IoT Enabled Smart Vehicle Safety System

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ABSTRACT

The exponential growth of the metropolitan cities of the country has generated and magnified urban sprawl into problematic proportions. Lack of efficient traffic control and management has many times lead to the loss of lives due to ambulances getting stuck in traffic jams.At present criteria, we cannot detect where the accident has occurred and hence no information related to it, leading to the death of an individual. The research work is going on for tracking the position of the vehicle even in dark clumsy areas where there is no network for receiving the signals.Our project will provide an optimum solution to this drawback. The proposed system has a GPS for tracking the position of the vehicle, GSM is used for sending the message and the ARM controller is used for saving the mobile number in the EEPROM and sends the message to it when an accident has been detected. An LCD display is used to display the latitude and longitude values and as well as speed in knots. Once the accident is held up an alert will be sent to the concerned mobile number for rescue. The device is also encompassed with an alcohol sensor in order to sense the alcohol consumption level of the driver. If the driver has consumed alcohol the vehicle will automatically get stooped and an intimation message will be transmitted to the concerned person or family members to rescue the driver. In this project, the vehicle is designed in a way of controlling it with a mobile device via Bluetooth. An obstacle sensing device is also placed in the vehicle so that when an obstacle is sensed at a distance of 40m, the speed of the vehicle will automatically get reduced without any manual operation.As there is a scope for improvement and as a future implementation we can add a wireless webcam for capturing the images which will help in providing driver`s assistance.

Keywords- **Iot, Microcontroller, GPS, GSM, ADXL335, HC-05, Mq3, L298N, Accident alerting system, Mobile controlled vehicle, Alcohol monitoring.**

I. INTRODUCTION

The Life of the people is under high risk. This is because of the lack of the best emergency facilities available in our country. An automatic alarm device for vehicle accidents is introduced in this project. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving valuable lives. A Switch is also provided in order to terminate the sending of a message in a rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of accelerometer (ADXL335). This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way. The high demand for automobiles has also increased traffic hazards and road accidents.

II. RELATED WORK

[1] proposed an alcohol detection and motor locking system. They used the AT89S51 controller, MQ-3 alcohol sensor, and an LCD to notify the occupiers of a car. The AT89S51 controller has an onboard flash memory which allows fast development and reprogramming in a matter of seconds. Kousikan., Sundaraj [2] employed an infra-red (IR) alcohol detection system to provide continuous monitoring of a driver's BAC. An IR source LED-894 was used to direct IR energy through an IR sensor (TSOP 1736) mounted on the steering wheel. The activation of the relay circuit is made possible by an interface of IC-4538B and transistor-BC 547. Pratiksha et al.

III. PROBLEM IDENTIFICATION

Regularly, in metropolitancities, most of the accidents are due to drunken drivers and there is no emergency alert

system persisting in the vehicles. It is difficult for the policemen to check whether all the drivers are in a normal state or drunken state. By checking the drivers one by one simultaneously, it is creating a huge traffic jam. Whenever an accident is being held, there is no method of passing the information to the nearby hospitals immediately. Because of the poor emergency alert facility, the drivers who met with an accident are dead.

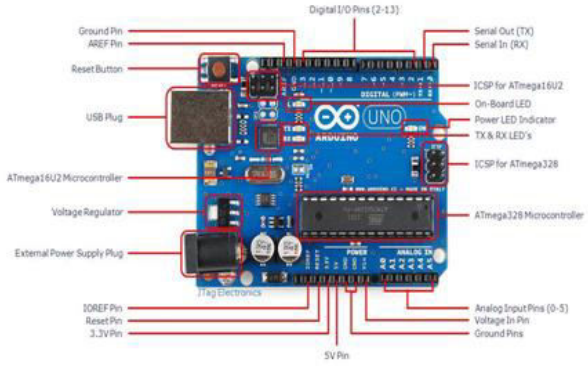
IV. PROBLEM SOLUTION

A system has been proposed, which has a GPS for tracking the position of the vehicle, GSM is used for sending the message and the Microcontroller is used for saving the mobile number in the EEPROM and sends the message to it when an accident has been detected. An LCD display is used to display the latitude and longitude values and as well as speed in knots. Once the accident is held up an alert will be sent to the concerned mobile number for rescue.Ultrasonic is indulged to sense the object at a distance of 4m and automatically reduce the speed of the vehicle when an obstacle detected without any manual operation.On the basis to prevent accidents, alcohol consumption level of the driver and drowsiness is measured and if there is any abnormality in the sensed data then the vehicle will stop automatically without any manual operation. A smoke sensor is placed near the engine so that when smoke is persisted, it will be intimated to the driver immediately by activating the alarm.

V. HARDWARE USED

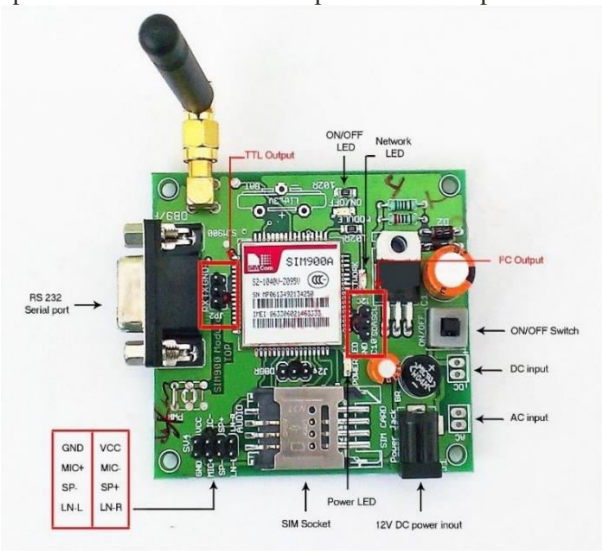
5.1. Arduino UNO

The proposed system is built around ATmega328 Arduino Uno microcontroller board. The unit consists of 14 pins which allows inflow and outflow of feeding (it is possible to use 6 of those pins as Pulse Width Modulation signal outputs), 6 continuous signal with time changing quantity, 16 megahertz electronic oscillator, a Universal Serial Bus port, a power connector, an onboard voltage regulator, ICSP header, and a reset button. The Atmega328 has 32 KB flash memory, 2 KB SRAM and 1 KB EEPROM.



5.2. GSM Module

SIM900 GSM module is preferred for this project for communication between an accident detector and alert system and mobile phone. It is basically tri-band work on various frequency range (EGSM 900 MHz, DSC 1800 MHz, and PCS 1900 MHz). In order to make communication between GSM mobile and ArduinoUno, we had only used Rx pin of GSM module and Tx pin of Arduino pin.



5.3. GPS Module

SIM28ML GPS module is preferred for this project. The main function of this module is to transmit location data to the ArduinoUno. The connection between ArduinoUno and GPS module is set by connection to transmit pin Tx of GPS to ArduinoUNO Rx pin. This module operates in L1 frequency (1575.42 MHz) and up to a fixed territory of about 10 meters in the sky, it generates accurate information. The output of the GPS module is in NMEA format which includes data like the location in real time.

5.4. Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

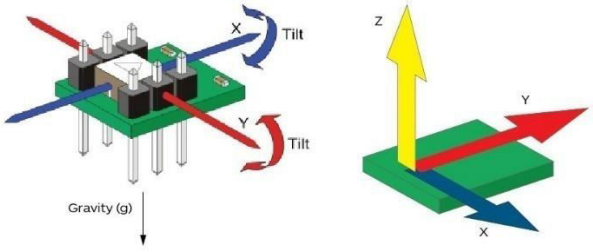
5.5. Motor Controller (L298N)

The L298N is an integrated monolithic circuit in a 15- lead Multi-watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic level sand drive inductive loads such as

relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the inputsignals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional Supply input is provided so that the logic works at a lower voltage.

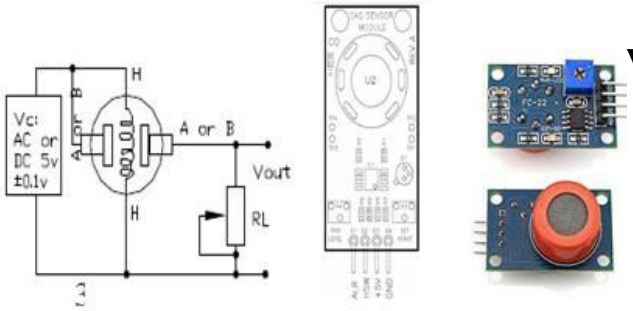
5.6. Accelerometer(adxl335)

An **accelerometer** is a device that measures proper acceleration. Proper acceleration, being the acceleration (or rate of change of velocity) of a body in its own instantaneous rest frame, is not the same as coordinate acceleration, being the acceleration in a fixed coordinate system. For example, an accelerometer at rest on the surface of the Earth will measure acceleration due to Earth's gravity, straight upwards (by definition) of g ≈ 9.81 m/s^2. By contrast, accelerometers in free fall (falling toward the center of the Earth at a rate of about 9.81 m/s^2) will measure zero.



5.7. MQ-3 Alcohol Sensor Unit

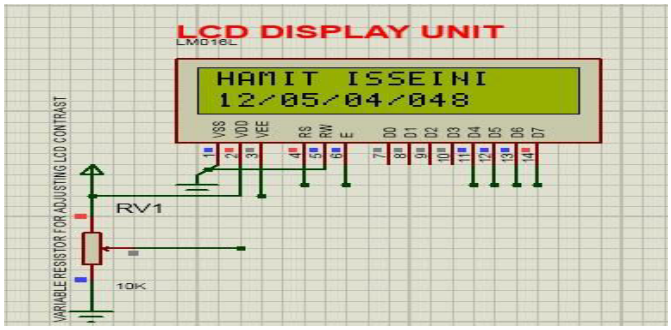
The sensor is made of Tin Dioxide (SnO_2) sensitive layer. The sensor is configured with a high sensitivity to alcohol and small sensitivity to Benzene. It has a simple drive circuit with fast response, stability, and long life. It has an analog interface type. On the sensor, port pins 1, 2 and 3 represents the output, GND and VCC respectively. The circuit diagram of the MQ-3 sensor is shown in figure 3 and 4. In the datasheet, the recommended value to be used ranges from 100k ohm to 470k ohm. Here, 200k ohm was used.



5.8. LCD

The LCD display is used for displaying the message sent from the remote location. The LCD module (Fig. 5) displays alphanumeric, kana (Japanese characters) and symbols. It consists of 16 pins (8 data lines, 3 control lines, 2 power lines, 1 contrast line and 2 pins for backlight LED connection). Data line and control line is connected to the microcontroller. The LCD display power rating is as stated below:

Current (IDD) $(VDD$=5.0$v)$…1.0mA − 3.0$mAmax$ Range of $VDD{-}V0$……..1.5~5.25Vor 5.0±0.25



5.9. Alarm and Indicating Unit

The alarm unit used is a buzzer which indicates when alcohol is detected. The buzzer used belongs to the PS series. The PS series are high-performance buzzers that employ Uni-morph piezoelectric elements and are designed for easy incorporation into various circuits. They have very low power consumption in comparison to electromagnetic units. It has a voltage requirement of 2V and is connected to pin 10 of the microcontroller. The standard resistor value of 220 Ω commercially available is closest to the computed value of 250 Ω, so a 220 Ω resistor was used to limit the current going through the LEDs.

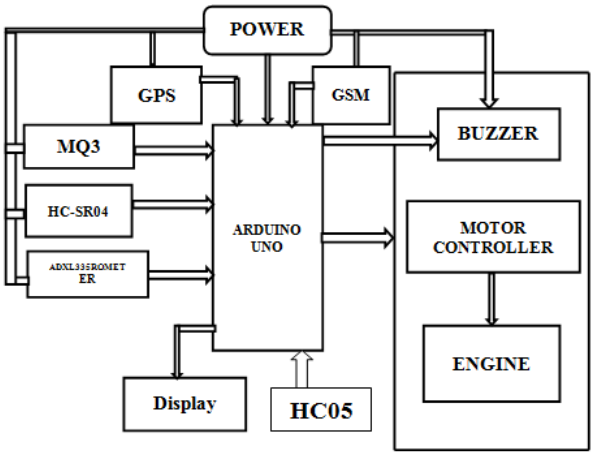
5.10. DC Motor

The DC motor is an electric DC motor used to demonstrate the concept of engine locking. Here in this work, the DC motor will be connected to pin 9 on the microcontroller, when alcohol is detected the DC motor stops in other to indicate that alcohol is detected and continue running when there is no alcohol detected.

VI. METHODOLOGY

This vehicle tracking system takes input from GPS and sends it through the GSM module to the desired mobile/laptop using mobile communication. Vehicle Tracking System is one of the biggest technological advancements to track the activities of the vehicle. The security system uses Global Positioning System GPS, to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send to send the coordinates and the location data to the monitoring center. At monitoring center various software's are used to plot the Vehicle on a map. In this way, the Vehicle owners are able to track their

vehicle on a real-time basis. Due to real-time tracking facility, vehicle tracking systems are becoming increasingly popular among owners of expensive vehicles. The alcohol sensor is placed in the steering of the vehicle. When the vehicle is power on, then the sensor will start sensing the alcohol consumption level of the driver and compares with the predefined level. When there is a variation in the level



VII. CONCLUSION

This project presents vehicle accident detection and alert system with SMS to the user-defined mobile numbers. The proposed Vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding the accident. Experimental work has been carried out carefully. The result shows that higher sensitivity and accuracy is indeed achieved using this project. EEPROM is interfaced to store the mobile numbers permanently. This made the project more user-friendly and reliable. The proposed method is verified to be highly beneficial for the automotive industry.

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