International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

Implementation on Alcohol Sensing Alert

Darshan Kurhe[1]
Information Technology, Bharati Vidyapeeth College of Engineering, Kharghar – 410210 Maharashtra, India

Rishikesh Mahale[2]
Information Technology, Bharati Vidyapeeth College of Engineering, Kharghar – 410210 Maharashtra, India

Mihir Hadaye[3]
Information Technology, Bharati Vidyapeeth College of Engineering, Kharghar – 410210 Maharashtra, India

---

Abstract - *In today's busy and hectic world, people are unable to get full rest and complete bedtime sleep. Due to this when they drive after a sleepless night, they end up dozing off while driving which can be very fatal. A lot of accidents are caused due to drowsy driving every year and it often goes undetected thereby leading to huge loss of lives and resources. We are presenting a system that detects drowsiness while driving and alerts the driver for the same. Such systems are available in high end cars only. Our system uses the front camera of the driver's mobile phone placed in front of the driver. The detection of eyes closed is efficient and works under different situations, it uses camera of any normal android phone. Hence, we provide users with a cheap technology.*

This paper discusses design, development and testing of the prototype of drink and drive situation detection and alert along with vehicle control system to minimize road mishaps and enhance public safety on road. Based upon the recent smart alcohol sensing and integration of satellite and cellular wireless communication technologies, the proposed device quickly senses the drunken state of the driver during start-up/driving by estimating the equivalent breath alcohol concentration level corresponding to the legally permissible state's threshold blood alcohol concentration level. On detection of such situation, on-vehicle alarm is activated to warn the person. Additionally, 'alert SMS' indicating drunk driver location, tracked by onboard GPS receiver, along with vehicle number is communicated remotely to authorized mobile user using GSM cellular network to take appropriate action thereafter.

***Key Words*: Embedded System, Drunk-Driver detection, Location Tracking, Alcohol MQ3 Sensor, Short Message Service (SMS).**

1. INTRODUCTION

It is very dangerous to drive while being tired or after not sleeping for long hours. It is estimated that drowsy driving caused approximately 70,000 crashes, 50,000 injuries, and around 1000 deaths. Moreover, around 6,000 fatal crashes happen every year. A survey revealed that 60% of people have driven a vehicle while feeling drowsy and 37% people admitted that they have fallen asleep while driving in the past one year. 4% drivers admitted they were involved in an accident because they had fallen asleep. Today a large number of these accidents caused are not recognized because the driver does not inform that had fallen asleep as it would make them responsible for the accident and in worst cases it may also lead to loss of life. Hence it is important to track drowsiness detection and alert the driver at the same time to prevent such fatal accidents and loss of life. It can also help to spread awareness amongst drivers about the associated risks, improving their driving habits. Such systems are present only in high end cars which are very expensive. They include automatic braking system when close to another vehicle which is detected by radars, ultrasonic sensors, automatic steering control when experiencing lot of car drifts on straight road.

However, a very small number of cars comprise of these features and it will take a lot of time for these features to become available in many cars built in. While on the other hand our system is cheap, efficient and can be easily used by many people. This problem is rising at a large pace and is getting undetected many times. It is important to prevent drowsy driving as it is the root cause of most of the accidents occurring nowadays. It is simply because the lives of people are becoming hectic, they have loads of work to do and don't get time to rest properly. Hence in order to cope up with next day's work they tend to drive after a sleepless night which is very dangerous. It not only places their life under danger but also of the people nearby them and who are dependent on them.

Table I. Overview of The Current Statistics of Accidents

Reasons	Total Number Accidents in 2016		
	Accidents	Killed	Injured
Alcohol	14,894	6,131	11,648
Exceeding Speed Limit	2,68,341	73,896	2,82,870
Two-Wheeler	1,62,280	44,366	1,53,060

2. LITERATURE SURVEY

Many researches have been proposed to detect physical and psychic conditions of a driver which may be one of the causes of road accidents. This chapter review the past researches carried out in relation to intoxication and drowsiness of the driver causing road accidents. Although the literature covers a wide variety of the methods of detecting the level of intoxication and drowsiness of driver, this review will focus on 3 major themes. These themes are physiological measures, vehicle- based measures and behavioral measures. Though the literature presents various themes, this chapter will focus on behavioral measures.

2.1 Alcohol detection

(Bhuta, et al., 2015) proposed a system which aimed to decrease the traffic collision caused by drunken drivers. The system recognizes the existence of alcohol in the vehicle and directly switch of the motor of the vehicle. In the meantime, a SMS includes the location of the vehicle is sent to three pre- selected contacts. The basic hardware needed to detect the existence of alcohol - the Arduino Uno Microcontroller, which is the heart of the system. While the alcohol sensor is utilized to detect the alcohol, the output is analog, which is interfaced to the Arduino Uno board. Moreover, GSM module utilized to send an SMS to three preselected contacts using the GPS module which tracks the location of the vehicle and included in the message sent by the GSM module. LCD displays the message showing that “Alcohol Detected”. Meanwhile a DC motor which is used as a simulator simulating the engine locking feature locks the engine, when alcohol is detected.

2.2 Drowsiness detection by measuring physiological changes

This approach is to gauge the physiological changes of drivers from bio signals; for example, the Electroencephalogram (EEG), Electrooculography (EOG), and Electrocardiogram (ECG or EKG). Since the sleep cadence is emphatically corresponded with brain and heart exercises, these physiological bio signals can give precise drowsiness identification. Apart from this, all the researches in this approach require electrode contacts on drivers' head, face, or chest. On other hand, wiring is another issue for this approach. The electrodes contacts and wires will pester the drivers and are hard to be actualized in real applications. The researchers mentioned that the heart rate (HR) also shifts crucially between the distinctive phases of tiredness, for example, alertness and exhaustion. In this manner, heart rate, which can be effectively controlled by the ECG flag, can likewise be utilized to recognize languor. Others have estimated tiredness utilizing Heart Rate Variability (HRV), in which the low (LF) and high (HF) frequencies fall in the scope of 0.04– 0.15 Hz and 0.14– 0.4.

The Electroencephalogram (EEG) is the physiological signal most normally used to gauge tiredness. The EEG signal has different recurrence classification. Firstly, the delta band from 0.5 Hz to 4 Hz, which means the human body is at rest. Secondly, theta band from 4 Hz to 8 Hz, which means that the human body is identified with tiredness. Thirdly, alpha band that identify the relief and innovation state of human body which from 8 Hz to 13 Hz. Finally, beta band that define the awareness state of the human body that starts from 13 Hz to 25 Hz. A reduction in the energy of human body changes in the alpha recurrence band and an expansion in the theta recurrence band which stipulate drowsiness of the human body (Saini & Saini , 2014).

2.3 Drowsiness detection by measuring vehicle-based changes

The researches proposed vehicle-based mechanism, which compute the steering wheel movement. Steering wheel movement is measured using an angle sensor mounted on the steering column which will measure the driver’s steering behavior. If the driver is sleepy, the number of micro corrections on the steering wheel reduces when compared to normal driving. When the driver falls asleep while driving, it results in swinging of steering as compared to normal driving condition. To reduce the consequence of changing lane which may result in an accident, the researchers took into consideration the small change in the movement of steering wheel which lies between 0.5° to 4° which is enough to modify the lateral position inside the lane (Saini & Saini , 2014).

Auto organizations, for example, Nissan and Renault, have embraced SWMs. However, it works only in extremely constrained circumstances. This is because they can work dependably at specific situations and are excessively subject to the geometric qualities of the street and to a lesser degree on the active attributes of the vehicle.

2.4 Drowsiness detection by measuring behavioral changes

A drowsy driver shows various trademark facial motions, including quick and steady flickering, gesturing or swinging their head, and incessant yawning. Behavioral measures method which is utilized by image processing of the various known facial movements. Different parameters are detected using the image processing process to detect the drowsiness of the driver.

2.5 Detecting drowsiness by detection of pupil and iris.

According to the Monitoring System for Drivers of Heavy Vehicles Automated, to detect the drowsiness of the driver, the researchers (Ozakta , et al., 2016) proposed that eye tracking is the procedure of evaluating either the point of staring or the movement of an eye relative to the head through an image-based eye detection by exploiting eyes' differences in appearance and shape from the rest of the face. The researchers (Ozakta , et al., 2016) added to identify the drowsiness of the driver is significant to detect pupil and iris.

3. PROBLEM STATEMENT

Drowsy driving is an important, but often unrecognized traffic safety problem. It is estimated that 10-20% of traffic accidents are caused by drowsiness. Not only loss of life but a large amount is spent on fatalities. Drowsy driving is often unrecognized because if drivers admit, it would make them liable. Drowsy driving is a dangerous combination of sleepiness and driving while fatigued and can be due to sleep deprivation, change in daily routine due to shift work, taking medication with sedatives, intake of alcohol after being tired. Almost everyone has experienced this problem while driving.

The people worst affected by drowsy driving are teenagers, professional truck drivers who have to drive on long routes for a long period of time without breaks, cab drivers who also drive for a long period, sometimes to complete their targets to get bonus profit and shift workers who work at night or for late hours also get affected due to tiredness.

Drowsy driving can be due to driving on highways for long time without any breaks particularly at night. Driver has trouble keeping their heads up, difficulty in focusing, frequent blinking, yawning frequently. Driver tend to forget routes; misses turns and drifts from their lane i.e. swerving means changing directions abruptly. It is observed that driving performance deteriorates with increased drowsiness resulting in crashes (more than 20% of vehicle accidents), loss of life and lot of money is spent on fatalities. Our objective is to create a security system that constantly determines the activity of driver and calculates the duration for which the eyes of the driver remain closed. If this duration exceeds a threshold value, the system generates an alert to wake up the driver.

Cost - Since each time new tubes have to be used for each individual; cost is increased. High cost of breathalyzer and tubes due to its maintenance.

Diseases Spread - Chances of disease spreading through air can be a major issue caused since the same breathalyzer is used. Although tubes are changed but the person's breath in device can lead to diseases.

Cheating the Breathalyzer - By using mints and chewing gums one can easily cheat the breathalyzer test.

4. FUTURE SCOPE

In future the project can be extended to make the system better. Currently only the behavior of the driver is being analyzed but the various systems of the car can also be analyzed such as the movement to the steering i.e. are there any sudden drifts made by the driver on a straight road, distance of the vehicles in front of the car, whether the car is moving in its lane only or not. Many luxury car manufacturers are integrating features like radars, ultrasonic sensors and cameras for the safety of the passengers but they are very expensive measures. Such systems inform the driver with the help of sound systems placed in car, vibrations of seat and steering.

Although these systems are in place but they are very expensive and will take a lot of time to be available in entry level vehicles when majority of people will be able to use it. On the other hand, these smartphone solutions are easy to use, cost efficient and can be placed within any car irrespective of the type of the car. Many applications are emerging which calculate the distance of the car from the vehicle in front. But none of the above have studied the behavior of the driver to alert, they are only monitoring the conditions of the road.

5. OBJECTIVES

Development of safety features to prevent drunk and drowsy driving, being one of the major challenges for automobile industry the objective of this project is to design a system to detect and provide driver safety by alerting the driver in case of drunk condition detection or drowsiness detection. Drowsiness detection would be implemented using visual features like Eye detection. For drunk state detection, the person's breath odour will be verified. The main objective of this system is to reduce the cost of breathalyzer and its tubes as well as to avoid spreading of diseases. Along with this there will be accurate result since there is no chance of cheating the breathalyzer. In case the sensor detects that the person has drunk, it will buzz an alarm and immediately the message will be sent to the police station.

TABLE 1. STUDY UNDER DIFFERENT LIGHT CONDITIONS

	Total Tests		Detected Correctly		Precision	
	Low Light	Good Light	Low Light	Good Light	Low Light	Good Light
Without Spectacles	30	30	20	24	0.66	0.8
With Spectacles	30	30	19	22	0.63	0.73

TABLE 2. LEVEL OF DRUNKNESS

Voltage Output	200 – 300ppm 1 – 1.5V 20 – 30%	300 – 400ppm 1.5 – 2V 30 – 40%	400 – 500ppm 2 – 2.5V 40 – 50%
Alarm	Off	Off	On
Ignition SYS	On	On	Off

6. SYSTEM ARCHITECTURE

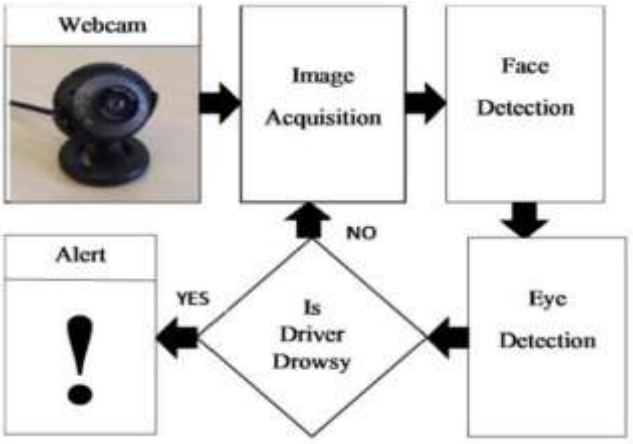


Fig-1: Drowsiness Detection System

Webcam will capture the real time image of the driver face then that image will go to Raspberry Pi which is Processor that will do image processing in open cv environment where face and eyes will be detect from the image and algorithm make a decision that eyes are closed or not using EAR(Eye Aspect Ratio) if eyes are closed for some period then Alarm will be triggered or generate the alert sign if eyes are not closed than detection process will be repeated.

7. SYSTEM METHODOLOGY

MQ3- Alcohol Gas Sensor

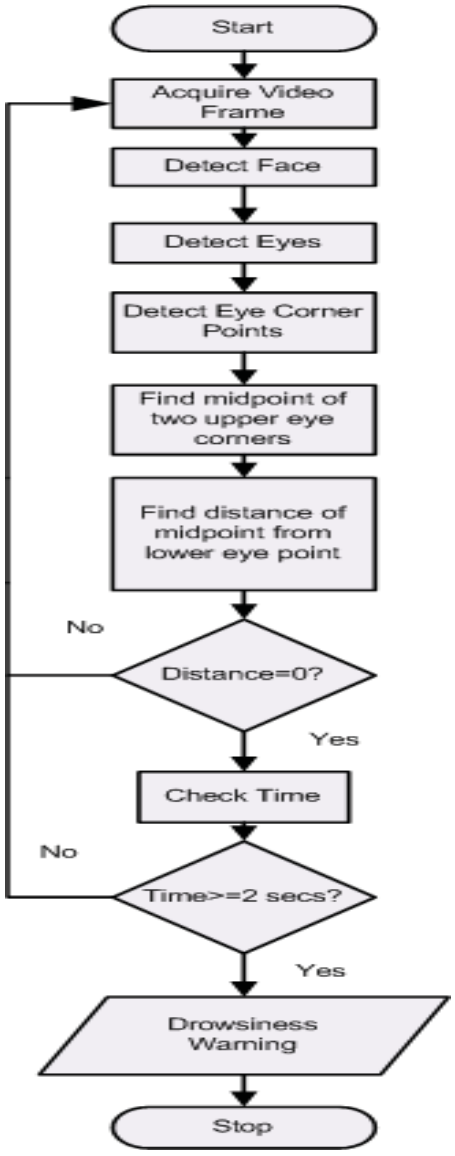
MQ3- Alcohol Gas Sensor is a low-cost semiconductor sensor which, used to detect the presence of alcohol vapour gas at concentrations from 0.05 mg/L to 10 mg/L. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapour and gasoline the sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. Its conductivity increases as the concentration of alcohol vapour gas increases.

This module provides both digital and analog outputs. This alcohol sensor is suitable for detecting alcohol concentration on your breath. It has a high sensitivity and fast response time. The sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is a resistor. A simple interface could be a 0- 3.3V ADC. The MQ3 alcohol sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc.

Fig-2: MQ3 Alcohol Sensor

Pin Out

1. VCC - Input Power Supply
2. DO - Digital Output
3. AO - Analog Output
4. DO – Digital Output



Fig– 3: Flowchart for proposed algorithm

An outline of the algorithm is provided below:

Step1: Acquire video frame from the capturing device.

Step2: Detect face.

Step3: Detect the eye region.

Step4: Find the two eye corners and one point on the lower eye-lid.

Step5: If the eye state is closed/blink for more than 15 seconds then it will alert an alarm.

Raspberry Pi


Fig-4: Raspberry Pi

Raspberry Pi is designed with a Broadcom SoC with an in-built ARM CPU and GPU. The Raspberry Pi used in the project is a Raspberry 3B (A generation 3 Raspberry Pi). Model 3B has a 64-bit quad core processor, and has on board IEEE 802.11a, IEEE 802.15 and USB boot preferences. The video output is HDMI (rev 1.3 & 1.4 and Composite RCA (PAL and NTSC). The Camera Connector is a 15-pin MIPI Camera Serial Interface (CSI-2). It also includes a Micro SD card.

When a user of the proposed system meets with an accident, then the vibration sensor records this impact and generates an impulse that will trigger the micro- controller. Upon receiving this trigger, the micro controller will send and SMS to the registered number along with the extracted GPS co- ordinates of the accident spot. This message will in the form of a Google Map link. When the receiver will click on this message it will redirect it to the accident spot. This will help in locating the rider and provide with help in time.

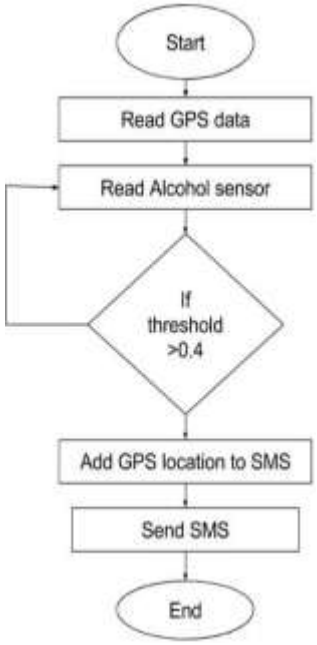


Fig-5: Flowchart

This time the trigger will be initiated by an MQ3 Sensor which has high sensitivity for Alcohol. So supposedly, if the rider is riding the bike under the influence of alcohol, an SMS will be sent to the registered number stating the same. This will help in limiting the cases of drunken driving.

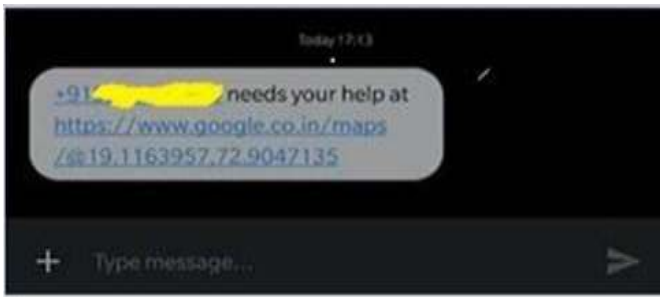


Figure-6: An SMS will be sent to the registered number

8. CONCLUSION

The main purpose of this project is to reduced number of accidents occur due to negligence of the driver. "Drunk driving detection". Drunk driving is a major reason for accidents in almost all countries all over the world. Alcohol Detector in Car project is designed for the safety of the people seating inside the car. An alcohol breath analyzer project should be fitted/ installed inside the vehicle. This project is one of the important Sensor based project ideas. The main unit of this project is an "Alcohol sensor".

If the person inside the car has consumed alcohol then it is alcohol detection is done by the sensor. The sensor gives this signal to a comparator IC. The output of the comparator is connected to the microcontroller. The microcontroller is the heart of this project. It is the CPU of the complete circuit. Microcontroller gives a high pulse to the buzzer circuit and the buzzer is turned on. At the same time, a relay is turned off. Due to this, the ignition of the car is deactivated. Alcohol Detection System with Buzzer Indication project is extended by adding an ignition key at the input and DC motor at the output. The input Ignition key is given to the microcontroller. It is used to find out that the car is started. Whenever a key is inserted into the ignition lock at that time the alcohol detection process is started.

REFERENCES

[1] Sinan Kaplan, Mehmet Amac Guvensan, Member, IEEE, Ali Gokhan Yavuz, and Yasin Karalurt, Driver Behavior Analysis for Safe Driving: A Survey, IEEE Transactions on Intelligent Transportation Systems, Vol. 16, No. 6, December 2015.

[2] Ralph Oyini Mbouna, Seong G. Kong, Senior Member, IEEE, and Myung-Geun Chun, "Visual Analysis of Eye State and Head Pose for Driver Alertness Monitoring", IEEE Transactions on Intelligent Transportation Systems, Vol. 14, No. 3, September 2013.

[3] Mario I. Chacon-Murguia and Claudia Prieto-Resendiz, "Detecting Driver Drowsiness: A survey of system designs and technology", IEEE Consumer Electronics Magazine, October 2015.

[4] Mona Omidyeganeh, Member, IEEE, Shervin Shirmohammadi, Senior Member, IEEE, Shabnam Abtahi, Aasim Khurshid, Muhammad Farhan, Jacob Scharcanski, Senior Member, IEEE, Behnoosh Hariri, Daniel Laroche, and Luc Martel, "Yawning Detection Using Embedded Smart Cameras", IEEE Transactions on Instrumentation and Measurement, Vol. 65, No. 3, March 2016.

[5] T. Sivakumar, Dr. R. Krishnaraj, "Road Traffic Accidents (Rtas) Due to Drunken Driving in India Challenges In Prevention", IRACST- International Journal of Research in Management & Technology (IJRMT), Vol. 2, No. 4, August 2012.