IoT Based Alcohol Detection for Drivers

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Abstract:
Driving under the influence of alcohol leads to accidents. The proposed system makes use of Raspberry Pi which is interfaced with an alcohol sensor (MQ-3) to detect drunk drivers. When a drunk driver is detected a buzzer is turned on and the speed of the vehicle is reduced. The drunk driver’s data(real-time location, date and time) is updated on the Google Cloud using internet. If internet is not available an SMS with the drunk drivers data is sent to the concerned persons. The information from the cloud can be fetched by the Android application on the user’s mobile phone.

Keywords: Raspberry Pi, MQ-3, DC motor, L293D, buzzer, SMS, GSM, GPS, Google Cloud, Android application, API.

I. INTRODUCTION
In recent years, there have been many cases of road accidents where many people have lost their lives. Many of the road accidents have been caused because of the drivers who are under the influence of alcohol. Drinking and driving not only puts your life at risk but also the lives of others. The existing system uses portable alcohol screeners which requires the stopping of vehicles and manually putting it inside the mouth of the driver and blowing into it to detect the presence of alcohol. To avoid this we have come up with a solution using IoT which makes use of Raspberry Pi which shows the status of the driver whether the driver is drunk or not while driving. This device is installed on the steering wheels of the vehicle. If the driver is found drunk the speed of the vehicle is slowed down by making use of DC motor and also an alarm is given through the buzzer to warn the driver. APIs are used to store the data about the driver such as the location, date and time when the driver was found drunk in the database. This data is retrieved through an Android application. In case the internet facility is not available then a message is sent to the concerned authority using a GSM module. This infotainment system is present in the vehicle and is available through an Android application that communicates with the Raspberry Pi using socket programming and updates the data in the database when alcohol is detected.

II. RELATED WORK
Pandurang [1] proposed “Design and Implementation of Driver Drowsiness and Alcohol Intoxication Detection Using Raspberry PI” in order to reduce the number of accidents on road by making use of MQ-3(Alcohol sensor). USB Camera used in OpenCV to detect drowsiness for continuous image capturing which compares the images present in database and GSM module to send SMS that alcohol content is detected along with relay circuitry, buzzers which are interfaced with Arduino Uno. Suprasha [2] proposed “DRUNK AND DRIVE DETECTION USING IOT” to detect if a person was drunk or not by using MQ-3 sensor and accordingly the controlled speed of the vehicle based on the traffic by using Ultrasonic Sonic sensors, drowsiness was detected using an eye blink sensor and sent an alert message to family members if any accident occurred. Anil [3] proposed “Drunk and Drive Detection with Ignition Lock Using Raspberry PI” which uses alcohol sensor (MQ-3) with raspberry pi for alcohol detection. If the alcohol content exceeds the limit then Twilio (cloud computing platform) is used to send SMS notifications. LCD display displays the message and L293D motor driver board which is responsible for working of DC motor stops the vehicle on detecting alcohol. Fathima [4] proposed “Development and implementation using Arduino and Raspberry Pi based Ignition control system” the MQ-3 gas sensor is used for alcohol detection. If the driver is drunk, the car engine would not get ignited. All the sensors and modules are connected to the micro controller board, the GSM-SIM900 module is used to send SMS to the family members. Akalya [5] proposed “Fatigue Detection Using Raspberry Pi 3”. In this system the driver’s fatigue or drowsiness is detected and alerts the person. The system uses 8-megapixel Raspbian camera that captures driver’s face and eyes and processes the images to detect driver’s fatigue. On the detection of drowsiness, the programmed system cautions the driver through an alarm. The alert message along with car plate number is sent to the concerned person mobile. Nagalashkini [6] proposed “Raspberry Pi based Embedded System for Vehicle Automation over Internet” This system aims to monitor the driver activity through the internet by the owner of the vehicle using GPS and can store these data in the cloud. In case anything goes wrong in the system the owner can get the update through a GSM module and will be able to stop the vehicle by sending a command. This command turns off the motor. The entire activities of the sensors are controlled by the Raspberry Pi which acts as a master controller and Arduino acts as a slave controller. Megha [7] proposed Implementation of Driver Drowsiness and other Features using Arduino and Raspberry Pi” uses 8 megapixel camera for detecting image or face. Eye closing rate is calculated after each 10 seconds, and if it crosses a predefined threshold value, then Raspberry Pi sends a high pulse signal serially to Arduino Uno which performs a set of tasks like slowing down the vehicle speed and parking it to left side of the road. Alcohol sensor works as a breathalyzer If the calculated %BAC crosses the threshold limit, an alarm is given through buzzer.

III. PROPOSED SYSTEM
Here we propose a prototype which will detect if the driver of a vehicle is drunk or not. To detect drunk drivers we are using...
MQ-3 (alcohol gas sensor) whose conductivity increases with higher alcohol gas concentration. It has good sensitivity to alcohol in wide range, and has advantages such as long lifespan, low cost and simple drive circuit. This sensor and a buzzer will be connected to Raspberry Pi. If the driver is drunk the sensor will detect it and the buzzer will be turned on and the vehicle’s speed will be reduced. The vehicle’s speed here is indicated by the DC motor. The Raspberry Pi will communicate with the infotainment system present in the vehicle which contains the android application for fetching the user data like the real-time location, date and time along with a SMS sending program. The user data will be received by the Raspberry Pi through socket programming on detection of drunk driver. After receiving the data from infotainment system, the data is updated on the Google Cloud database. This data is retrieved from the Google Cloud and is reflected on the Android application where the owner of the vehicle will be able to see the driver’s real-time location along with the timestamp. If the internet is not available for updating the data then the infotainment system will send a SMS to the owner of the vehicle specifying the driver’s location along with the timestamp. This process continues as shown below in Figure.1.

![Figure.1. Flowchart](image1)

The system architecture is shown in Figure 2. Google Cloud is used for storing and retrieval of data. With the help of the APIs we are able to insert and retrieve data through Android application. We are using Raspberry Pi 3 Model B which has in-built Wi-Fi Programming language used in Raspberry Pi is Java, which is compatible with Google Cloud and APIs. Raspberry Pi contains a code to update the data in the database.

![Figure.2. Architecture](image2)

IV. HARDWARE REQUIREMENTS

A. Raspberry Pi 3 Model B

The Raspberry Pi 3 Model B is the earliest model of the third-generation Raspberry Pi. It contains BCM2387 chipset, four USB ports, one 10/100 Base-T Ethernet socket, 40 GPIO pins, 15-pin MIPI Camera Serial Interface, push/pull micro SD slot, micro USB connector. When the Raspberry Pi is turned on it boots from the SD card containing the linux kernel based operating system. The wireless LAN can be turned on by specifying the Wi-Fi name and password. It can be programed using Java, Python, C++, C and Ruby. MQ-3 sensor, DC motor and buzzer are connected to the Raspberry Pi through GPIO pins.

B. MQ-3

MQ-3 gas sensor has high sensitivity to alcohol gas is resistant to the interference of gasoline, smoke and vapour. It is low cost and suitable for various applications of detecting alcohol at different concentration. Sensitive material of MQ-3 gas sensor is SnO2, which has lower conductivity in clean air. When the target alcohol gas exist, the sensor’s conductivity gets higher along with the gas concentration rising.

It contains 4 pins namely: VCC pin, GND pin, D0 (digital) pin and A0 (analog) pin.

When the VCC pin is interfaced with Raspberry pi using 5V pin, if the sensor detects the presence of alcohol it’s digital pin goes high and the appropriate code is called to ring the buzzer and slow down the speed of the DC motor.

C. Buzzer

Buzzer or beeper is an audio signalling device. Buzzer will automatically turn on when alcohol is detected.

D. DC motor

DC motor is used as a prototype to indicate the motion of the vehicle. When alcohol is detected we can slow it down to a certain speed by using pwm function when interfaced with raspberry pi using L293D motor driving IC.

E. L293D

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. It means, by using a L293D IC we can control two DC motors.

V. SOFTWARE REQUIREMENTS

A. Android Studio

Android Studio is the official Integrated Development Environment (IDE) for Android app development, based on IntelliJ IDEA. APIs can be added by adding a jar file to the library in Android application. By doing so we can easily insert the data into the database.

B. Google Cloud

For database support, both Raspberry Pi and Android application use Google Cloud for storing and retrieving data.
APIs have to be deployed first in order to insert, update and view the data.

C. MySQL Workbench

MySQL Workbench is a unified visual tool for database architects, developers, and DBAs. MySQL Workbench provides data modeling, SQL development and much more. All the SQL tables have been created using MySQL Workbench. It is also used for viewing the entries in the table.

D. Eclipse

Eclipse is an integrated development environment (IDE) used in computer programming. It contains a base workspace and an extensible plug-in system for customizing the environment. Eclipse is written mostly in Java and its primary use is for developing Java applications, but it may also be used to develop applications in other programming languages. All the Java APIs are written in this software and deployed from here.

E. GPS Application

GPS stands for Global Positioning System, which is used for fetching the real-time location of the driver. GPS or network provider in the Android device and we can use that to get the current location in terms of latitude and longitude. Using the latitude and longitude we can also get the complete address by using reverse Geocoding.

E. GSM Application

In Android, you can use SmsManager API or devices Built-in SMS application to send SMS. In this case we are using it to send SMS to the owner of the vehicle specifying the current location (fetched by the GPS application) and timestamp when the driver is drunk.

VI. RESULTS

This proposed system is able to detect drunk drivers. When alcohol is sensed by the sensor, it first controls the speed of the DC motor then turns on the buzzer and after that calls the socket program function which fetches the current location, time and date which is then updated on the Google Cloud. The updated data is reflected on the Android Application.

VII. CONCLUSION AND FUTURE SCOPE

In this paper we tried to reduce the road accidents caused by drunk and drive cases by creating an automatic alcohol detection system using IoT. In the future, once alcohol has been detected we would like to reduce the speed of the vehicle for this we first check if any other vehicle is behind this vehicle and then accordingly reduce the speed. To do this we will need an Ultrasonic sensor to detect the speed and distance of a vehicle approaching from behind. Instead of using DC motor to show the slowing down of the speed we would like to program the vehicle’s ECU (Electronic Control Unit) to reduce the speed.

VIII. REFERENCES


