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Elite Vehicle Controller: Drunk Driving Detection with Vehicle Ignition Locking Using GSM

Sakshi Berad[1], Sanjana Aher[2], Divya Varpe[3], Sonali Dhuttargi[4]
[1,2,3]*Student,* [4]*Teacher, Dept of Information Technology, Bharati Vidyapeeth's College of Engineering for Women, Pune, India*

Abstract— Alcohol detection system is developed for road transportation safety in smart city using Internet of Things (IoT) technology. Due to the rapid increase of vehicles on roads, the probability of road accidents is rising steeply. Drunk driving is considered to be a major cause of road accidents throughout the world. The main aim of this project is to develop a system that would detect the amount of alcohol that is consumed by the driver of the vehicle. This system discusses development and live-performance test of the prototype of drink and drive situation detection and alert cum vehicle control system to minimize road mishaps and enhance public safety on road. The model is developed using Arduino Uno and alcohol detection sensor (MQ-3) as its major components. As a safety measure, when the level of alcohol crosses a permissible limit, Vehicle Control System is triggered to lock ignition or stop the fuel inflow to the vehicle. Additionally, 'alert SMS' indicating drunk driver location, tracked by onboard GPS receiver, along with vehicle number is communicated remotely to the authorized people (family). The deployment of this system will help in reducing the incidence of drunk driving related road accidents in smart cities.

Keywords—GSM, GPS, Alcohol sensor, Arduino microcontroller, ignition control (DC Motor), Buzzer

I. INTRODUCTION

Road safety has become a major public health concern. Over 12,256 people died in road accidents in 2019 (Refer Table 1.1) Now days, many road accidents are occurring due to the alcohol consumption of the person who is driving the vehicle. Thus, drunken driving is most common reason of accidents in almost all countries all over the world. This system should be installed in the vehicle. Detecting drunk driving requires stopping vehicle manually, scanning drivers by using breath analyzer. The alcohol detection system works on simple principle- if driver has consumed alcohol, breath analyzer sensor will detect the level of alcohol in the driver's breath and if it crosses set threshold, an alert will be triggered and vehicle engine will stop.

Year	Road Accidents due to Intake of Alcohol	Total number of road accidents	% share of total road accidents
2015	16,298	5,01,423	3.3
2016	14,894	4,80,652	3.1
2017	14,071	4,64,910	3.0
2018	10,511	4,67,044	2.3
2019	12,256	4,49,002	2.8

Table 1.1 Overview of Accidents due to Alcohol Consumption

In our paper we discuss about the alcohol detection system for vehicle using alcohol sensor MQ3 and buzzer using Arduino. This paper presents the progress in using the alcohol detector, a device that senses a change in the alcoholic gas content of the surrounding air this device is more commonly referred to as a breath analysis, as its analysis the alcohol content from person's breath. The system detects the presence of alcohol in the vehicle and immediately locks the engine of the vehicle. Thus, the system prevents drunk driving accident automatically.

II. AIM, GOAL & OBJECTIVES

A. Aim

The aim of this project is to design an embedded system for implementing an efficient alcohol detection system that will be useful to avoid accidents.

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B. Goal

The overall goal is to develop a portable, reliable, sensitive, simple, and inexpensive alcohol detection system.

C. Objectives

1) To design a system to detect and alert for drunk and drive condition.
2) To reduce the cost of breath analyser and its tubes as well as to avoid spreading of diseases.

III. LITERATURE SURVEY

Sr. No.	Reference Number	Work Description	Problem Found
1	IEEE 2017 Ref No:[3]	Alcohol Detection System for Car Users thru Iris Recognition Pattern Using Wavelet Transform	Infrared light which is harmful when it has direct contact with the user 's eye
2	IEEE 2018 Ref No:[1]	Alcohol Detection with Engine locking System	Alarm indication should be there to indicate driver that vehicle engine will lock after 10 minutes.
3	IEEE 2019 Ref No:[7]	Alcohol Detection system PIC 16F877A Microcontroller	It is outdated system and expensive one.

In four of the studies, alcohol prevalence, tested in less than 50% of the study population, varied from 17.3% to 46%. Alcohol prevalence was consistently higher amongst drivers (33.3% - 69.2%) than in other road users, and over 95% of intoxicated drivers were male (95%-100%). There are multiple methods and test for measuring the BAC like Breath Alcohol Analyzer Method, Touch Based Method, Iris Recognition Based Alcohol Analysing Method. Previously, the whole process takes 10 to 15 minutes with the fuel cell-based instrument, and up to 5 minutes with the purely infrared based ones.
In the existing system, alcohol detectors are not proposed in any of the vehicles, hence there is a chance for anyone to drink and drive. Traffic police uses alcohol detectors to avoid drunk and drive.
MQ-2 Sensors: These sensors are used to detect the presence of gases in the air such as methane, butane, LPG and smoke but they are unable to distinguish between gases. It is not able to sense alcohol in air.
AT89S53: Low-power, high-performance CMOS 8-bit microcontroller with 8KB of ISP flash memory. The device uses Microchip high-density, non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. On-chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. This powerful microcontroller is suitable for many embedded control applications.

IV. HARDWARE'S USED

A. Arduino-UNO

Arduino is a microcontroller board in view of the Tmega328. It has 14 digital in-put/yield pins (of which 6 can be utilized as PWM yields), 6 simple sources of info, a 16 MHz quartz precious stone, a USB association, a power jack, an ICSP header and a reset catch. The Arduino board is the central unit of the system. All the components are interfaced to the board and programmed as per their functionality to operate in synchronization.



Fig.4.1. Arduino-uno

B. MQ-3 Sensor

It helps to perceive whether the driver has frenzied alcohol or not. It has unwavering and long life, high compassion and faster retort.

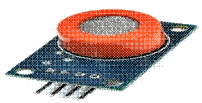


Fig.4.2.MQ3 Sensor

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C. GSM Module

It is used to send a SMS to the contacts of the user about the location of the vehicle. It is beneficial in emergency situations.

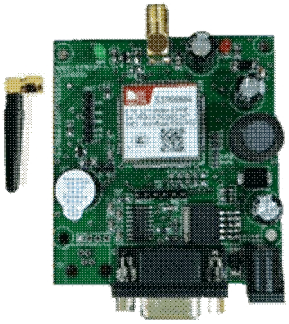


Fig.4.3.GSM Module

D. GPS Module

The Global Positioning System (GPS) is a satellite-based navigation system that provides location and time information. It is used to track the location of the user which is send via SMS through GSM module.



Fig.4.4.GPS Module

E. DC Motor

It is used as a dummy for indicating the engine locking facility whenever alcohol is detected.



Fig.4.5. DC Motor

F. LCD

If alcohol is detected it displays the message indicating “ALCOHOL DETECTED”.

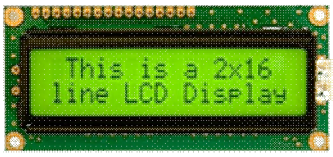


Fig.4.6.LCD Display

G. Buzzer

If alcohol is detected buzzer automatically gets turn on.



Fig.4.7 Buzzer

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V. ALGORITHMS & FLOWCHART

A. Algorithm

Step 1: Initialize the vehicle (DC Motor)

Step 2: DC Motor initiates to begin rotation.

Step 3: Detection of the alcohol level through the MQ3 Sensor.

Step 4: If the alcohol is above the predefined threshold, then analog inputs send to Arduino-uno which performs the conversion to digital outputs.

Step 4.1: If step 4 is true then it will go to step 5.

Step 4.2: If step 4 is false it will go to step 3.

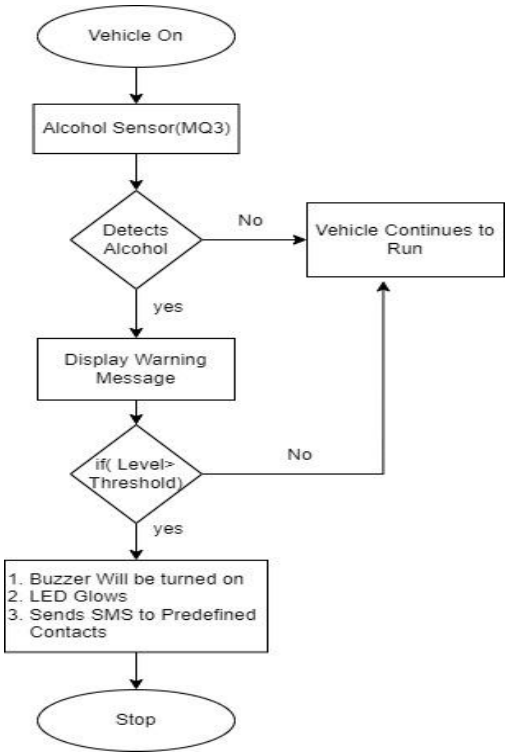
Step 5: The 'Alert' message as 'Alcohol Detected' is displayed on LCD, LED and Buzzer will be turned on.

Step 6: GSM & GPS Module will send 'Alert' message and location of the vehicle to predefined contacts.

Step 7: DC Motor terminates the rotation.

Step 8: Stop.

B. Flowchart



VI. EXPECTED OUTCOMES

The system should work smoothly with all its specified properties. The designed system would finish the function of communicating with the base station via GPS, GSM and control of various parameters.

The system is having some expected outcomes as follow:

1) The system should be able to detect accurate alcohol level content.

2) System should generate the SMS message on detection of alcohol.

3) System should display Warning Message on detection of alcohol.

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VII. CONCLUSION

An effective solution is provided to develop the intelligent system for vehicles which will monitor various parameters of vehicle in-between constant time period and will send this data to the base unit, by using hardware platform, whose core is Arduino, Alcohol sensor MQ3, GPS & GSM module. The designed system would finish the function of communicating with the base station via GPS, GSM and control of various parameters. The whole control system has the advantage of small volume and high reliability. This system brings innovation to the existing technology in the vehicles and also improves the safety features, hence proving to be an effective development in the vehicle industry.

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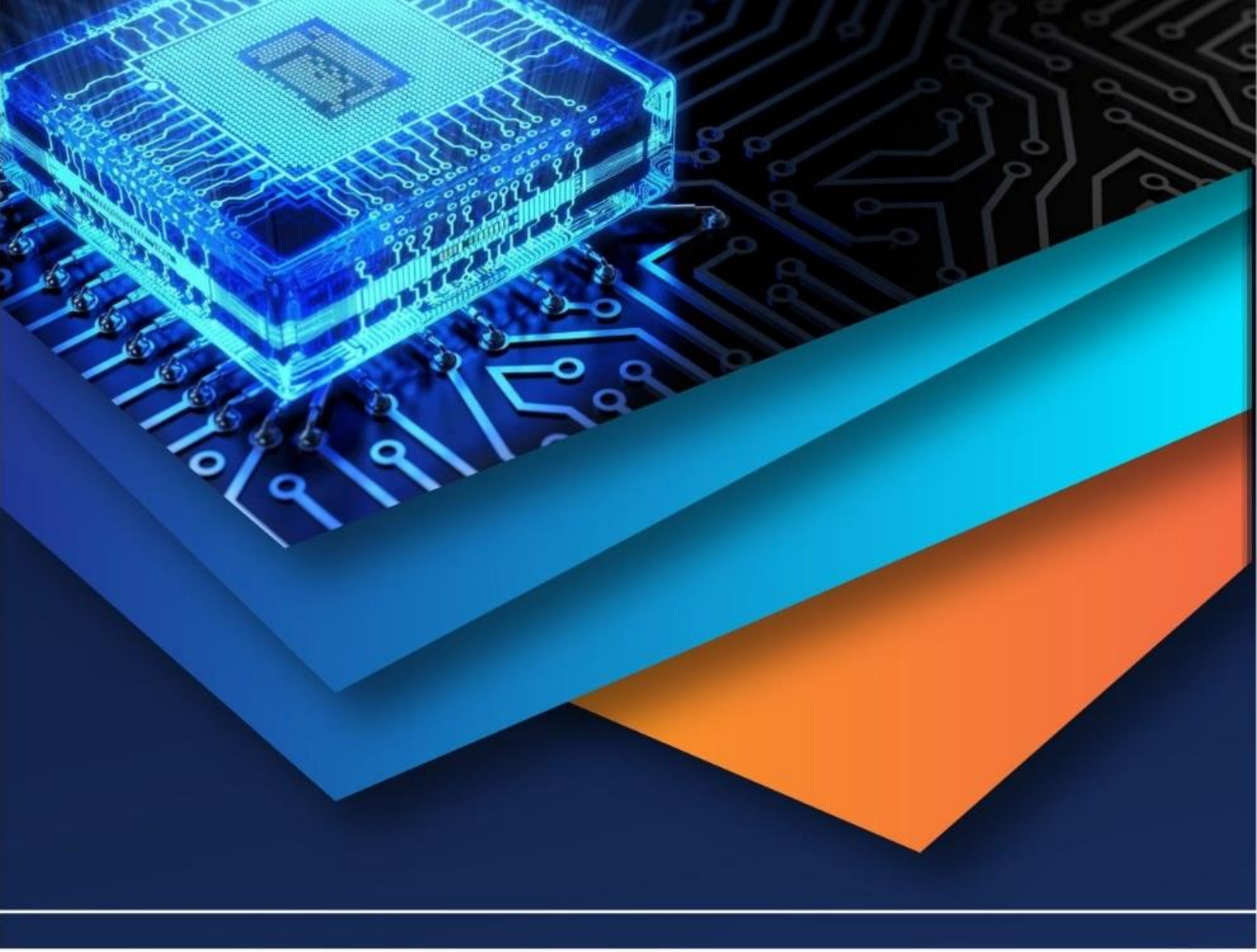
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