MICROCONTROLLER BASED AUTOMATIC ENGINE LOCKING SYSTEM FOR DRUNK DRIVES

[1]Mr. A. Anbarasan,

[2]Mr. Achal Zachariah, [3]Ms. C. Sophiya, [4]Mr. M. Viswa.

[1]Associate Professor, [2,3,4] Student,

[1,2,3,4,] Department of Mechanical Engineering,

[1,2,3,4] Loyola Institute of Technology, Chennai, India.

Abstract: This Study proposed us to develop a prototype that demonstrates the working of automatic engine locking system for drunken drives using an Alcohol Sensor. We use the specific MQ_3 Alcohol Sensor that senses the Blood Alcohol Content (BAC) from the driver's breath where it is placed on the Steering Wheel. By placing the sensor on the steering wheel, our system has the capacity to continuously check alcohol level from the driver's breath. The input for the system is from Detection Sensors from Alcohol Breath of the driver. The controller keeps looking for the output from these sensors. If there are any traces of Alcohol above the set limit, then the 2/2 Way Solenoid Valve system will be used to cut the fuel flow from the Fuel Tank to Engine of the vehicle. In case the driver got drunk while driving, the sensor will still detect alcohol in his breath and stop the engine. This makes the Vehicle from engaging onwards for a little while and comes to rest from motion, so that the car would not accelerate any further and the driver can park by the roadside. Through this the vehicle comes to rest, thus prevents the Accidents from occurring. The indication of the Alcohol being detected will be indicated through the buzzing of the Alarm and a Display stating that Alcohol Detected is displayed else it shows Alcohol Not Detected in the LCD screen display.

Keywords: MQ_3 Alcohol Sensor, Microcontroller, 2/2 Way Solenoid Valve, Arduino Uno ATmega328, Blood Alcohol Content (BAC).

I. INTRODUCTION

Most of these days, we hear a lot of accidents that happens all over the world. In the accidents mentioned Alcohol consumed accidents are raising as days passes by. The National crime records bureau's report on accidental deaths in India 2015 suggests that about 1.5 percent of total 4.64 lakh road accidents were caused by drunken drivers or influence of drug or alcohol resulting injuries to 6,295 people. According to the report, among 3000 deaths more than 8 deaths every day accounting for just over 2 percent of all fatalities in road accidents. The report of Road Accidents in India 2015 puts the number of accidents caused by drivers under the influence of alcohol as the fatalities, much 3.3 percent of road accidents and 4.6 percent of fatalities from road accidents [3]. At Tamil Nadu the drunken drivers who got their license suspended in the year from Jan to Dec of 2017 is 30,393. From Jan to Dec of 2018 is 45,113. In Jan 2019 alone is 2,046[4]. This shows that the drunken driving is cumulative as years passes by and the measures taken were seem to be having no effect in the reduction of the drunken drivers.

Reference [5] indicates the global burden of road traffic injuries is excessive in countries that can least afford to meet the health services, economic, and social challenges that are faced by them. The life led by the low-income and the middle-income countries under these circumstances is precarious in the view of limited resources which was classified as per the World Bank website. These project the highlights of the basic needs and priority of road-traffic affecting the low-income and middle-income countries to take preventive measures to safe guard the life and to provide better road for travelling and reduce the rate of road-traffics that cumulate and to stop them from being the victim's hereafter. Reference [6] states that majorly three groups are affected mainly in the road accidents, about 70% of fatalities are pedestrians, next is the passengers commuting on buses, minibuses, trucks., and the last is the cyclists. Even much more protection is needed based on the local evidence and research by the road safety management in the developing countries. Reference [7] accounts the major risks-based factors in the road safety precautions where the children and adolescence are too affected. The WHO accounts state nearly 5-35% of the cases registered are ones due to the drunk driving and raise the risk of crashing into pedestrians and self-injury through insolent behavior of reckless driving. And 43 countries representing 2.3 billion people are now currently have the best practice of enforcing the drinking laws. Reference [8] shows the comparison of the road fatality rate which is six times greater than that of the United States which has 1.6 of 100,000 vehicles where in India its 14. The world federation of road safety has estimated that the western countries are likely to reduce the road fatalities to less than two percent in two years where as in India its rising rapidly this shows the emergency response facility of our country with others is too low and their effort to reduce to eliminate the road accidents. The police's lackadaisical attitude along with the corrupted politics towards enforcing laws has an extraordinarily high contribution and will reduce the rising of road accidents where by effective policing can bring Indian people to reduce the number of dying on its roads. Reference [9] under the supervision of the state government the polices have done an investigation on the causes of the road accidents. It is found that nearly 90 black spots were identified in the state highways and national highways after the incident of a lorry container crashed with the Kerala State Transport Corporation (KSRTC) bus in Tirupur. Black spot analysis was done under the supervision the officials commanded by the Supreme Court Committee on Road Safety. Major of the black spots are still under the maintenance as of said its 43 and still proceeding to eliminate the black spots to reduce the accidental rates.Reference [10] accounts that with reference to the WHO and National Crime Records Bureau (NCRB), every hour 40 people die in road accidents under the age of 25. And is the second most Cause of death for the age group of 5 to 30. The peak hours are the most dangerous hours to be on the roads, the two-wheeler and trucks shares the responsibilities of 40% of death during this time. Among the list drunken driving is placed on the 5th place where Rash Diving,

crossing speed Limit, jumping signals & Avoiding Seat belt comes before them. The peoples who are affected externally while crossing roads or being in the platform when a drunken driver rash the vehicle are more than the ones inside the vehicle. Refence [11] shows the detailed explanations of the drunken driving what comes before and what happens after and who all are facing the consequences in the after effects of an accident. The detailed explanation of how injuries and important it is to not drunken drive the vehicle causing a ruckus and injury to self and others near to you. Reference [12] states the law and effect of it, The MV Act, 1939, has a clause which states that "Driving by a drunken person shall be punishable at the first offence with imprisonment for a term which may extend to six months or with a fine which may extend to two thousand rupees or both; and for a second offence, if committed within three years of the previous similar offence, imprisonment for a term which may extend to three thousand rupees, or with both. By this law the driver was allowed to take an amount up to 30 mg per 100 ml of blood. A drunken driver is in a state where he takes risks and for entertainment goes and does that's beyond what should be done and becomes everything wrong and endanger others who's with him.

Reference [13] accounts the 30th road safety week campaign from 4th to 10th February 2019 for the theme "Sadak Suraksha – Jeevan Raksha". Addressed the meeting mentioning the severer state of our country by **Shri Nitin Gadkari, Union Minister for Road Transport & Highways -** Approx. 1.5 lakh people die in nearly 5 lakh road accidents every year in India. Around 48% of these fatalities happen to be in the age bracket between 18 and 35years. Refence [14] shows that The National Road Safety and Traffic Management Board Bill 2010 was introduced on May 4th by the Minister of Road Transport and Highways, Shri Kamal Nath. The Bill stated the development and regulation of road safety, traffic management system and safety standards in highway design and construction. The road maintenance is also taken care of, and provide special requirement of women, children and senior citizen. Reference [15] tells that the injury pattern among road traffic accidents from South India by having the details collected from the hospitals. Further analyzing and tabulating the details are described how the injuries are categorized based on the injury taken by the patient and resulting how many will be injured and how many will lead to death. The average age calculated to those who are injured is to be 31 to 35 years and highest among them is the age group of 20 to 29 years. Among them limbs and face are said to be the common external injuries and head is the commonest internal injury. The commonest fracture is predicted to be in the lower limbs by 43.5% of injuries. Reference [16] shows that fatigue driving is also a major cause to the road accidents. Certain accounts states that there are cases that has both factors as a cause such as a drunkard while driving knowledges fatigues and is a most critical kind of accidental state. This report states the factors that leads to the most of the fatigue and the drunkenness and measures to reduce the accidents occurrences. Reference [17] shows the detailed description of the driver who's consuming the legal and illegal substances later which leads to the cause of an accident. The legal substances include the legalized alcohol consumption and the illegal substances include the drugs such as cocaine, synthetic drugs, etc... These are some of the accounts which after referring then lead us to promote a prototype to fabrication in order to minimize the road accidents which is the major consistent in Tamil Nadu where the alcohol is available in every state and to all age people nowadays. The restriction is needed to be enforced by the officials.

II. SYSTEM ARCHITECTURE

In this method the Microcontroller Unit (MCU) is the heart of the system which operates the whole setup and does the operation as intended. The Alcohol Sensor is used to detect the alcohol which is emitted from the breath of the driver. When the engine is started, the sensor starts and will continuously sense for the alcohol emitted and will project the percentage of alcohol projected in the Liquid crystal Display (LCD). As the limit is crossed for the alcohol sensor fixed then the connection is sent to the Arduino board and it sends the signal to cut the flow of the fuel from the solenoid valve connected in the tube from the fuel tank to the engine pump where displaying alcohol detected in the LCD display and rings the buzzer. In doing so, it alerts the driver that the fuel is stopped from going to the engine and which makes the vehicle to come to rest. Through the continuous sensing of the sensor the as when the percentage of the alcohol present is reduced from the limit set value the Arduino board sends the signal to the solenoid valve and releases the fuel, stops the buzzer from ringing and thus the engine can be started. After the fuel being released the LCD display projects the status at which the engine is whether the solenoid value is cut off where it displays "ALCOHOL DETECTED" and when released it displays as "ALCOHOL NOT DETECTED" or shows the percentage at which the alcohol is detected and releasees the value as it goes below the set limit.

III. REQUIRED COMPONENTS

The method is implemented on the assembled by the combination of the Electrical equipment's which are to detect the Alcohol Content by using the sensor and other components which are used to form a circuit are briefly explained. The Details of which why they are used and from where they have been referenced from to use are also mentioned below:

i. Microcontroller Unit (Arduino Board ATmega328):

The Arduino board which is used here is the cheapest and most available one in the market. The chips also are being replaced if anyone in the board becomes injury. It is a single task focused based controller [2]. The Microcontroller is a single task operating system, whereas the Microprocessor is a multitasking programmer which is widely used in the computers, laptops mobile phones etc.

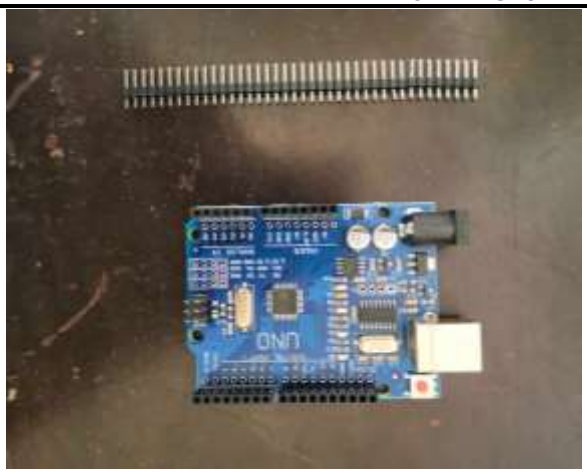

Fig. 1. Overview of Arduino UNO ATmega328

ii. Alcohol Sensor Unit:

An Alcohol Sensor is used in this setup which is fitted inside the car on the steering wheel facing towards the driver. Alcohol sensor (MQ3) is suitable for detecting alcohol content present from the breath of the driver, which also works in the same concept of breath analyzer where the Blood Alcohol Content (BAC) is sensed. It is made up of Tin Dioxide (SnO_2) as gas sensitive material layer to sense alcohol content [1].

Fig. 2. Overview of MQ-3 Alcohol Sensor

iii. Liquid Crystal Display (LCD):

The LCD display is fixed inside the car somewhere it's visible to the passengers and driver. It displays "ALCOHOL DETECTED" else "ALCOHOL NOT DETECTED" when the alcohol is sensed by the sensor. This display gives indication that alcohol is been detected or not. The display is used to guide the driver if the buzzer rings and to refer the display to confirm the presence of alcohol being detected in the car, where it shows as notification to the other passengers who are aboard that car and to take actions immediately [2].

Fig. 3. Overview of LCD

iv. Relay*:*

Relay is used to send the signal to the board and cut off the fuel by passing low power signal to solenoid valve. That means when alcohol is detected, the power signal is alerted. The main purpose is that the relay works as a time controller to cut off and pass the fuel as embedded in the coding to stop the vehicle when an alcohol presence is detected by the sensor. The Relay works efficiently and is also plays a main role to in controlling the flow of the fuel to the engine [2].

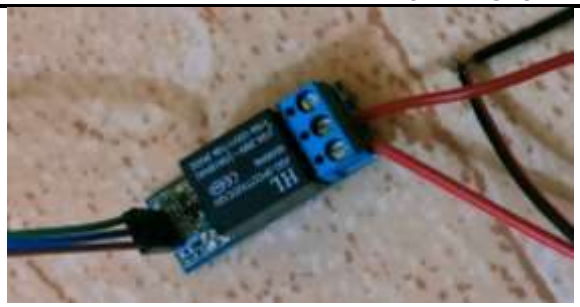

Fig. 4. Overview of Relay

v. Buzzer:

Buzzer is used to Alert the driver and the passengers in the car that the alcohol is been detected inside the car. It also is used to notify if the alcohol content is below the set limit which is set by encoding it to the circuit board through Arduino software since the board used is Arduino UNO board. By this the awareness is created and the people inside the vehicle both the driver and the passenger can bring the vehicle to halt and be safe [2].

Fig. 5. Overview of Buzzer

vi. Solenoid Valve**:**

The Solenoid Valve is one of the main components used in the setup to control the fuel of the vehicle. Once when the Alcohol sensor senses the signal is transmitted to the Arduino board and then to the relay valve which triggers the solenoid valve and stops the fuel supply to the engine which makes the vehicle to a halt.

Fig. 6. Overview of Solenoid Value

IV. RESULT

The Result of the experiment has shown that the fuel cut-off by the solenoid value has bought the vehicle to a halt / rest which is at certain distance away from the place that alcohol has been detected. The Solenoid Value has successfully stopped the flow of the fuel to the engine just when the sensor detects the alcohol presence in the vehicle. As the vehicle is not supplied with the fuel, the vehicle comes to the rest either by slowing down from the speed in which it was travelling or by stopping the vehicle when it was started. In doing so the vehicle will not be in a way for others and won't be a cause of any other accidents. Even by travelling the vehicle moves at a speed in which it is previously accelerated with and so the movement in which it comes to the rest is enough to make the vehicle to move to side if it's in the middle of the road or in a highway.

V. CONCLUSION

In this paper, our system works efficiently also prevents the accident from occurring and drunken driving of the vehicle. The system is designed and constructed using the Arduino Uno ATMEGAA328 Microcontroller, alcohol sensor, buzzer, LCD display, relay and solenoid valve. This Experimental valuation shows the sensor delivers a faster response when alcohol is detected. By implementing this system in vehicle, a safe journey is expected away from injuries, accidents and deaths. Further modification can be done in order to implement various safety measures.

Some of the modifications that can be done to a vehicle in order to prevent accidents are:

- ✓ Can make both the indicators to blink faster to alert the vehicles in rear and front.
- ✓ To set a braking system to bring the car to reduce the speed of its course and to a halt or to move on in a reduced speed to avoid collisions in a Highway.
- ✓ To send a notification to the boss / relatives of the driver / nearby Police Station and Hospital with the location of the car and an alert that alcohol is consumed.
- ✓ Ring the siren of the vehicle in simultaneous to alert thee vehicles nearby.

Various uses of the Alcohol Sensor that can be implemented in the day today life is:

- ✓ Can be used in the restricted areas to avoid any kinds of danger through the leakage of chemicals or consume of alcohol by workers.
- ✓ Leakage of flammable gases can be sensed.

VI. REFERENCE

[1] Alcohol Journal Automatic Engine Locking System Alcohol Detection for Drunk & Drive with GSM. National Conference on Advances in Engineering and Applied Science (NCAEAS) [Last Cited on 29th January 2018]. [Google Scholar]

[2] Alcohol detection of drunken drives with automatic car engine locking system Alcohol Detection of Drunk Drivers with Automatic Car Engine Locking System. Accepted: 2017.09.25 [Google Scholar]

[3] Aesha Datta "Drunk driving is a bigger problem than statistics show" The Hindu Business line, New Delhi. [Last cited on April 04, 2017]; Available from https://www.thehindubusinessline.com/economy/policy/drunk-driving-is-a-bigger-problem-than-statistics-show/article9616180.ece [Google Scholar]

[4] Government Of Tamil Nadu Home (Transport) Department Road Accident Analysis in Tamil Nadu 2019. [Last cited on Jan 18, 2019]. Available from https://tnsta.gov.in/pdf/analysis_jan2019.pdf [Google Scholar]

[5] Ameratunga S, Hijar M, Norton R. Road-traffic injuries: Confronting disparities to address a lobal-health problem. [Last cited on 2011 June 27];Lancet. 2006 367:1533–40. Available from, http://www.thelancet.com/journals/lancet/article/PIIS0140-6736 (06)68654-6/fulltext . [PubMed] [Google Scholar]

[6] Nantulya VM, Reich MR. The neglected epidemic: Road traffic injuries in developing countries. [Last cited 2011 June 27];BMJ. 2002 324:1139–41. Available from: www.bmj.com/content/324/7346/1139.full. [PMC free article] [PubMed] [Google Scholar]

[7] Global Statut Rreport On Road Safety. World Health Organization. [Last cited 2012 April 16]. Available from: https://www.who.int/violence_injury_prevention/road_safety_status/2018/GSRRS2018_Summary_EN.pdf . [Google Scholar]

[8] Accidental Injurys. Times of India. Chennai Edition Oct 23. 2008. [Last cited on 2011 Sept 19]. Available from, http://www.timesofindia.indiatimes.com//home/opinion/edit-page/Accidental-Injury/articleshow/3630126.cms . [Google Scholar]

[9] Tamil Nadu has seen dip in number of road accidents since 2016: Transport Authority. [Last cited on 2020 March 02]. Available from: https://www.thehindu.com/news/national/tamil-nadu/tamil-nadu-has-seen-dip-in-number-of-road-accidents-since-2016-transport-authority/article30959237.ece . [Google Scholar]

[10] Road Accidents in India 2011. [Last cited on 2012 April 18]. Available from: http://freedrivingtest.in/road-accidents-in-india-a-concern.html . [Google Scholar]

[11] Drinking and Driving: A road safety manual for decision-makers and practitioners. . [Last cited on 2012 April 18]. Available from: http://www.who.int/roadsafety/projects/manuals/alcohol/drinking_driving.pdf . [Google Scholar]

[12] Indian Driving Schools. Road Safety; Drunken Driving. 2011. [Last cited on 2012 April 18]. Available from, http://www.indiandrivingschools.com/drunken-driving.html .

[13] Government of India. Ministry of Road Transport and Highways (Road Safety). Observance of 30th Road Safety Week from 4th to 10th Feburary 2019. [Last cited on 2020 March 23]. Available from: http://www.businessworld.in/article/30th-Road-Safety-Week-A-Report/09-02-2019-167025/ .

[14] The National Road Safety and Traffic Management Board Bill. 2010. [Last cited on 2012 Apr 18]. Available from: http://www.prsindia.org/billtrack/the-national-road-safety-and-traffic-management-board-bill-2010-1147 .

[15] Jha N, Srinivasa DK, Roy G, Jagdish S. INJURY PATTERN AMONG ROAD TRAFFIC ACCIDENT CASES : A STUDY FROM SOUTH INDIA. Indian J Community Med. 2004;29:20–4. [last Cited on 28 January 2003]. Available from: https://www.researchgate.net/publication/45261780_Injury_Pattern_among_Road_Traffic_Accident_Cases_A_Study_from_South_India . [Google Scholar]

[16] Zhang G, Yau KKW, Zhang X, Li Y. Traffic accidents involving fatigue driving and their extent of casualties. Accident Analysis & Prevention 2016; 87:34±42.

[17] Pino MJ, Herruzo C, Raya A, Herruzo J. Legal and Illegal Substance Consumption and Traffic Accident Risk Perception Among Spanish Young People. Social Indicators Research 2016; 129(2):835±845.