Smart Vehicle Monitoring And Tracking System

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Abstract: Nowadays tracking a theft vehicle or monitoring continuously vehicles, tracking systems have escalated quickly. The major concern of the proposed system is identifying vehicle theft and monitoring its status. We can use this in several ways such as delivering security to vehicles such as bikes or cars and many other vehicles and if there are any goods in the vehicle, with the help of this we can keep track of the vehicle in maps. This is very useful for tracking the movement of a vehicle from any location at any time. In this, we can make a tracking system that is modelled and executed for tracking the signal of any enabled vehicle from any geographical location.

Keywords: Vehicle Tracking , Node MCU, Thingspeak , GPS Sensor.

1.Introduction

The origin of Vehicle Tracking Systems started in the vehicle manufacturing industry. They needed some sort of set-up to know where an individual vehicle was at any time and for how long it has traveled. At first vehicle tracking systems were introduced for light management were submissive tracking systems. In a submissive tracking system, a tracking device is positioned in the vehicle's Global Positioning System location, velocity, heading, and a tripping event such as key on and off, door open or closed. When the vehicle returns to a certain location the device is separated and data is loaded into the computer. A real-time tracking system was needed that could transfer the collected data about the vehicle after regular periods or at least could transfer the information when it is necessary by monitoring the Area. Active systems that transfer vehicle data in real-time via cellular or satellite networks to a remote computer or data center were expanded. countless vehicle systems that are in work. At present, there are some forms of Automatic Vehicle Location (AVL). It is an idea of regulating the geographic location of a particular vehicle and transferring the information to another located server. The location is determined using the Global Positioning System and the transmission system could be a satellite, terrestrial radio cellular network from the vehicle to a radio receiver, satellite, or neighboring cell tower. After

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catching all the data, the tracking data can be transferred using any choice of telemetry or wireless communications devices. GSM is the most widely used service for this action.

2.Block Diagram and methodology

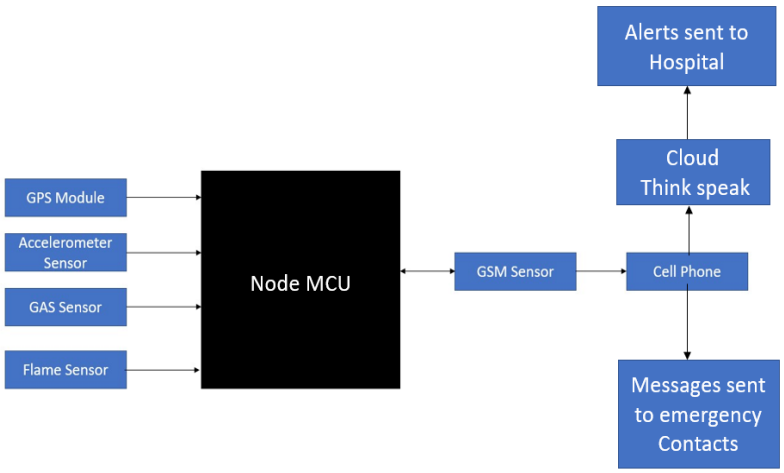


Fig.1. Block diagram

The block diagram (Fig.1.) depicts the various interfaces and components used in the project.

The smart vehicle tracking and monitoring system helps its owner to track down the vehicle and monitor the vehicle at regular intervals of time. Monitoring includes any sudden rise in the temperature or when smoke is detected in the vehicle and any accident has occurred, the owner will get a message using a GSM module through his mobile phone, and also the data is stored in the cloud.

In this mainly there are three sensors (MQ-2 gas sensor, Flame sensor, Adxl345 Accelerometer), SIM900AGSM Module (Global System for Mobile communication) and NEO-6m GPS Module (Global Positioning System) sensor. In this using Node MCU(ESP8266) communication is proposed to the used sensors and other devices. As shown in the block diagram the process is carried out. In the proposed system it is made in such a way that if there is an accident or need to track the vehicle, we can use this system which has been fabricated into a single PCB board. When an accident takes place it automatically sends the alert message to the given phone numbers or emergency contacts and the data is sent to the Think speak cloud platform, which is a free flatform which everyone can use.

2.1Working

When the accident takes place, ADXL 345 or accelerometer sensor detects it, which has three axes (x, y, and z), When any one of these axis changes, in this way it detects the accident, if there is any fire occurs in the vehicle then the flame sensor detects this and hence in this way both the digital values of the accelerometer and flame sensor are read by the esp8266 and hence by the code given in the microcontroller is executed and hence when there is accident, first the main GSM Will be on then; it will need some time to fix the signal because it needs

to communicate over cellular network. Once the GSM is fixed the GPS will automatically be fixed (There will blinking of light every 3 seconds) then according to the code, when the accident or flame occurs the real-time coordinates of the vehicle will be sent to the given phone number or the emergency numbers which have been saved, and the data will also be sent to the cloud server. If we want the location of the vehicle but there is no accident, it can also be achieved by changing the code. In this way, we can use it to track the vehicle if there are any goods and at the same time to monitor the vehicle. Hence in this way, we can find out the real-time location or the exact location of the vehicle in google maps, where the location is sent to the mobile phone through the GSM module. We mount the prototype in the vehicle. In this, we have made both hardware and software (Proteus) Simulations.

Below are the components of the Product.
List of components:

- SIM900A gsm module
- NEO-6m GPS module
- LCD display 16x2
- Node-MCU (ESP 8266)
- Gas MQ-2 Sensor
- Flame Sensor
- ADXL345-Accelerometer Sensor
- Bread Board
- Jumper wires

2.2 Simulation

The "SMART VEHICLE TRACKING AND MONITORING SYSTEM" has been done on a simulating platform. i.e., PROTEUS software. Where all the components and controller are interfaced using multiple libraries and program codes. Connections are made as per the requirements. here in this project, we have used an MQ-2 gas sensor, Temperature sensor, buzzer, Motor, GPS, GSM, LCD display, and a microcontroller (Node-MCU). All the components are connected to the GPIO pins of the microcontroller, and the code is dumped into the source code page. After writing the code we simulate by pressing the run button on the schematic page

3. Flow chart

This code is written for a Node-MCU board that includes several sensors and GSM (Global System for Mobile communications) module. The code uses the Tiny GPS++ library to obtain latitude and longitude from the GPS module. Acceleration data is collected using the Adafruit_ADXL345_Unified library, while the flame and gas sensors are connected to the board as digital input pins.

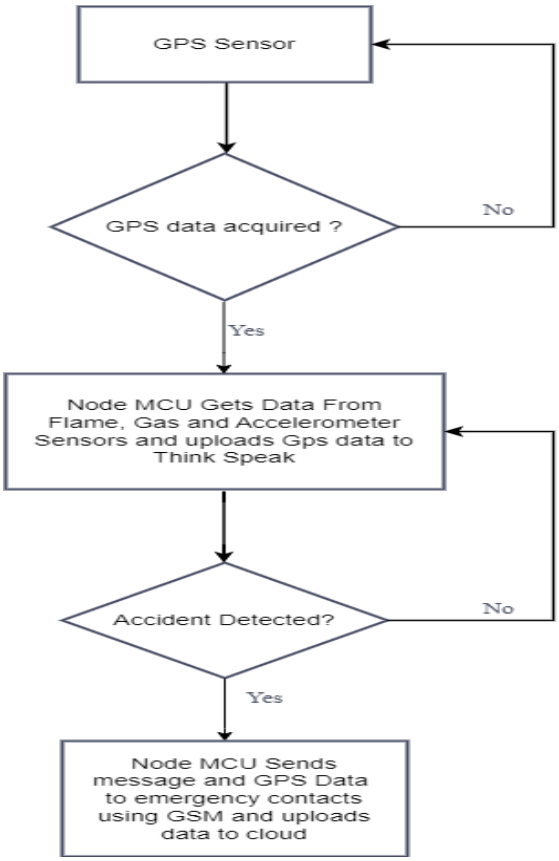
The program reads the GPS data in the GPS_data() function and uses this data to trigger the flame and gas sensors. When either sensor is triggered, the program sends an SMS message to a specified phone number through the GSM module with the coordinates of the location where the sensor was triggered. The coordinates are included in a Google Maps URL to provide a location on a map.

The ShowSerialData() function is used to print the serial data received from the GSM module to the serial monitor. The Cloud_data() function is used to establish a GPRS (General

Packet Radio Service) connection to the internet through the GSM module and to set up the HTTP request to send data to the cloud.

In the loop() function, the GPS_data() function is called to get GPS data and check if the flame and gas sensors have been triggered. If either sensor is triggered, the program calls the GSM_msg() function to send an SMS message and the Cloud data() function to send data to the cloud.

The below flowchart shows how the code works according to the conditions given.



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that if there is an accident or need to track the vehicle, we can use this system which has been fabricated into a single PCB board. When an accident takes place it automatically sends an alert message to the given phone numbers or emergency contacts and the data is sent to the Think Speak cloud platform, which is a free platform that everyone can use.

4. Simulation And Hardware Results:

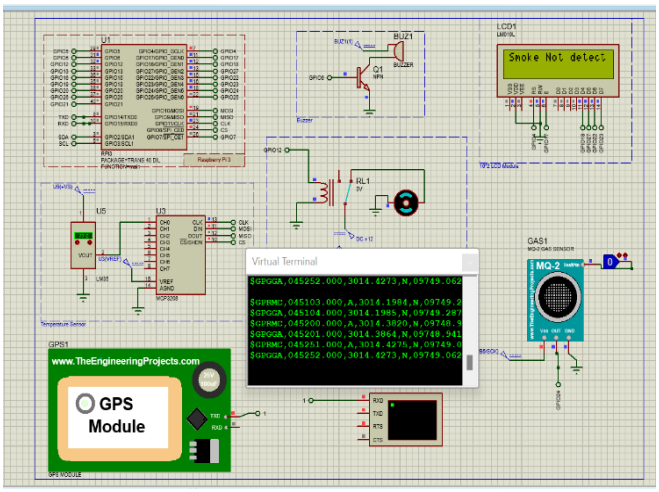

Fig.3. Normal condition (Simulation)

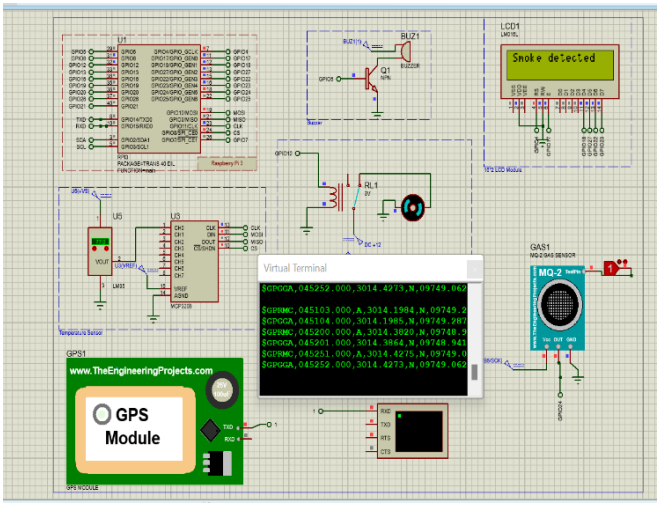

Fig.4. While operating condition(Simulation)

Fig.5. Hardware on PCB

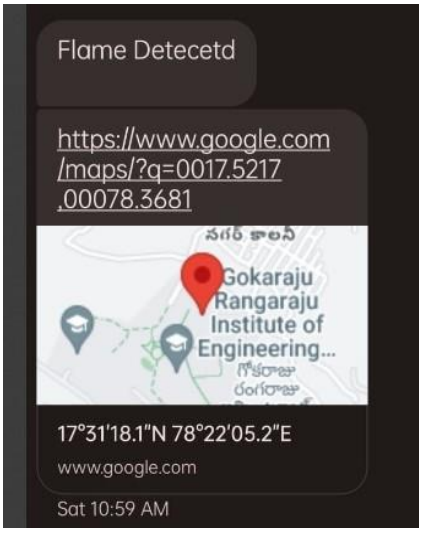

Fig.6. Result

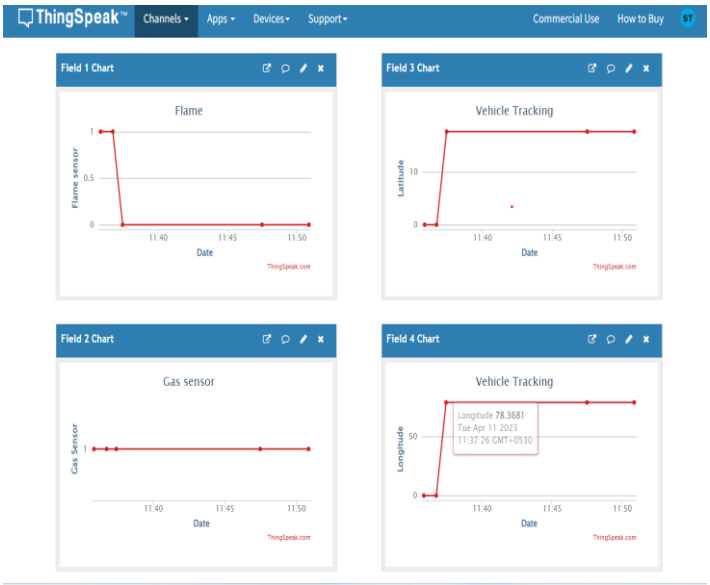

Fig.7. Thingspeak

5. Result

In this project, initially when all the connections are made as per the required model, and the power supply is given to the hardware. At first, the global positioning system (GPS), gets locked and all the sensors are activated. When the vehicle is in normal condition, i.e., without any disturbances or external accidents, there will be no alert sent to the registered number. In

this project there are 4 sensors which help in detecting smoke, gas, fire, accident. As soon as there is a detection in any of these categories, the respective sensor detects the problem in the vehicle and sends a alert to the number assigned in the code. The alert can be sent to multiple phone numbers which should be specified in the programming code. If there is a fire detection in the vehicle, the fire sensor detects the problem and sends a message to the registered phone number regarding the fire that has been detected. This whole process takes 3 to 10 seconds on average. An additional feature included in this paper is that all the data can be stored in the cloud. Thingspeak is a platform that is used as a cloud storage system. The day-to-day data is continuously sent to the thingspeak server which stores the data limitlessly. An additional feedback system is introduced where the user can send a message to the node MCU and can know the status of his/her vehicle.

6. Conclusion

In this paper, the development of the system is discussed. Smart vehicle monitoring and tracking systems have revolutionized the way we track and manage vehicles. With the advancement of technology, it is now possible to monitor a vehicle's location, speed, and other critical parameters in real-time using GPS and other sensors. Such systems not only help in improving the overall efficiency of fleet management but also provide significant benefits in terms of security, safety, and cost savings. By accurately tracking the location and status of vehicles, fleet managers can optimize routing and reduce fuel consumption, resulting in substantial cost savings. Moreover, these systems can also help in improving driver behavior, reducing the risk of accidents, and improving overall safety on the road. In addition, the data generated by these systems can be used for predictive maintenance, allowing fleet managers to identify potential issues before they become major problems. Overall, a smart vehicle monitoring and tracking system is a must-have for any organization that manages a fleet of vehicles. It not only improves operational efficiency but also helps in reducing costs and improving safety, making it a valuable investment for any business. Improves performance monitoring, communication channels, safety and security, and productivity

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