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Alcohol Detection in Real-Time To Prevent Drunken Driving

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Abstract: *The number of accidents in the world is increasing day by day and among these accidents, more than 60% are caused due to menace of driving under the influence of "unreasonable" alcohol consumption. Therefore, since the death due to drunken-driving has assumed proportion larger than one can imagine, it requires immediate attention. This paper attempts to explore the possibility of using the technology that would detect the level of alcohol in the blood and prevent "very-start" of the motor vehicle. The model device aims at preventing the user from driving when drunk and reduces the number of accidents occurring due to drunken driving. The model is created using Arduino Uno and Alcohol detecting sensor. The alcohol detecting sensor (MQ-3) when connected to an Arduino UNO R3 detects the level of alcohol content in blood by analysing driver's breath.*
The MQ-3 alcohol sensor isembedded (placed) atthe middle of the steering wheel (Internet of things) so that whenever the driver exhales the sensor measures the alcohol level, analyses whether it is within the "safe" limit or not,before allowing the ignition of the "motor-engine". The "stipulated" legal limit of alcohol level in India is 0.03%, which means 30 microliters of alcohol in 100 milliliters of blood. Needless, to say as and when the excess-alcohol content gets detected it sets up alarm or buzzer. The placing of the alcohol-sensor at the centre of the steering wheel ensures that the detection of alcohol-content is limited to the driver's seat and does not take into the account the alcohol content in the blood of the fellow-passengers. The paper attempts to produce the design and operation of the "model-device"that when produced commercially can help save precious life lost to reckless driving under the influence of alcohol.
Keywords: *Automobile, Embedded, Drunk and drive, IOT.*

I. Introduction

Driving a vehicle requires complete concentration, reflexive action and quick decision-making abilities for the drivers to avoid any untoward incidences. The consumption of alcohol beyond safety limits can obstruct functioning of the brain and impact "presence-of-mind" capability of the driver resulting in accidents that can prove fatal not only for the driver but also for the fellow-passenger. In turn, it can result in endless trauma to the members of the family back-home.

The technology-enabled device if fitted in the car will test the multiple-conditions that will trigger the alarm indicating that the current state of mind of the driver is not apt to behind the wheels.

1.1 The Alarming Statistics

- In 2015 - 10265 people died in alcohol-impaired driving crashes, accounting for nearly one-third (29%) of all traffic-related deaths in the United States.
- Of the 11132 traffic deaths among children ages 0 to 14 years in 2015, 209 (16%) involved an alcohol-impaired driver.
- In 2015 -nearly 1.1 million drivers were arrested for driving under the influence of alcohol or narcotics. That's one percent of the 111 million self-reported episodes of alcohol-impaired driving among U.S. adults each year.

This clearly indicates that "reckless" drunken- driving is the major cause of accidents even in the developed nations such as USA, the situation is equally alarming elsewhere too. These accidents not only impacts the life of drivers, fellow-passengers, family-members back home but also has the adverse effect on environment and society. The society is full of example of those accident-survivors who lead a traumatised life thereafter. The fear-psychosis completely grips them.

As stated earlier, the alcohol in the blood seizes the working of human brain to such an extent that it can result in lack of concentration, drowsiness and can make the drivers go overboard, increase the speed, skip the lane, jump the signal and hit the stationary object damaging the vehicle to unimaginable. At times morning

joggers, elderly citizens on their morning walk, school children fall prey to these accidents for no fault of there. It's just that they are at wrong place at the wrong time.

The manual detection device that cops use, do analyse the breath and detect the alcohol consumption and penalise the defaulting drivers but then it becomes increasingly impossible for the traffic-cops to control, measure and monitor the vehicle movement given the size of modern-day traffic. It therefore becomes imperative for government-authorities to take advantage of the growing-technology to prevent such accidents and possibly prevent drunken-driving.

II. Proposed System and Working

As with any technology-based embedded system, this model too requires specific hardware and application that make the device operational. Table 1, enlists the hardware and software requirenment for the model

Table 1: The IT infrastructure requirement

Hardware Requirements	MQ3 Alcohol sensor Arduino UNO R3 Motor Shield Bluetooth module (HC-05) DC motor LED and Buzzer Breadboard Jumper cables
Software Requirements	Arduino IDE Turbo C

- **MQ3 Alcohol Sensor**

MQ3 has always been used as a breath analyzer by cops to detect the alcohol content in the blood of drivers. The alcohol detection gas sensor used here too is MQ3 which is suitable for detecting if a person has consumed alcohol or not .As and when it detects the presence of alcohol in air, the sensor conductivity increases, generating the output for MQ3. Its sensitivity towards benzene, gasoline, smoke and vapour is less while that toward the alcohol is very high. The adjustment of sensitivity can be done with the help of potentiometer in MQ3 (SnO2) which shows lower conductivity in clean air. The range of this gas sensor is up to 2 meters and the sensor can be used for detecting alcohol with different concentration levels. It is also a low-cost material, has a long life, and require minimal or no maintenance. Figure 1 shows the image of the sensor mounted on PCB (printed circuit board)

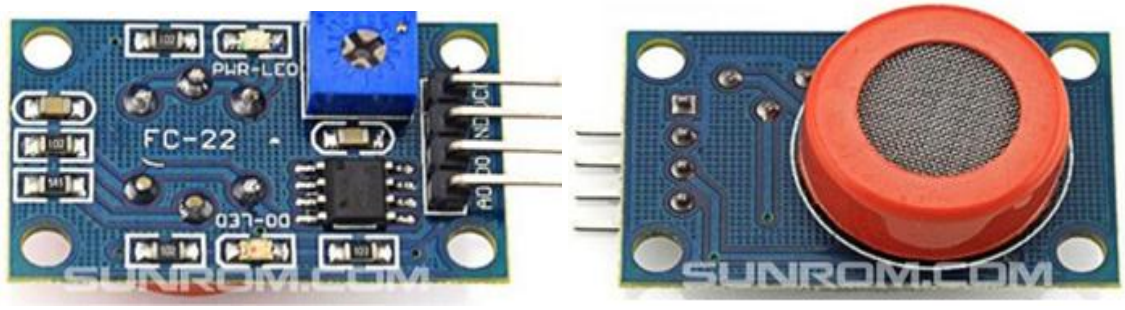

Figure 1:MQ3 sensor mounted on PCB(Source: http://www.sunrom.com/p/alcohol-sensor-module-mq3)

The Features

1. Size : 20x20 mm
2. Requires 5 volt of power supply
3. Pin specification: 1-Output, 2-Gnd, 3-VCC
4. Analog Interference
5. High sensitivity to alcohol
6. Faster response time
7. Highly stable, long life and low in cost

- **Arduino Uno R3**

The Main Unit of model-device is Arduino Board. The microcontroller on Arduino Uno is based on atmega328. It can be reprogramed as per needs for using in electromechanical devices. In Arduino board, there are 14 digital I/O pins (inputs/output pins), and it has 6 analog inputs as shown in figure 2.

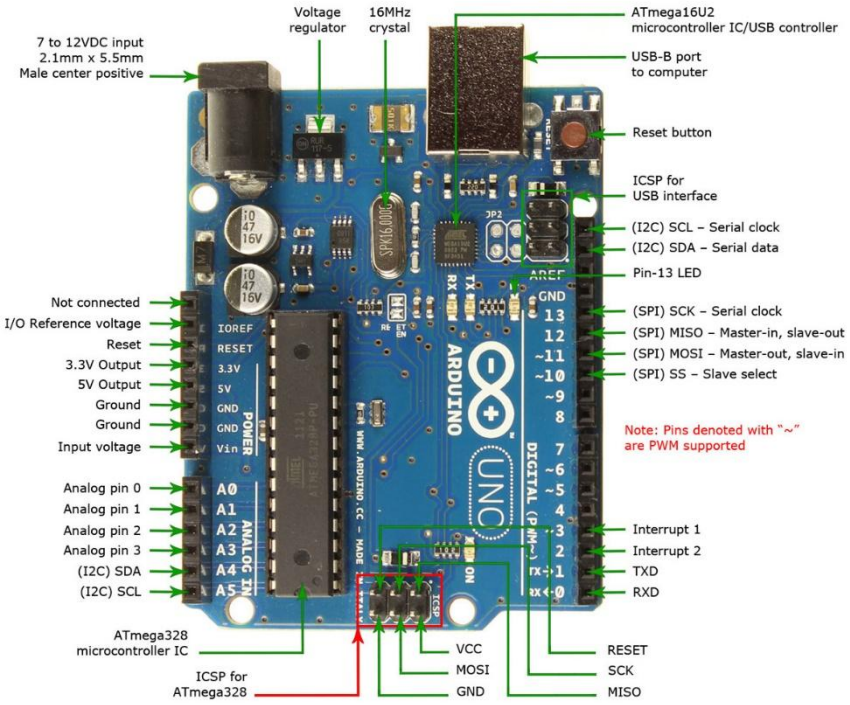

Figure 2: Arduino Uno R3 – Pin Diagram (Source: http://roboticsnepal.com/arduino-uno-r3.html)

The Features

1. The Microcontroller in Arduino is atmega328
2. Requires Voltage 5V for operating
3. The Input Voltage is between 7V and 12V
4. There are 14 Digital I/O Pins
5. There are 6 Analog Input Pins
6. The amount of DC current per I/O pin is 40 mA
7. The amount of DC current for 3.3V pin is 50 mA
8. It has a Flash Memory 32 KB (atmega328)
9. It provides SRAM of 2 KB (atmega328)
10. It has EEPROM of 1 KB (atmega328)
11. The clock Speed is 16 MHz

2.1 The Operational Flow

As soon as the driver enters the key to ignite the engine the MQ3 sensor gets activated and detect the alcohol level through exhale, and if it is measured to be beyond the excessive limit, the vehicle does not start. In case, if the driver is intoxicated before but starts consuming the alcohol while on move, the sensor keeps measuring and moment the level crosses the limit, the vehicle starts slowing down and gets stationed at the detected location. The figure 3, demonstrates the operation of the device.

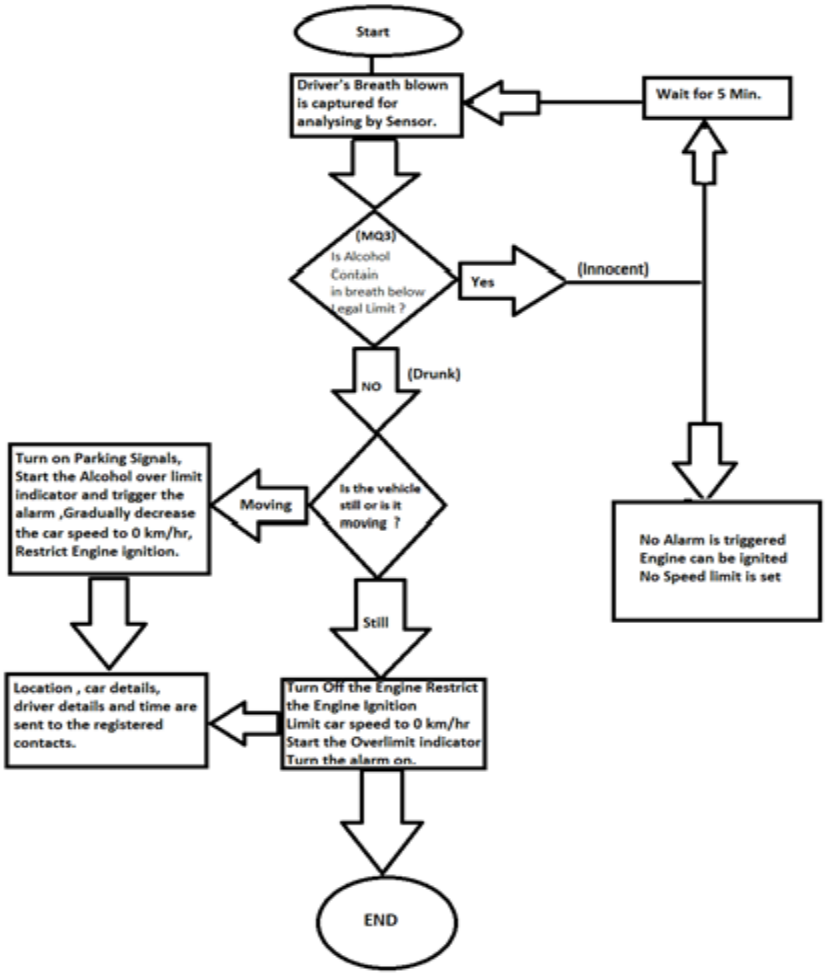

Figure 3: The Operational Flow-chart

Since, the MQ-3 alcohol sensor is expected to detect alcohol level of the driver alone and not that of the fellow passengers in the motor-vehicle, it is important to embed the device at that position that is at the top of the steering wheel (see figure 4). This will ensure that the device work efficiently and effectively. The remaining sensors and modules such as the GSM (Global System Module for mobile) and GPS (Global Positioning System) module can be placed anywhere inside the motor-vehicle as per the convenience and design compulsion by manufacturers.

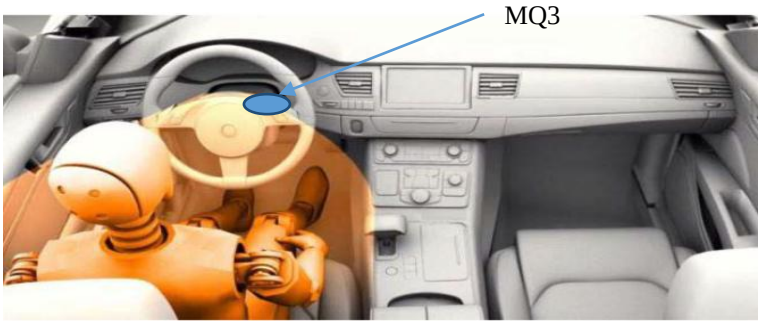

Figure 4: Location of sensor (Source: https://techxplore.com/news/2015-06-car-driver-blood-alcohol.html)

III. Operational Cases

Some of the operational scenarios are listed below:

1. *Driver is drunk before entering the vehicle*
2. *Driver consumes alcohol after the vehicle ignition or while driving*
3. *Passengers are consuming alcohol while vehicle is moving*

In the first case, the driver may have attended a party or otherwise, has consumed alcohol above the legal limit and then entered the car. In this situation, the system is designed in a way such that whenever the driver starts or tries to ignite the engine of the motor-vehicle, the MQ-3 alcohol sensor getsactivated, the sensor starts sensing for alcohol and does its assigned job. The MQ-3 sensor detects alcohol as the driver starts exhaling; it works on the basis of sensing the level of alcohol consumed from his breath when he exhales.

The second possible case could be if the driver is stressed out or wants to relax while driving and starts consuming alcohol (though not a best way to relax) while on move. The system is designed such a way that it will continue to operate during the entire course of driving and will keep checking the alcohol content on a continual basis. The moment detected level goes beyond the stipulated legal-limits it triggers the desired action.
The third case occurs when the driver is not drunk and the passengers in the vehicle start consuming alcohol while on move. in that case it will not detect since the system is embedded on the steering wheel and has a limited range of two-meters. Not only the positioning of the device matter but also the behaviour of the fellow-passenger (consuming alcohol) as he/she has to ensure that they don't enter into the defined range that triggers the activation of the sensor.

IV. Advantages

- Safe driving: There are many accidents in which the driver often loses his precious life under the influence of alcohol.
- Prevents traffic chaos: A person under the influence of alcohol doesn't have control over his actions as it impacts synchronised coordination of brain and body, as a result, he/she violates the traffic rules which can prove to be fatal. The proposed system takes action based on the alcohol content.
- Compact size: Only the MQ-3 alcohol sensor has to be placed on the steering wheel and the rest of the components are hidden. The MQ3 sensor doesn't occupy more than 3 inches space.
- Reduced number of accidents: The main focus of this system is to reduce the number of accidents due to alcohol consumption during driving. The embedded GPS alerts the registered mobile number so that action can get initiated and the victim get immediate medical attention (often the reason cited for fatality is delayed medical care)
- Apt complementing device for cops: Every vehicle cannot be checked by the cops manually. This device can automate the process (alerts can be made to reach the local police station), thus freeing the cops to task more important tasks such as investigation of robbery, murder and other crimes in the society.

V. Limitations

Every system is subject to certain limitations and inherent errors, the MQ3 based system for detecting alcohol content in blood too is subject to failure and system crash –

- If the driver wears a mask on or covers his mouth, the amount of breath exhaled by the will not be enough for the sensor to trigger the action.
- If the driver covers the sensor module by something like a handkerchief or a piece of cloth it will not function as desired as the input to the sensor gets blocked and enables the start of the vehicle.
- If the windows of the vehicle are open, then too the sensor will not be able to detect whether the driver is drunk or not and if drunk whether the level is above the legal limit or not. Also, the open windows cause noise (disturbances) to the sensor resulting in the insufficient functioning (error in the reading) of the sensor.
- If the vents of the sensor get blocked due to some dust/dirt or other materials, this will too result in the system not being able to perform efficiently

VI. Conclusions:

Drunken driving prevention system proposed here is anIoTapplication which will prevent drunk and drive cases to larger extent as well as protect the "innocent" pedestrians from getting harmed due to this unwarranted menace on roads. The proposed design ideated in this paper has many limitations and can further be improved by usage of more and more newer versions of technology based applications. This model has the potential to become more successful as safety provider system. This system can be used by the automobile manufacturers and integrate it in the manufacturing design process ofvehicles. It should be made compulsory by the regulatory authorities or government to make this system integrated into every possible automobile. As this system can be implemented only if the windows of the car are shut and air currents would disturb the detection level of the MQ-3 alcohol sensor. This situation can be considered as a future scope for upgraded sensor technology. In case of motorbikes or heavy vehicles there are no window closing options, in such a case the proposed system needs a few changes for its effective working. The system illustrated in this paper is tested in

many scenarios and results were found to be effective in order to reduce the number of accidents gradually. By implementing this proposed system we can have a much safer world free of drunk and drive accidental cases.

References

[1]. Barua;Pranshu Jain; Gupta; & Gadre. 2013. *Road Accident Prevention Unit (R.A.P.U)*. Texas Instruments India Educators' Conference.

[2]. Bhuta; Desai; &Keni. 2015. *Alcohol Detection and Vehicle Controlling.* International Journal of Engineering Trends and Applications (IJETA). Vol. 2 Issue 2.

[3]. Impaired Driving: Get the Facts.Page last updated: June 16, 2017. Available at *https://www.cdc.gov/motorvehiclesafety/impaired_driving/impaired-drv_factsheet.html [accessed 15 July 2017]*

[4]. Phalak; Kowekar; & Joshi. 2015. *Smartphone and Sensor Based Drunk Driving Prevention System*. International Journal For Research In Emerging Science And Technology, Vol.2, Issue 9.

[5]. Pranjali Ingale Patil; Priyanka Barhate; Bhagyashri Nemade; &Vijay D. Chaudhari. 2017. *Alcohol Detection System in Vehicle Using Arduino*. International Research Journal of Engineering and Technology (IRJET). Vol. 04 Issue: 06. Available at https://www.irjet.net/archives/V4/i6/IRJET-V4I651.pdf[accessed 15 July 2017]

[6]. Prashanth K P; Kishen Padiyar; Naveen Kumar P H; & K Santhosh Kumar. 2014. *Road Accident Avoiding System using Drunken Sensing Technique*. International Journal of Engineering Research & Technology (IJERT). Vol. 3. Issue 10. Available at Road accident avoiding system using drunken sensing technique.http://www.ijert.org/download/11491/road-accident-avoiding-system-using-drunken-sensing-technique*[accessed 15 July 2017]*

[7]. Ramanath; Sudharsan&Udhayara. 2010. *Drunken Driving and Rash Driving Prevention System.* International Conference on Mechanical and Electrical Technology-ICMET

[8]. Sivakumar; & R.Krishnaraj. 2012. *Road Traffic Accidents (RTAS) Due To Drunken Driving In IndiachallengesIn Prevention*. International Journal of Research in Management & Technology (IJRMT), Vol. 2, No. 4.

[9]. T.Venkat; NarayanaRao; &Karttik Reddy Yellu. 2017. *Preventing Drunken Driving Accidents using IoT*". Available at www.ijcset.net.| Vol. 8. No. 3.

[10]. Vaishnavi;Umadev; &Vinothini. 2014.*Intelligent Alcohol Detection System For Car*. International Journal of Scientific & Engineering Research, Vol. 5, Issue 11.

[11]. Vijay; Saritha; Priyadharshini; Deepeka; &Laxmi. 2011. *Drunken Drive Protection System*. International Journal of Scientific & Engineering Research. Vol. 2, Issue 12.

[12]. What is Arduino? 2017. Available at http://www.arduino.cc/*[accessed 15 July 2017]*