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Smart Vehicle Transportation System Using Node MCU

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Abstract: *In this paper, vehicle accident monitoring and tracking systems are implemented using IOT webpage acting as a medium for data transfer and visualization. The system is developed to monitor various driver help parameters like seatbelt earing, speed indication, and vehicle parameters like GPS Module, the distance between the vehicles and tracking of the live location of the Vehicle. The Ultrasonic sensoris placed in the frontpart of the vehicle, if any two vehicles draw near to one another then an alert message is sent to the SMS through IOT Webpage application. The seatbelt sensor is placed in the side part. When the panic button is pressed, the panic alert messageis send to SMS(IOTWEBPAGE) The developed system takes care of vehicles and s driver's safety.*

Key Word: *NODE MCU,IOT Webpage, GPS, Sensors.*

I.INTRODUCTION

The urban expansion, vehicle ownership surged, causing increased traffic congestion and accidents. As a result, sustainable urban development, especially smart city construction, faces severe challenges. Hence, it has become the top concern of all social communities to tackle traffic problems. To this end, the Intelligent Transportation System (ITS) might come into play and offer a new silver ling for traffic problems. Among all difficulties, acquiring big traffic data is the most challenging. Indeed, the complex urban conditions and overcrowded population have left the conventional way of traffic control almost paralyzed Thanks to modern technologies, such as the Internet +, Big Data Analytics (BDA), cloud computing, and Artificial Intelligence (AI), ITS-assisted urban traffic The associate editor coordinating the review of this manuscript. So far, research on efficient traffic data collection, processing, and data-based prediction is most prevalent in ITS-related literature. For example, Han studied the on-road vehicle- oriented Information Acquisition Model (IAM) and feature recognition framework based on Deep Learning. They found that the classification accuracy of the fine-tuned multitask Google Net was 99.5%. The positioning accuracy was much higher than in similar research works. Kundu et al. developeda new Deep Learning model for bot net detection and classification and applied it to detect traffic records. It was observed that the developed model was superior to the existing Machine Learning model by clearly explaining model decision-making.

yet they couldn't comprehend that it is the greatest hazard thatmay risk to their lives. Despite with part of checking's a few people still take liquor and drive it prompts peril, it isn't protected to the general population and furthermore to the people in the vehicle. Due to over endure their work or havingless rest hours may likewise prompt laziness and because of that the individual who is driving the vehiclemay fall a rest or close the eyes for quite a while that may prompts deadly accidents, In few cases the temperature inthe motor turns out to be high because of more warmth in the environment or because of loss of coolant these are the most widely recognized issues for the warmth in the engine, Most of the accidents occur because of not maintaining a proper distance between them this is also a serious problem that to be considered, to overcome these issues we had planned a vehicle observing and controlling framework, in that we have utilized distinctive sensors and gathered data from everysensor and data is analyzed using Blynk Application,and we had utilized a GPS module to track the data and here the microcontroller we have used is Node MCU.

II. LITERATURE REVIEW

Das et al[1] proposed a vehicle accident and location monitoring system. This system provides a mechanism to reduce disasters by monitoring eye blinking of the driver, which indicates drowsiness, obstacles located in the road and the drunken state of the driver. Accident and the location of the vehicle are detected. By this system primary care isreceived as the accident information is available Anusha et al[2] implemented a system using LPC2148 and the system has features like storing in the database. The work includes GPS, GSM modules. The framework also detects Alcohol consumption and Engine Temperature, All the values can be seen on the Web page. so safety is provided to the travelers inthe vehicle. Imteaj et al[3] developed an Android-based application that detects an accidental situation and sends an alert message to the nearest police station and medical care center. This application is organized with an external pressure sensor to extract the outward

force of the vehicle body. Hence, the application plays an important role in Post-accident services and could lessen the effect due to an accident Mayuresh et al[4] described a system that uses an open source platform and intended to monitor and trace the location of a vehicle, the framework also checks fuel consumption, ultrasonic and vehicle speed, GPS/GPRS/GSM modules are used for communication. All the values are stored in the data base on the web server.

Prasanth et al[5] are designed and implemented a model that is based on Raspberry Pi and a smart phone android application. The system mainly comprises of three things GPS/GPRS/GSM SIM 900A.The entire setup is placed inside the vehicle. GPRS sends the information to the server and GSM is used for sending the alert messages to the vehicle mobile owner.

Manali et al[6] proposed a system that has an Android mobile assembled with GPS and GSM modules along with a processor that is setup in the vehicle. During the movement of the vehicle, the location of the vehicle is continuously observed in the web server using GPRS.

Harum et al[7] suggested a framework that is based on Raspberry pi that is connected to 3G/4G dongle used as a Modem. The vehicle unit is attached to the vehicle, theattached unit is configured to receive signals from a mobile tower and send it to web server to represent the location on the map in the real time.

Navod et al[8] designed and implemented vehicle tracking, vehicle monitoring, controlling and vehicle status. In this system vehicle door, parking lights, side mirrors aremonitored and controlled by a mobile phone.

III.VEHICLE MONITORING AND TRACKING SYSTEM

The vehicle monitoring and tracking system have been developed in this paper. An ultrasonic sensor is placed in the front part of the vehicle, if any vehicle draws near then alert message is sent to the SMS via webpage application. To avoidthe over speed in the vehicle ultrasonic sensor is utilized and it is placed in the forint part of the vehicle if the speed increases the car increases then Notification is sent to SMS through IOT. If panic button is pressed is in high range then panic alert will be sent. If the person feels drowsiness then itis detected by IR sensor and it will be in on state and an alertis sent to mail saying the driver is in the drowsy state. The values of all the sensors are collected by Node MCU as it has inbuilt Wi-Fi module all the data is transferred to the cloud through Wi-Fi and analysis is done in iot webpage app and notifications are sent according to the conditions.

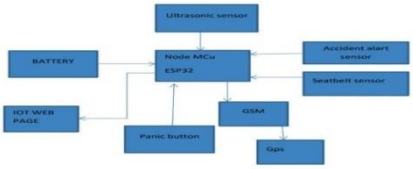

Fig. 1 represents an overview of the proposed system

Sensor:

Choosing a sensor is a difficult task, according to the application requirements we have to choose sensors, if the system has to sustain for long time sensors should work accurately, they should be reliable

Ultrasonic sensor:

Here ultrasonic sensor is used, the reason behind choosing ultrasonic sensor its operation is not affected by sunlight, it has high accuracy rate and stable readings, It is used to detectan obstacle that is near to the vehicle. The sensor used in this prototype model ranges from 2cm-400cm.Ultrasonic sensor mainly comprises of four pins VCC, GND, Echo, Trigger, VCC supply for ultrasonic sensor is usually 5V, GND pin is connected to the ground of the Node MCU, The trig and echopins are connected to the digital i/o pins on the Arduinoboard. To generate the ultrasound, you need to set the trig on a high state and the generated sound will be received by the echo pin.

Fig. 2. Picture of Ultrasonic sensor

We can calculate the distance between the two vehicles byusing the formula

Distance=(0.034 *time)/2

Seatbelt Sensor:

Seat Belt Sensor used in airlines and in almost all automotive vehicles use a reed switch sensor as the most reliable way to detect ifa seat belt is engaged. The sensor detects whether the seat belt buckle is latched or unlatched, allowing the passenger safety system to determine the optimum airbag deployment..

Fig 3: Picture of seatbelt sensor

Accident alert Sensor:

Road accidents rates are very high nowadays, especially two wheelers. Timely medical aid can help in saving lives. This system aims to alert the nearby medical center about the accident to provide immediate medical aid. The attached accelerometer in the vehicle senses the tilt of the vehicle and the a heartbeat sensor on the user's body.

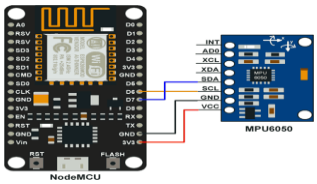

Fig4: Picture of accident alert Sensor

Panic burron:

A **panic button** is an electronic device that can easily be activated to request help during an emergency situation where danger to persons or property exists. A panic button works by sending an instant alarm straight to management or security personnel the moment the alert button is triggered. This emergency alert is sent over a Bluetooth or wi-fi network

Fig5: Picture of Panic button

Node MCU:

The Node Micro Controller Unit (Node MCU) is used as a gateway. It has inbuilt Wi-Fi module which is used to send the sensor data to cloud for storage and analysis. The main reason behind selecting Node MCU is that the sensors used in our project uses only digital pins and one analog pins are required. Also, it consumes less power (3.3v) and is of low cost when compared to other micro controllers /processors like Arduino and Raspberry pi. Node MCU is connected to ultrasonic sensors, gas sensor, temperature sensor, IR sensor.All the values are connected and send to Cloud server.

Fig. 6. Photo representing Node MCU

The ESP8266 is designed and manufactured by Espressif Systems. Node MCU contains all crucial elements of the modern computer: CPU, RAM, networking (Wi-Fi), and evena modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs just $2 USD a piece. The features like establishing a Wi-Fi connection with just few lines of code, Plug and play mode, Programmable Wi-Fi module and Arduino like software and hardware I/O made Node MCU an IoT Tool that is best suitable for variousapplications based on IoT. It has a deep sleep mode which consumes 60mA is useful for low power consumption of an application. Some more features of Node MCU are:

- Voltage:3.3V.
- Wi-Fi Direct (P2P), soft-AP.
- Operating current Average: 80mA
- Flash memory attachable: 16MB max (512K normal).
- Integrated TCP/IP protocol stack.
- Processor: Tensilica L106 32-bit.
- Processor speed: 80~160MHz.
- RAM: 32K + 80K.
- GPIOs: 17 (multiplexed with other functions).
- +19.5dBm output power in 802.11b mode
- 802.11 support: b/g/n.

GPS Module:

Node MCU is ESP8266 based advancement board. It highlights ESP-12E as its handling center. It is a 32bit MCU.It has 14 GPIO pins, single channel 10 bit coordinated ADC. It bolsters UART, I2C, SPI correspondence. It is 3.3V

perfectevent that you are new to Node MCU at that point read our Getting Started with Node MCU.It has four pins VCC, GND, Tx, Rx

Fig 7: Picture representing GPS module

IOT Webpage:

IOT can control hardware remotely. It can display sensor data, visualize. The three main components of IOT Webpage are Data cloud, user interface, system security, data analytics, network interconnection. Using IOT Webpage app we can create different widgets according to the requirements. Webpage server is responsible for the communication between hardware and the smart phone.

Features of IOT platform:

1. Can connect cloud using WIFI, Bluetooth, USB,GSM.
2. Easy to use Widgets
3. Emails, SMS , notifications can be sent

Fig 8: picture representing webpage application

The project should be created in the IOT Webpage after installation and with a particular id project should be created. Then akey is generated to the given SMS and with that particular key hardware can be connected to the cloud platform.

- ❖ Indicating seatbelt wearing or not to SMS throughIOT webpage application
- ❖ Panic alert message is sent to wifi network ofwebpage app(chrome browser)
- ❖ GPS location is sharing to SMS through IOTapplication
- ❖ Ultrasonic sensor is used to indicate the speed to wifi(chrome)
- ❖ Accident alert sensor is notify to indicate an alert meaasage to SMS through IOT webpage application

Fig 9: Image of widgets

There are many widgets in the IOT application. Each widget has its own settings and the widgets are the button, value, slider, timer, joystick,maps .

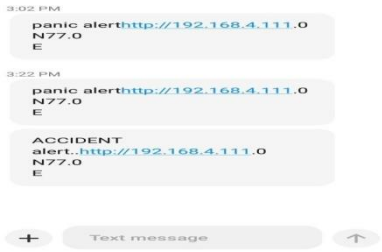

Fig 10: Picture representing widget in SMS app

Selection of pins is important in the widget. There is Digital pin, Virtual pin and Analog pin, a particular frequency can beselected, We can select on the play button and run the project.

IV.RESULT AND DISCUSSION

Experimental Setup:

Fig 11: Set up of Vehicle accident monitoring setup

All the values of the sensors are collected by NodeMCU andare sent to IOT Webpage application.

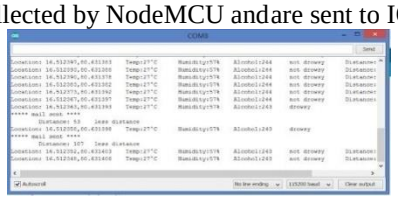

Fig 12: screenshots representing the values and the message displayed on the serial monitor

The location details, seatbelt conditions, and the panic alert and state of the person are displayed on the serial monitor, thevalues of the sensors exceed then notification message will bedisplayed on the serial monitor

The proposed safety system for heavy vehicles makes use of tNode MCU units and suitable out various functions. The important hardware elements used in the proposed peripherals for carrying system. A small-scale embedded system based on Node Micro Controller Unit (Node MCU) isproposed and prototype. This system aims towards intuitive mechanism and will rely on prevention before the worse things occurs RF allows everything to be sensed controlled and monitored remotely using internet enabled devices like computers, mobile phone, Tablets, wearable.

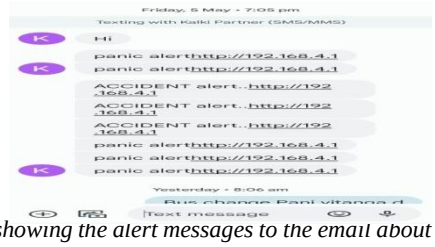

Fig 14: Screenshots showing the alert messages to the email about thestate of the driver

V.CONCLUSION

Implementation of Vehicle Monitoring and Tracking system is implemented using Ultrasonic sensor, Seatbelt sensor, Accident alert sensor, panic buiton, GPS Module to increase the safety of the driver and to avoid accidents, By using this system constant checking of the and also the conditions of the car is checked and also the location of the vehicle is traced. The driver or the person in the car is alerted by the mobile application. The system is cost- effective, dynamic and efficient. The implementation of various techniques has been reviewed and we have suggested a solution in this paper.By this solution we have provided a security to the vehicle owners by providing location tracking, accident alarting, speed , emergency alart etc. There are various ideas are proposed similar with our idea but all the ideas are only for four wheelers and trucks

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