Retraction

Retraction: A study on the Efficacy of Alcohol Detection in the prevention of Drunken Driving (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012084)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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A study on the Efficacy of Alcohol Detection in the prevention of Drunken Driving

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Abstract. Accidents on roads due to drunken driving have become increasingly common. We have developed a device which can prevent the accidents that occur due to drunken driving by stalling the vehicle. We are using the (MQ-3) sensor which can detect alcoholic content from the driver's breath. The Arduino NANO board is very flexible and can be programmed to the MQ-3 sensor’s sensitivity requirements which in turn can actuate the relay to break the circuit which connects the starter motor and the battery, thereby stalling the vehicle. This circuit is quite compact and be integrated in all types of vehicles.

Keywords: Drunken driving, MQ-3 sensor, Arduino NANO, Breath detection, stalling the Vehicle.

1. Introduction

A huge number of accidents occur on roads all over the world among those a significant number are caused due to drunken driving. In India, the number of road accidents during the period 2015 – 2017 is shown in Table 1 among which about 3.0 to 3.3% were identified to be caused by drunken driving. The data on the number of deaths due to the accidents which are caused by drunken driving in certain European countries and in the United States of America are shown in the Table 2. These data clearly indicate the extent of the influence of intake of alcohol in the road accidents. There are many devices and concepts which are being developed and some of them are under development for reducing the road accidents which occur due to drunken driving such as embedded systems to detect drowsiness, intoxication of alcohol in drivers etc. [1]. The scientific and engineering community has put forth many possible solutions to reduce or eliminate the accidents due to drunken driving. This problem is approached in many ways and hence has a variety of alternative solutions, but many of which are not practically viable. One of the best possible solutions is to prevent a driver in a drunken state to start his vehicle by locking the engine of the car [2 – 5]. Some possible solutions such as alerting a driver in a drunken state to stop his vehicle is not reliable as it heavily depends on the extent to which the driver is intoxicated with alcohol [6]. Other kind of solutions available for this problem which may be effective is the comparison of the data collected by tracking of drunken driver’s driving style to the standard data “Naturalistic Driver Behaviour Dataset (NDBD)” collected from a normal driver’s driving style [7]. The main objective of the present work is to prevent the drunken driver to start the vehicle by using an alcohol sensor and a relay which could potentially save many lives. We discuss about the use of MQ-3 sensor and a 5 V single channel
relay to stop the drunken driver from starting the vehicle once the MQ-3 sensor detects alcohol from the exhaled breath of the drunken driver.

**Table 1.** Data on road accidents in India during 2015-2017.

| S. No | Year | Total number of road accidents | Road accidents due to intake of alcohol | Percentage share of total road accidents |
|-------|------|---------------------------------|----------------------------------------|----------------------------------------|
| 1.    | 2015 | 5,01,423                        | 16,298                                 | 3.3                                    |
| 2.    | 2016 | 4,80,652                        | 14,894                                 | 3.1                                    |
| 3.    | 2017 | 4,64,910                        | 14,071                                 | 3.0                                    |

**Table 2.** Roads deaths in some parts of Europe and US attributed to alcohol intake.

| S.No | Countries                  | Road deaths due to alcohol intake |
|------|----------------------------|----------------------------------|
| 1.   | Austria                    | 8%                               |
| 2.   | Belgium                    | 6%                               |
| 3.   | Czech Republic             | 13.5%                            |
| 4.   | Denmark                    | 25.1%                            |
| 5.   | Estonia                    | 30.0%                            |
| 6.   | Finland                    | 23.5%                            |
| 7.   | France                     | 30.8%                            |
| 8.   | Germany                    | 0%                               |
| 9.   | Hungary                    | 0.3%                             |
| 10.  | Latvia                     | 0.1%                             |
| 11.  | Lithuania                  | 0.7%                             |
| 12.  | Luxembourg                 | 34.4%                            |
| 13.  | Netherlands                | 3%                               |
| 14.  | Poland                     | 9%                               |
| 15.  | Republic of Cyprus         | 43.3%                            |
| 16.  | Romania                    | 0.2%                             |
| 17.  | Slovakia                   | 0%                               |
| 18.  | Slovenia                   | 35.5%                            |
| 19.  | Spain                      | 31.0%                            |
| 20.  | Sweden                     | 16.1%                            |
| 21.  | United Kingdom             | 13.5%                            |
| 22.  | United States of America   | 0.33%                            |

2. Problem Statement

Many people lose their lives due to the act of irresponsibility of the drivers who operate their vehicles in a drunken state. Such crashes not only cause fatalities but also cause damage to the common utilities in the site of crash. These crashes can be avoided by implementing sensor-based devices.
3. Proposed System

Our proposed system comprises of a MQ-3 sensor, Arduino NANO, 5 V single channel relay, and a Display. These components together can successfully detect the presence of alcohol and can also prevent the drunken driver from starting the vehicle.

4. Working Prototype

The basic layout of the circuit is shown in Figure 1 where all the components are graphically represented. The functioning of the system is pictorially represented in the Figure 2, where the actuation of the relay in the presence and absence of alcohol is clearly described. The fabricated prototype is a full-fledged working model of the “Drunken Driver Detection System”. The topview of the complete circuit and the components used in the fabrication process are shown in the Figure 3.

**Figure 1.** Basic layout of the hardware modules used in the designed drunken driving System

**Figure 2.** Schematic of the flowchart showing visual representation of the designed drunken driving system.

The MQ-3 gas sensor is used to detect the presence of alcohol and it has a detection range of (0.05...
mg/L – 10 mg/L), which makes it very sensitive to alcohol. The Arduino Nano board is used as the IC to mount the MQ-3 sensor, OLED display and relay. OLED display can show the presence of alcohol and the drunken state of the driver. The relay disconnects the ignition circuit whenever it detects dangerously high levels of alcohol.

![Figure 3](image_url)

**Figure 3.** Photograph of the fabricated drunken driver detection system (a) Top-view of the fabricated circuit, (b) MQ-3 gas sensor, (c) Arduino Nano IC, (d) OLED display and (e) 5 V single channel relay.

5. **Methodology**

People are under no form of supervision during driving, which could check the stability of the driver or whether the driver is in a drunken state or not. Which we firmly believe is the prime reason for accidents due to drunken driving. Whenever a driver enters his/her vehicle the alcohol sensor will produce an electrical signal if it detects alcohol in the driver’s breath, it will actuate the relay switch to get disconnected from the circuit. If it did not detect any alcohol in the driver’s breath the relay will stay connected to the circuit. If the relay establishes the connection with the circuit, the driver will be able to start the vehicle (or) if the relay did not establish a connection with the circuit, the driver will not be able to start the vehicle as shown in the flow chart (Figure 2). The detailed electronic circuitry designed in the present work is graphically depicted in the Figure 4, where the integration
of the (“Drunken Driver Detection System”) with the car’s ignition system is presented Table 3.

![Diagram of the sensor system](image)

**Figure 4.** Schematic diagram showing the designed and fabricated drunken driver detection system.

6. Results Outcome

The MQ-3 sensor has a good range of detection. Hence, if a drunken driver enters his/her vehicle, the device will analyse the presence of alcohol in the driver’s breath effectively. If alcohol is present in the driver’s breath the relay will be actuated and break the circuit and hence the car’s engine cannot undergo the ignition process (or) if the alcohol is not present in the driver’s breath the relay will not break the circuit so that the car’s engine can be started by the driver. Overall, it provides a very effective solution. The observed levels of alcohol intake and the corresponding state of the driver for a typical case study using the above system are shown in Table 3.

| S.No. | Analog Value of MQ-3 sensor | State of Drunkenness   |
|-------|-----------------------------|------------------------|
| 1.    | Value<200                   | Sober                  |
| 2.    | Value>=200 & Value<280      | Alcohol Detected       |
| 3.    | Value>=280 & Value<350      | Drunken State          |
| 4.    | Value>=350 & Value<450      | Unstable               |
| 5.    | Value>450                   | Very High Intake       |

7. Advantages of The System

The following are the main advantages of the designed and fabricated drunken driver detection system:
1. An efficient method to detect drunken drivers without manual screening
2. Fast and reliable method
3. Simple and elegant system easily adoptable by public
4. Low cost
5. Harmless detection
6. Can be equipped in a large scale with a nominal investment
7. Can be used as a “Breathalyzer”
8. Can be installed in “Alcohol Free Zones” such as public places, educational institutions, industries etc.
9. Handy and portable
10. Simple and easy to fabricate

8. Conclusion
As per our study we are sure that the system fabricated in the present work using the MQ-3 alcohol sensor would be an ideal and the most feasible solution that could be implemented to prevent the accidents which occur due to drunken driving. It is cost effective and is also reliable as recorded by our study. We hope that it would be increasingly adopted by the public in the near future to prevent the fatalities and the damage caused by the accidents which occur due to drunken driving. We could observe that such safety measures have gained a positive response from the public for the past few years. It is undeniable that this concept could improve the road safety by multiple folds all over the world by eliminating the accidents which occur due to drunken driving.

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