IOT based Drunk Driver detection

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Abstract

Now a days drunk driving is a growing problem in our country and accounts for one-third of traffic related accidents and deaths. Drunk Driving under influence of alcohol has affected and killed countless of people's lives. If anyone is drunk and drive, not only he is in danger but put but this is risk for passengers and pedestrians, and other people who were on the roads. For every thirty minutes someone's life is cut short and families are devastated. Due to this many innocent families are accused and losing their lives. To overcome this problem, an efficient system is proposed to detect the drunk drivers using IOT based Drunk Driver Detection. The MQ3 alcohol sensor is used in this system to detect the alcohol levels of the driver. If the sensor detects drunken driver, a notification alert is passed to the vehicle's owner as well as to the nearby police station. Then the owner or police may take severe action on the driver.

Keywords: Drunk Driving; *Internet of things; using IOT based Drunk Driver Detection(IOTDDD);*

1. Introduction

Accidents caused by impairment of alertness in vehicle drivers pose a serious danger to people, not only to drivers themselves but also often to the general public. According to latest data compiled by the National Crime Records Bureau (NCRB), drunk driving was responsible for 7,061 – a mere 1.5% of the road accidents in India. The concern related to drunk driving is not only the high accident rate, but also the type of crashes that are most likely to happen. Road safety has turn out to be a principal public health concern. Over 1, 37,000 people were died in road accidents in 2013.

The report of Road Accidents in India 2015 puts the number of accidents caused by drivers under the influence of alcohol as well as the fatalities much higher — 3.3 per cent of all road accidents and 4.6 per cent of all fatalities from road accidents. During these crashes, ten thousands of people were killed, and much more people injured. In addition of being a major menace to public safety and health, drunk driving enforce an extreme financial burden on the entire society, particularly on the healthcare sector.

Andhra Pradesh has been placed third on the list of states with the highest accident rates in 2017.A.P. witnessed 30,045 road accidents with 8,210 deaths which makes 7.52% of the country's total.The below table shows the accident rate and cause for the accidents in A.P. Out of these 30,045 accidents, 20% are only due to drunken driving.

2. Literature Review

In 1927, a Chicago chemist, William Duncan McNally, invented a breathalyser in which the breath moving through chemicals in water would change colour. This invention for the housewives to test whether their husbands are drunk or not.

In 1935, the first practical roadside breath-testing device was the **drunkometer**. It was developed by Rolla Neil Harger of the Indiana University School of Medicine. The drunkometer collects a motorist's breath sample into a balloon inside the machine. Then the breath sample was pushed all through an acidified potassium permanganate solution. If there was alcohol in the breath sample, the solution changes colour. The greater the colour change, the more alcohol was present in the breath.

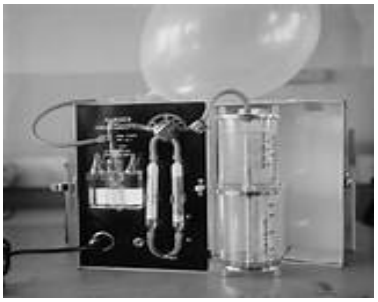

Fig 1: .Drunkometer

The main drawback to Harger'sDrunkometer was that it required re-calibration every time it was moved. Therefore, it was not portable and was impractical for police officers. In Britain in the year 1967, two persons named Bill Ducie and Tom Parry Jones have innovatively developed and then marketed the first electronic breathalyser. The Road Safety Act 1967 initially introduced the first lawfully enforceable possible blood alcohol level for drivers in the UK, and if this is exceeded this is treated as an offence and to be in charge of a motor vehicle. Then they introduced the breathalyzer checking on roads, that are readily available to police forces across the country.

Later this Electronic Breathalyser was implemented in India to detect the drunken people. It is mainly used by the police in order to detect the people who were driving vehicles by consuming alcohol. The main limitation of this system is that the police are not able to check each and every vehicle. Also there is a chance for drunk drivers to escape from the police in the traffic. So, there is a need for an effective system to check every drunken driver.

Chemical reactions in breathalyser: When the user exhales into a breathalyser, any ethanol present in their breath is oxidized to acetic acid at the anode:

$CH_3CH_2OH(g) + H_2O(l) \rightarrow CH_3CO_2H(l) + 4H^+(aq) + 4e^-$

At the cathode, atmospheric oxygen is reduced:

$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$

The general reaction is the oxidation of ethanol to acetic acid and water.

$CH_3CH_2OH(l) + O_2(g) \rightarrow CH_3COOH(aq) + H_2O(l)$

The electric current created by the above reaction is measured by using a microcontroller, and exhibited on display as an estimate of overall blood alcohol content (BAC) by the Alcohol sensor.

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3. IOT based Drunk Driver Detection

The proposed system is to create an effective alcohol detector in vehicle where we detect the drunk driver when he enters the vehicle and notifies the owner and the police. As this system will be developed using IOT, we use a sensor which detects the presence of alcohol.

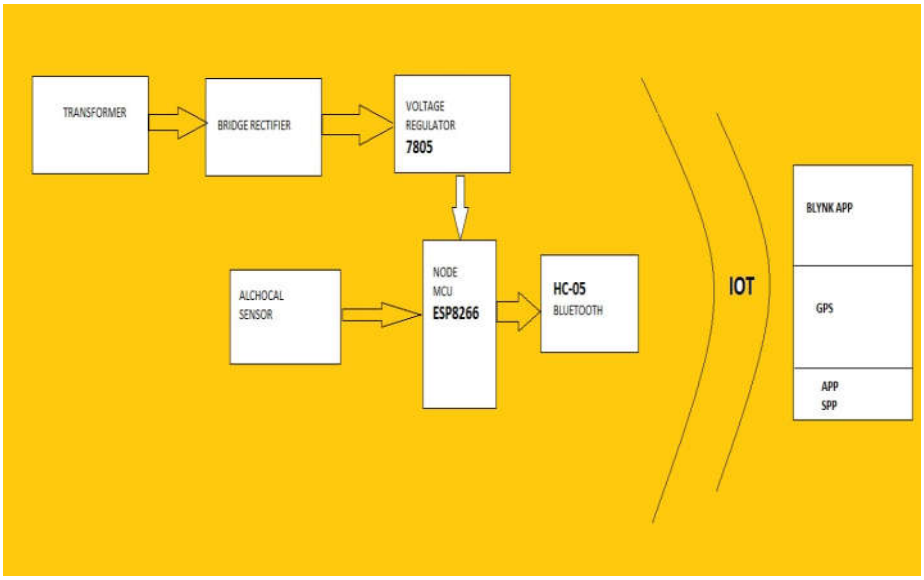

Fig 2 : Architecture of IOTDDD

IOTDDD works on principle of auto detection. When the driver enters the key to ignite the engine the MQ3 sensor gets activated and then starts detecting the alcohol level through exhale, and if it is measured to be beyond the excessive limit, immediately the owner and nearby police station get the notification. 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 and emits a beep sound. In this system, in order to notify the owner and police an app will be developed using Blynk App.

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 if fixed at position top of the steering wheel to ensure that the device work effectively and efficiently. The remaining sensors and modules such as the GPS (Global Positioning System) module can be placed anywhere inside the motor-vehicle as per the convenience and design compulsion by manufacturers. As Global Positioning System (GPS) is even accessible by the smartphones, it can be used to obtain the specific location of the driver, making it easy for the correspondents to track the vehicle.

The equipment used are MQ3 Alcohol sensor, NodeMCU ESP8266, Transformer, Bridge rectifier, Voltage Regulator, HC-05 Bluetooth module

Alcohol Gas Sensor MQ3 is a low cost semiconductor sensor that detect presence of alcohol gases at concentrations that is not acceptable. SnO2 is the sensitive material used for MQ3 sensor whose conductivity is less in clean air. This conductivity increases as the concentration of alcohol gases increases. This is highly sensible to alcohol that has good resistance to disturbances due to smoke, vapour and gasoline. This module provides both digital and analog outputs. This MQ3 alcohol sensor module can be interfaced easily with any Microcontrollers or Arduino Boards including Raspberry Pi. MQ-3 gas sensor has high sensitivity to Alcohol, and has good resistance to disturb of gasoline, smoke and vapour. The sensor is low cost and suitable for different application.

Fig 3 : MQ3 Alcohol Sensor

This alcohol sensor is suitable for detecting alcohol concentration on breath, just similar to common breathalyser. This has high sensitivity with fast response time. Sensor imparts an analog resistive output which based on concentration of alcohol.

The NodeMcu is an open-source firmware with development kit that help out to prototype and simulate any IOT product within a few script lines. The features are Open-source, Interactive, Programmable, Low cost, Simple and smart,WI-FI enabled.

4. CONCLUSION

Drunken driving prevention system proposed here is an IOT application 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 new versions of technology based applications. This proposed IOTDDD is a safety provider system for the owner who is accused if any problem arises due to drunk driver though he is not directly involved in the issue. Automobile manufactures can integrate this into their manufacturing design. 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. The implementation of automated drunk driver detection systems make world free of drunk and drive and eventually avoid accidental cases.

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