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Health Monitoring with Alcohol Detection and Control System Based On IoT

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Abstract:
Accidents caused due to drunken drive are increasing tremendously in this modern world. To prevent these kinds of accidents, we propose an IoT based health monitoring system with alcohol detection and control. The proposed project is designed to reduce accidents caused due to drunken driving. Globally the cases of accidents are increasing due to this aspect. In order to prevent these accident cases, in this project an IoT based method has been designed. In that Arduino, Alcohol Sensor, Heart beat rate sensor, Global System for Mobile communication, Wi-Fi modem, are utilized. Once the alcohol rate and heart beat rate are exceeding the specified limit, the command will be given to the ignition system of the vehicle to stop the operation of the vehicle.

Keywords: Arduino, Alcohol sensor, Heart beat rate sensor.

I. Introduction

IoT (Internet of things) based health monitoring with alcohol detection and control is an innovative system that combines the power of IoT, alcohol detection, and engine control to improve safety and health in various industries, including transportation, healthcare. The system is designed to monitor the health status of individuals, particularly those who work in hazardous environments, such as drivers. It uses senor, such as heart beat rate sensor to collect the data on the user's health status in real-time. The alcohol detection feature of the system uses alcohol sensor (MQ-135) to detect the alcohol levels in the users breathe. This feature is used to control the drunken drive accidents. The engine control feature of the system is designed to prevent accidents caused by impaired drivers. The system can detect if the user has consumed alcohol above a certain threshold, and in such cases, it can automatically disable the engine of the vehicle, preventing the user from operating. Overall, IoT based health monitoring with alcohol detection and control is an innovative system that can significantly improve safety and health in various industries. It can help prevent accidents caused by impaired drivers, reduce the risk of health-related incidents in hazardous conditions.

Mugila et al [1] proposed that wearing smart helmet to prevent any mishap is suggested by writer which have certain deficiencies. Firstly, restrictions on the use of helmets to only 2 wheelers. Secondly, microcontrollers are software based mega system in comparison to the economical siren that are open-source hardware. Pavan Shukla et al [2] proposed that the design and implementation of an Alcohol Detection with Engine Locking for cars using the Ultrasonic Sensor and Arduino UNO as the MCU (Master Control Unit). The system will continuously monitor level of alcohol concentration in alcohol detection sensor and thus turn off the engine of vehicle if the alcohol concentration is above threshold level. The model will also send the

message of whereabouts of the vehicle through SIM900A. The project provides an efficient solution to control accidents due to drunk driving. Pramod Gadekar et al [3] proposed that by integrating alcohol sensor with Arduino board. Arduino processor ATmega328 is able to handle more functions than conventional microcontrollers. The alcohol sensor used in this project is MQ3 which to detect the alcohol content in human breath. Since sensor has fine sensitivity range around 2 meters, it can suit to any vehicle and can easily be hidden from the suspects. This project is fitted inside the vehicle. The project is designed for the safety of people sitting inside the vehicle. Viswanatha et al [4] proposed that the system has demonstrated three ways of detecting alcohol level in the body of the car driver and prevent car driver from driving the vehicle by turning off the ignition system. It also sends messages to concerned people. In order to detect breath alcohol level MQ-3 sensor is included in this module along with a heartbeat sensor which can detect the heart beat rate of driver, facial recognition using webcam & MATLAB and a Wi-Fi module to send a message through the TCP/IP App, a Raspberry pi module to turn off the ignition and an alarm as prevention module. Diwakaran et al [5] proposed the alcohol detection system is mainly integrated and developed for road transportation Safety for the people who are living in the smart cities can enjoy the availability of Alcohol detection system. This mainly works with the help of IoT. When it traces the breathing levels of host and trigger the necessary actions like deny the driving availability and reduces majority of the drunk and driving accidents. Gupta et al [6] proposed Alcohol Detection with Vehicle Controlling. A liquor finder and a GPS is used for this. And where as GSM is associated with Arduino. The liquor inside the body of a person crosses the limit the Arduino will stop the vehicle and GPS sends the location of the drunker person to their family/police. Goswami et al [7] proposed that Android based rush and drunk driver alerting system. DUI is the system we used for detecting the alcohol present in the vehicle where the DUI works when there is presence of alcohol the vehicle stops and sends the alert message to the police /family. Jiangpeng Dai et al [8] proposed that Drunk driving, or officially Driving Under the Influence (DUI) of alcohol, is a major cause of traffic accidents throughout the world. In this paper, we propose a highly efficient system aimed at early detection and alert of dangerous vehicle manners typically related to drunk driving. The entire solution requires only a mobile phone placed in vehicle and with accelerometer and orientation sensor. Piyush Vinay Phalak et al [9] proposed that highly efficient smart mobile phone sensor based drunk driving detection system via this paper. The hardware as well as the smart phone, which will be placed in the vehicle, will collect and analyze the data from specialized sensors to detect if any violations such as driving under alcohol influence are detected. We expect the system to present solution that observes very low false positive and negative rates, accurate evaluations. In the future might integrate more additional features to make it more efficient. Dwipjoy Sarkar et al [10] proposed that a distinct system is designed which combines the application of computer vision with embedded systems and are targeted for reducing road accidents due to driver drowsiness and alcoholic intoxication. Development of software algorithm is completed which is partially tested and found successfully working. The research is still in continuation to develop it into a full-blown system. There is much yet to improve and work on in this field. Dhivya et al [11] proposed an effective prevention mechanism is to provide awareness and safety mechanism to the driver.

Major cause of vehicular accidents is alcohol consumption. This paper introduces methods such as alcohol detection, a heart rate monitoring system, and a personal identification system and discusses how they can be implemented to avoid accidents. Parameswaran et al [12] proposed that vehicle accident detection and alert system with SMS to the user defined mobile numbers. The GPS tracking and GSM alert-based algorithm is designed and implemented with ATMEGA 8A MCU in embedded system domain. The proposed Vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding 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. Baskett et al [13] proposed that preliminary work towards a smartphone-based wireless body area sensing system that will be used to improve current methods and provide realtime interventions if necessary. This system consists of several wearable sensors for measuring physiological data, a smartphone, and a web server. The smartphone is the centre piece, responsible for collecting sensor data, interacting with the user, performing real-time computation, and communicating with the web server. The system collects physiological data, self-reported emotional and behavioural state, and other user context data such as GPS location or ambient audio recording.

II. Proposed methodology

In this proposed module, An MQ-135(alcohol) sensor is placed to detect the alcohol consumption level of driver and heart beat sensor is placed motorbike to monitor the heart beat rate. The results obtained from sensors are constantly updated to cloud using IoT. When the values obtained from alcohol sensors attains the threshold limit (0.04 mg/ml to 50 mg/ml) then the system prevents the chances of accident by stopping the vehicle ignition system and stores the alcohol consumption values of the vehicle user. The heart beat rate of the driver is also continuously monitored with the help of appropriate heart beat rate detection sensor and the data are updated in the cloud. In case of any abnormal detection in heart beat rate of the driver, then the current status of the person is informed to their contacts through Global system for mobile communication. Whenever the accident happen the accident switch is used to send the message to the respective mobile numbers with the help of GSM, when we hold accident switch for 3 seconds. The ARDUINO plays an important role in this system, It is connected with alcohol detection and heart beat rate sensors which helps to update the values to the user of the vehicle. It has a built-in Wi-Fi module which is responsible for cloud updates when it is connected to the internet. The sensed values from sensors are continuously updated in the vehicle owner's cloud storage. The proposed module includes different aspects such as Development, Testing, Deployment, Maintenance and support.

Design: In the design stage, the requirements of the system are defined based on the needs of the target users. This includes defining the sensors to be used, the data to be collected, and the algorithms to be developed for detecting alcohol levels and controlling the engine. The system design should also take into account the security and privacy concerns of the users.

Development: The development stage involves building the hardware and software components of the system. This includes the sensors, the data

collection and processing should be designed to enable remote monitoring and control of the system through a web-based interface or a mobile app.

Testing: The system should be tested in a controlled environments to ensure that it meets the performance and accuracy requirements. This involves testing the sensors and algorithms under different conditions and scenarios to ensure that they can detect alcohol levels accurately and control the engine effectively.

Deployment: Once the system has been tested and validated, it can be deployed in the target environment. This involves installing the sensors, connecting the system to the internet, and configuring the control mechanisms. The system should be tested again after deployment to ensure that it is functioning correctly.

Maintenance and support: The system requires regular maintenance and support to ensure that it continues to function correctly. This includes updating the software and firmware, replacing faulty sensors, and providing technical support to users.

III. BLOCK DIAGRAM

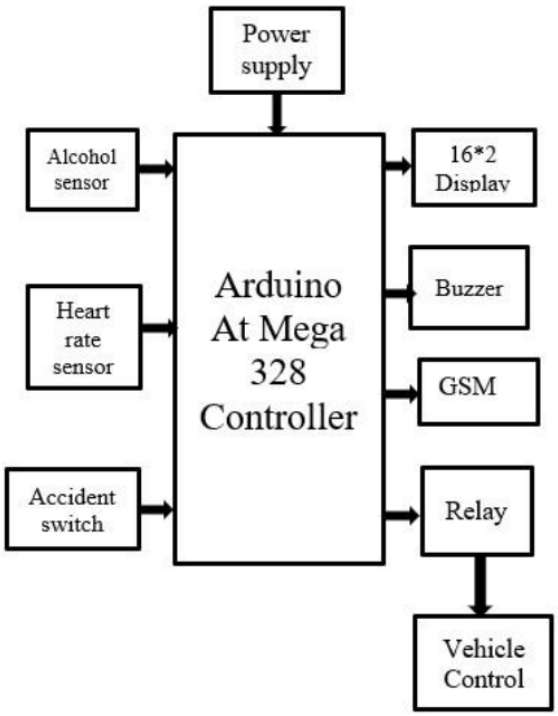


Fig. 1 Block Diagram

In the above fig1., MQ135(alcohol) sensor is placed to detect the alcohol consumption level of driver and heart beat sensor is placed at the handle-bar of the motorbike to monitor the heart beat rate. The results obtained from sensors are constantly updated to cloud using IOT. When the values obtained from alcohol sensors attains the

threshold limit (0.04 mg/ml to 40 mg/ml) then the system prevents the chances of accident by stopping the vehicle ignition system and stores the alcohol consumption values of the vehicle user. The heart beat rate of the driver is also continuously monitored with the help of appropriate heart beat rate detection sensor and the data are updated in the cloud. In case of any abnormal detection in heart beat rate of the driver, then the current status of the person is informed to their contacts through Global system for mobile communication. The ARDUINO plays an important role in this system. It is connected with alcohol detection and heart beat rate sensors which helps to update the values to the user.

It has a Wi-Fi module which is responsible for cloud updates when it is connected to the internet. The sensed values from sensors are continuously updated in the vehicle owner's cloud storage.

Alcohol sensor

The fig. 2 explains the MQ-135 sensor which detects the presence of alcohol consumed by the driver. It can sense the alcohol content ranging from 0.04mg/L to 4mg/L. It can operate at temperatures between -10'C to 50'C.It requires a minimum power supply. The alcohol sensor is technically referred to as a MQ135 sensor which detects ethanol in the air. When a drunk person breathes near the alcohol sensor it detects the ethanol in his breathe and provides an output based on alcohol concentration.

Fig.2 MQ-135AlcoholSensor

It consists of total 6 pins, but we use only 4 pins. The two pins A, H are used for heating purposes and the other two pins are used for ground and power. The air exhaled by the driver is monitored continuously with MQ-135 sensor and updated in the cloud. When the values detected from the sensor attains the threshold limit, then the vehicle ignition system will stop resulting in accident prevention.

Heart Beat Monitor Sensor

The heart beat rate of fig. 3 of the driver is detected using a heartbeat monitoring sensor. The sensor board consists of IR(Infra-red) transmitter and IR (Infra-red) receiver, which are placed in straight line to each other. It also has 3pins(ground, power supply, output). In order to measure the pulse rate, the finger is placed in between the IR sensors. This sensor module is attached to the handle-bar of the motorbike. The variation in the IR sensor readings provides the appropriate heartbeat rate of the driver. When an abnormal heart beat rate is detected, then the current health status of the driver comprising of his/her heart beat rate is send to the irrelative through IoT.

Fig.3Heart Rate Sensor

Gsm Modem

In the below fig. 4 GSM is a digital cellular communication standard that is universally accepted. The European Telecommunication Standards Institute created the GSM standard to define the procedures for second-generation digital mobile networks that are used by devices such as mobile phones.

Fig. 4GSM Module

Relay

In this project relay of fig. 5 plays the key role as it controls the vehicle operation. The relay will be connected from Arduino to the Ignition switch of the vehicle which is connected to the battery. It will turn on the vehicle through producing high voltage spark in the engine through which the vehicle will start. The relay will act as a switch between the battery and the ignition switch. Whenever the alcohol rate exceeds the threshold level then the Arduino will send the command to the relay to stop the connection between the ignition switch and battery. As a result, high voltage spark in the engine will not be produced. Thus, the vehicle operation will be stopped.

Fig. 5 PCB Power Relay

Internet Of Things

In the below fig. 6 The network of physical devices, home appliances embedded with electronics, sensors, software, actuator and network with proper internet, connect together to store, share, process data is called as Internet of Things (IoT). The applications for internet connected devices are extensive. IoT helps object to sense data and control it remotely. The system consisting of network connected embedded devices with minimum CPU, power resources and memory is

responsible of collecting appropriate information from natural ecosystem to perform the proposed function.

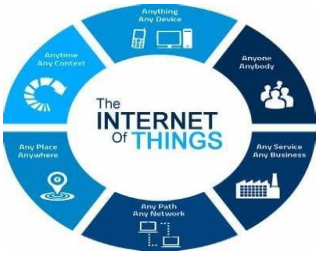


Fig.6InternetofThings

Push Button Switch

A Push Button switch of fig. 7 is a type of switch which consists of a simple electric mechanism or air switch mechanism to turn something on or off. Depending on model they could operate with momentary or latching action function. The button itself is usually constructed of a strong durable material such as metal or plastic. It is a mechanical device used to control an electrical circuit in which the operator manually presses a button to actuate an internal switching mechanism.

Fig. 7 Push Button switch

We also included this switch which operates as an accident remainder. Whenever the person is

subjected to an accident then by pressing this switch button for 3 seconds a message will be sent through the GSM module.

IV. RESULTS AND DISCUSSION

In this system, An MQ-135(alcohol) sensor is placed to detect the alcohol consumption level of driver and heart beat sensor is placed at the handle-bar of the motorbike to monitor the heart beat rate. The results obtained from sensors are constantly updated to cloud using IoT. When the values obtained from alcohol sensors attains the threshold limit (0.04 mg/ml to 50 mg/ml) then the system prevents the chances of accident by stopping the vehicle ignition system and stores the alcohol consumption values of the vehicle user. The heart beat rate of the driver is also continuously monitored with the help of appropriate heart beat rate detection sensor and the data are updated in the cloud. In case of any abnormal detection in heart beat rate of the driver, then the current status of the person is informed to their contacts through Global system for mobile communication. Whenever the accident happen the accident switch is used to send the message to the respective mobile numbers with the help of gsm, when we hold accident switch for 3 seconds. The ARDUINO plays an important role in this system, it is connected with alcohol detection and heart beat rate sensors which helps to update the values to the user of the vehicle. It has a built-in Wi-Fi module which is responsible for cloud updates when it is connected to the internet. The sensed values from sensors are continuously updated in the vehicle owner's cloud storage.

Table 1: Time taken by Module to send message

Activity	Action	Time in sec.
Alcohol level exceeds the limit	Off the ignition of vehicle	3.54
Message sent to mobile through gsm	Send message	8.28
Graphs and updating of values in things view app	Shows the values of Alcohol, Heartbeat and accident switch	9.43
Alcohol sensor sensing the alcohol level	Light will on after sensing	4.23

The above table 1 has explained about what is the time taken by module and gsm to off the ignition and send the message to the respective mobile numbers. And graphs and values of alcohol rate, heart beat rate, accident switch button are shown in things view app and alcohol sensor sensing the alcohol level.

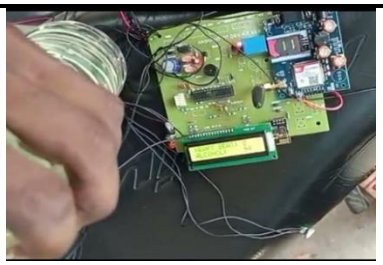
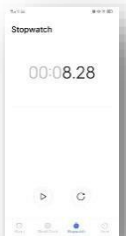


Fig. 8(i)Alcohol rating exceeds

Fig. 8(ii)SMS through GSM

In the fig. 8(i)& fig. 8(ii) proof for alcohol rate exceeding and message sent to mobile through gsm.
The message sends to the mobile numbers which



are connected to the GSM.

Fig.8(iii)Time taken to send the message by GSM to mobile

Fig.8(iv)Time taken bythe module to stop the ignition and Time taken to update value in app

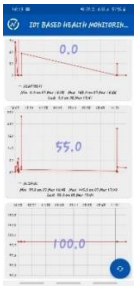


Fig. 8(v) Graphs on Thinks View App

Vehicle name	Honda Activa 4g
Vehicle braking	130 mm drum brakes
Vehicle CC	109cc
Vehicle battery	AmaronABR-PRAPBTZ4L(3Ah)

In the above fig.8(iii), fig.8(iv) & fig.8(v) shows the time taken by the module to stop the ignition of the vehicle is **3.54seconds**. The time taken by the GSM module to send the message is **8.28seconds**. The graphs and values are updated in Thinks view app within **9.43 seconds.**

In the above table 2, the vehicle specifications are mentioned with respect to type of vehicle, CC, braking and battery.

Advantages:

1. The proposed module can reduce the accidents due to drunken drive.
2. The module is useful to observe the user's position whether they drunken or not.
3. In the module the accident switch button is added additionally to send the message with help of GSM to the respective mobile numbers and will upload in the thinks view app.
4. In this, the module is connected to the ignition switch of the vehicle and it stops the operation as off when the value exceeds the limit within 4 seconds which is very fast when compared to other modules.
5. This module can be very helpful for police to decrease the drunken drive accident cases.
6. The app can be installed by mobile users and enter the channel ID to see the current status.

V. Conclusion And Future scope

In conclusion, the proposed IoT-based health monitoring system with alcohol detection and control provides an efficient and reliable way of monitoring alcohol intake and preventing drunken drive cases. With the help of this module, the respective mobile number users can monitor their alcohol consumption using the Think's View App and by using the GSM the SMS sends to the user Contact numbers.

In future, GPS can be added to this module to send the geographical location of the drunken driver to the nearby police stations to take prior actions before any disaster happens to the lives of people.

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