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PRODUCT DEVELOPMENT LAB-1 REPORT

IOT BASED DRUKEN DRIVING ALERT DEVICE

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INTRODUCTION

Every day, almost 29 people in the United States die in alcohol-impaired vehicle crashes- that implies, one person every 50 minutes in 2016. In 2010, the most recent year for which cost data is available, these deaths and damages contributed to a cost of $44B per year in the US alone. A new survey reveals that deaths in accidents caused by drunken driving have witnessed a 20 per cent rise in the last six years in India. Delhi, the capital of India topped 53 Indian cities in fatal road accidents with 2,213 deaths last year. Out of these, drunken driving was responsible for at least 1,550 casualties - a shocking 70 per cent. The biggest problem is that all these punishments and laws for this offence have only been able to punish the offenders after the crime has been committed; there is no way of preventing these incidents before happening.

Hence, this project aims to come up with a solution to the above mentioned problem by building an automated system that can detect the presence of alcohol consumed by the person inside the car and can immediately send an alert message to the respective authorities (police). Alcohol detection is performed in real time by the alcohol sensor, the microcontroller and Analog to Digital converter circuit. Thus, there is never a situation when the system is in a shadow or a sleep state. It makes a normal car a smart car.

In this drunk and drive detection project, the system generates an alarm once the level of alcohol measured in the environment (in this case, the car) is above a set threshold value. Also, it reads data from the GPS unit which gives the exact position of the vehicle to microcontroller. Then the microcontroller sends an SMS (name of the person, vehicle number, alcohol level in the car, speed of the vehicle and the current location of the moving vehicle) to the hand held mobile phone with the help of the GSM module. User can click on the link in the received SMS. The integration of the GPS tracker with the Google Maps would ensure that the position of the offender is given out on the maps readily to ensure easy location and further possible actions. Therefore, with this system, we can prevent drunken driving menace in the society, that is the major cause of road accidents and ultimately save lives!

MOTIVATION BEHIND DOING THIS PROJECT

Drunken driving has been one of the main reasons behind road accidents. Driving under the influence of alcohol has affected and killed countless of people's lives. If someone drinks and drives, not only does he put himself at risk, but his passengers, pedestrians, and other people, who are on the road, are at a greater risk as well. Government is taking steps to prevent drunk driving by introducing new laws such as the law by the Supreme Court of India to close all the liquor shops near the highways. A driver having blood alcohol level of 30 mg per 100ml of blood is considered drunk according to the Indian law. The traffic police have also been provided with alcohol sensor tools to check whether the driver is drunk or not. According to the Motor Vehicle Act, 1988 a person can get an imprisonment of up to six months and penalty up to two thousand rupees. These steps have definitely reduced the road accidents due to drunk driving to some extent but have not been able to stop it. Had the car been smart enough to detect whether the driver is drunk or not and instantly sent alert messages to the authorities concerned, accidents due to drunk driving can be rooted completely; and that is exactly the motivation behind doing this project.

OBJECTIVES

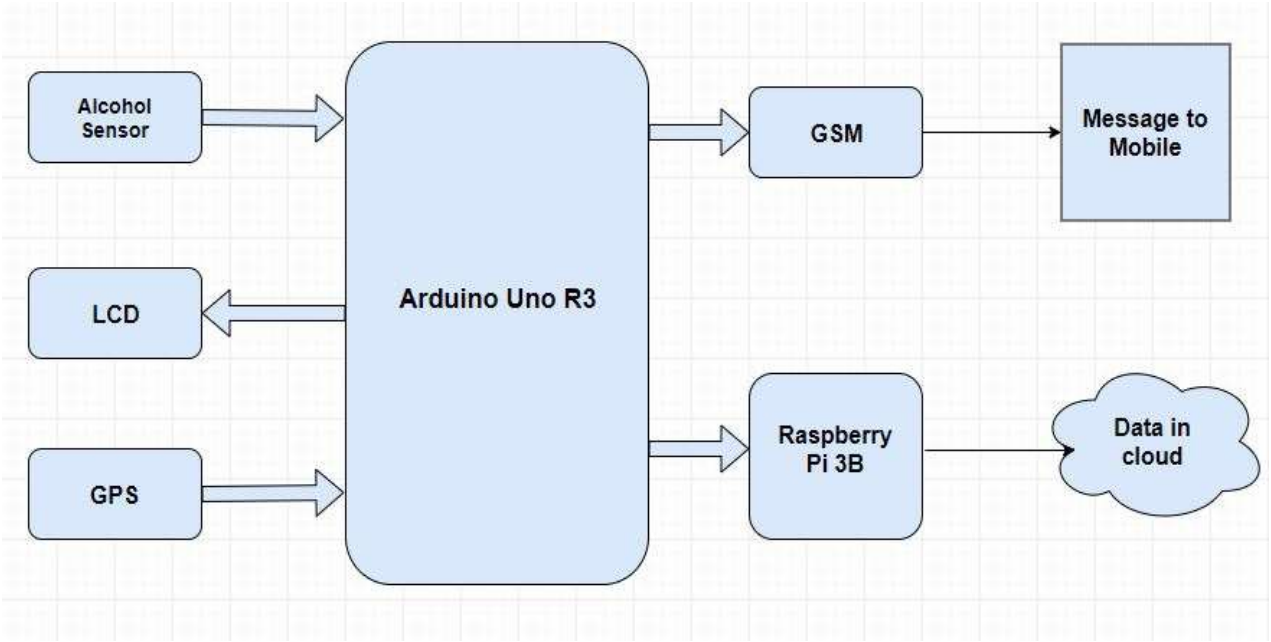
Phase 1:

The alcohol sensor (MQ3) has to be calibrated so as to accordingly know the threshold level at which the alert signal will be sent. Then the alcohol sensor has to be connected to the Arduino board. Since Arduino has on-board Analog to Digital converter, there is no need to separately use an ADC. The alcohol sensor continuously senses the presence of alcoholic gases in the atmosphere and simultaneously sends the analog data to the ADC of the Arduino. A C++ code has to be written to read the data from the sensor and also print them on the screen. According to the desired threshold value (the value at which the presence of alcohol is determined), the digital pin output which was set at 0, will be turned high and we can use this condition to send an alert message. In addition, the alcohol levels are also continuously printed on the LCD screen for the user to see the real time information of the alcohol levels in the atmosphere.

Phase 2:

A GPS module is interfaced with the Arduino board. The GPS module continuously keeps track of the moving vehicle's location and keeps sending them to the microcontroller, which further is interfaced with the GSM module. As soon as the alcohol sensor senses the presence of alcohol in the car's environment, the digital pin's output is turned high. At this time, the GSM sends the alert message to the pre-set mobile phone number. (The number could be of close friends, families or the police.) Now, the police will get to know the live reports of people driving under the influence of alcohol. The information about the level of alcohol consumption is also sent, which will further enable the police to prioritise which offender needs to be addressed first (in case, there are multiple alerts simultaneously and the police will have to decide on the basis of the level of alcohol consumed by driver. The higher the consumption, the higher is the need to catch that driver first.) With the help of the data sent via the GPS module, the police can put those latitude/longitude values on the Google Maps, get the exact location of the vehicle, track down the culprit and duly fine/punish them. This way, the rate of accidents caused due to drunken driving can be conveniently reduced. Further, the Raspberry Pi connected interfaced with the Arduino continuously sends the alcohol level to the cloud which can be analysed by seeing the datapoints collected over a long period of time.

BLOCK DIAGRAM



COMPONENTS REQUIRED

- Microcontroller (Arduino UNO)
- Alcohol Sensor (MQ3)
- GSM module (SIM 900A)
- GPS Module (Neo 6m)
- Raspberry Pi 3
- LCD Display (16*2)
- Breadboard
- Jumper wires

SOFTWARE USED

- Arduino IDE
- C++ programming
- Python
- Ubuntu OS
- ThingSpeak Cloud Platform

WORK DONE

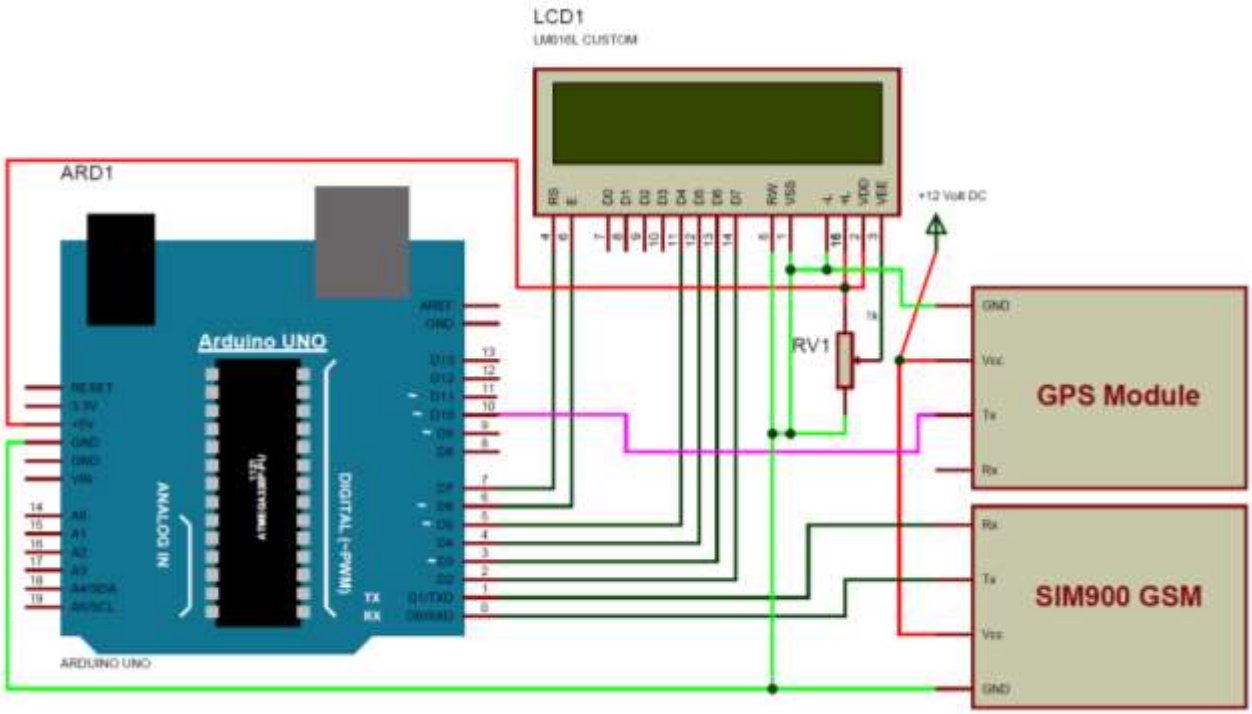
Phase 1 Work Details:

Arduino IDE was first installed on the computer. Then the Arduino board was serially connected with the computer and sample programs were run to check the correct working of the microcontroller. After that, the alcohol sensor was pre-heated for 24 hours and then calibrated. Appropriate connections between the sensor and the board were made. A C++ code was written to read the analog data collected by the sensor and then print them on the screen accordingly. Then the Arduino was interfaced with the LCD Display. A C++ code was written to display the real-time alcohol sensor values on the screen. After that, the code was updated to accommodate the alert message feature. An 'if condition' was introduced to check if the sensor has detected alcohol in the environment. If the condition was true, then the alert message was displayed on the LCD screen. The code for the same has been uploaded to Github : https://github.com/SweetyShukla/PDLab2k18 under the file name lcd_display.ino

Phase 2 Work details:

Arduino library for using GPS which is called the TinyGPS was downloaded and installed. Then the GPS module (Neo 6m) was interfaced with the Arduino board. After that, GSM module (SIM 900A) was interfaced with the arduino board. In the code, the condition for sending alert signal was made in such a way that as soon as the presence of alcohol is detected in the atmosphere, the current location of the driver along with the severity of the case (according to the alcohol level) is sent to the registered mobile number. The message sends the location in the form of latitudes and longitudes, which can be directly found out on the Google maps. The code has been uploaded to Github : https://github.com/SweetyShukla/PDLab2k18 under the file name Final-code.ino An additional feature has been added by interfacing Arduino with Raspberry Pi. The data values from the Arduino are sent to Pi by direct serial interfacing and through a python script all these values are uploaded to the cloud to store all the data points and also to make significant analysis in the future. The python script has been uploaded to Github under the file name Rpicode.py

CONNECTION DIAGRAMS



FINAL IMPLEMENTATION

GRAPH PLOTTED

USES

This device is fit for any type of vehicle- car, bus, or truck. Hence, it can be used to prevent any kind of drunken driving case.

Other than vehicles, this device can be installed at the places where drunk people are strictly not allowed. For example- In classrooms, lecture halls, library, offices, hospitals, court rooms etc. Attaching a camera module along with this alcohol sensing feature can be more useful in identifying the drunk person.

FURTHER WORK TO BE DONE

This prototype has to be made smarter so as to differentiate alcohol detection from actual alcohol consumption and from things like cough syrup, nail paint remover or sanitizer.
The priorities regarding which driver to attend to first are now being decided on the basis of two factors- Alcohol level detected and the location. However, the severity of the case might differ not on the basis of consumption but on the basis of sobriety. For example- Person A has drunk more alcohol than Person B. However, due to more intake capability, Person A is just mildly drowsy but Person B is heavily drowsy. Therefore, we need to build a method that detects the sobriety and an algorithm that makes priorities on the basis of the level of drowsiness, not on the level of alcohol consumption.

RESULTS AND CONCLUSION

The drunken driving alert device is hence successfully made and implemented. The device remains powered as long as the vehicle is moving; the sensor keeps testing for the presence of alcohol in the atmosphere of the car, the raspberry pi keeps sending data values to the cloud and the GPS keeps tracking the current location. As soon as the sensor detects alcohol presence, the condition to send alert message becomes true and the required message is sent in a few microseconds.

The embedded system solution which is proposed here has given good results in the experiments conducted. It is compact, very reliable, has high sensitivity, fast response and long lifetime. If this system is implemented in the future cars, it can provide a cost-effective and power-efficient solution to the major social problem of drunken driving. Not only for cars, this prototype has a wide range of applications and thus can be deployed in many areas.

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