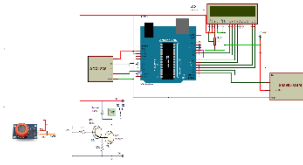


Fig. 6 Schematic Diagram

The work comprises of four major parts

- Alcohol Detection Sensor:** As soon as someone blows near the alcohol sensor, it will check the alcohol level and the result would be displayed on the screen. Display would say either alcohol level high or alcohol level low. Once, this data becomes available we move to the next part.
- Text message if the alcohol level is high:** The message i.e the alcohol level is high would be shared to the contact as a text message through GSM Module. The personal contact has been added in the code,
- Engine lock if the Alcohol level is high:** The person with a high level of alcohol won't be able to start the engine due to his condition and will thus not be able to cause an accident in near future.
- Tilt angle notification:** If the car, meets an accident and topples to a certain angle then the personal contact would get a message that the car has met an accident with the location of GSM

Drivers provide a puff of breath directed towards a small sensor, which can be outfitted in the steering column or side door trim. The system is designed to give a "alcohol detected" display in case of presence of presence of alcohol content in breath in a few seconds. After successfully integrating Alcohol sensor and Tilt sensor, work was done on the Engine locking part of the project. Alcohol in the car whether it's in motion already or just starting it the engine stops and doesn't start if there is alcohol presence in the atmosphere then it would play an important role in reducing the number of car accidents and drunk and driving cases in India. On bootup the board will display texts such as "Initializing". Once, the system is ready and the Alcohol sensor senses alcohol in atmosphere then the board will display "Alcohol Detected" and if the vehicle tilts more than to a certain angle then the board will display "Tilt Sensed". In both the scenarios, a text message will be sent to the number mentioned in the code from the SIM 900 GSM Modem that "ALERT: ALCOHOL DETECTED" and "ALERT: ACCIDENT DETECTED" respectively with the SIM card inserted in the Modem. Including a secondary GSM Modem also ensures that in accident if by any chances driver's phone gets destroyed or is not functioning then the known one's can get an update of the mishap, ensuring timely provision of healthcare to the people in the vehicle. This would not ensure 100% safety; however, this would help to at least save few lives by providing timely healthcare and emergency ambulance service to the people who met accident.

V. CONCLUSION

The solution offered in the project enables usage in road vehicles, the sensor can be seamlessly integrated into vehicles so there is no physical hardware in the vehicle cabin. Alcohol detection plays a major role in accident aversion. Also, any mishap can be avoided with the help of tilt detector. Moreover, the system also send a SMS to the contact ensuring the safety of the driver. All in all, although the system may not ensure 100% safety; however, this would help to at least save few lives by providing timely healthcare and emergency ambulance service.

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