Implementation of Smart Vehicle fleet Monitoring and Reporting System using IoT

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Abstract - The goal of this paper is to introduce the technology behind Vehicle Tracking Systems and Fleet Management Systems, which will benefit a wide range of people, including end customers and commercial vehicle owners, by allowing them to keep track of their moving assets, save money on fuel, identify vehicle misuse, improve operational efficiency, and automate day-to-day operations. The system is designed to track and detect gasoline leakages based on several driver assistance data such as alcohol consumption and vehicle parameters such as fuel level, vehicle position, tracking, and detection of fuel leakages based on fuel level. The devised mechanism ensures the safety of both the vehicles and the drivers.

Keywords: *ESP8266, GPS, IoT, Tracking,Things peak*

I. INTRODUCTION

In a country like India, where the economy is still developing, fuel conservation is critical to the growth process. Approximately 35 percent of the population relies on transportation, and taking public transportation helps to save the majority of the fuel lost. We're working on an Internet of Things (IoT)-based vehicle monitoring system with this in mind. The device uses a gasoline level sensor and the odometer is dependent on GPS to keep track of the vehicle. The gasoline level sensor will be fitted in the vehicle's fuel tank, providing information on the

fuel level at any given time. Every meter covered by the car generates a pulse from the GPS-based odometer. Furthermore, this system is being developed.

The controller, which is related to the GSM/GPRS modem and the detectors, manipulates these data. Using a GSM/GPRS modem, the data is transferred to a cloud database. The cloud database will save all information on the vehicle's status, and a website will be built to showcase the results. All of the information about the vehicle's status is stored in the cloud database

Every day, the fleet managers are faced with many challenging challenges. At present, the technology is not at all to the point that many of the problems can be solved. This article will describe the most functional and technical solutions for fleet management and was Persistent Systems Limited, was formed. Below are the key business requirements of the fleet –

The four biggest challenges facing the Navy, the industry is a –

The Driver of the security behaviour. In the context of the Navy, for the Management of the Accidents in the Study carried out by the IEC in 2016, it was found that the most common forms include: accidents may happen to the speed of the fleet, in reverse. This is not surprising: the number of accidents is on the increase in the back seat, including all the drivers. The common event of an accident, a reason for speeding, traffic violations (jumping svetoforları when the device is switched on, the non- conformity with the road signs), discipline, humiliation, lane changes, driving in a state of intoxication, lack of breaks, eating, or using a mobile phone. You have a big expense in the event of an accident in the navy, including property damage, increased insurance payments, employee benefits, claims, reduced productivity, and, perhaps, at the end of the third-party claim, in order To ensure that only authorized to execute, the rights of your vehicle, and it's also important in order to solve the problem.

A. The Price and fuel efficiency [2]. The ability to model and predict the consumption of fuel is very important in order to improve the fuel efficiency of a vehicle in order to avoid the error handling in the fleet management market. The fuel consumption of a vehicle depends on a number of internal factors, such as the distance of the transport properties of the vehicle, the driver's behavior, as well as external factors such as traffic and weather conditions. However, all of these factors can be evaluated, or it is available for the fuel consumption analysis.

B. See-site parking, and theft in the real world (or the risk) of the theft of the vehicle. As a result, it is a system that allows you to answer a simple question – "where's my car?" A vehicle in the event of a crisis, a severe road traffic accidents, a freak of extreme weather events, the crisis could add up to both drivers and vehicles are at risk. To see the Fleet, will help you to find out if there are assets that impact zones to provide an opportunity to take corrective actions, if needed. An immediate alert is needed if the vehicle deviates from the established route, or stay for a longer period of time at any place. Perishable items (such as drugs, foods, and plants. This word can be used by a manager on the delivery side, or in a logistics company, to crawl. The loss of perishable goods is on the way, which means a loss of revenue. Goods are packed in containers which will be stored in a restricted environment,

such as temperature, humidity, luminosity, etc., to keep the material fresh for a longer period of time. Even more damage to your delicate items, which results in a large number of complaints from customers and a reduction in costs, reduction in the replacement of the faulty items. It's hard to tell who and what is on his way out of the car, and be sent immediately to changes in the event of the opening of the door, vehicle, and any unauthorized location.Damage to Property, Identify the Fake and the original claim from your customers, Abuse, damage to property and theft, as this will lead to insurance claims by customers and can lead to significant losses for the company. Because of the lack of data about the traffic on the road, it is very difficult to determine if the customer's claims are false or to the original source. In the following sections of the article, the technology with the help of the fleet, in order to solve the problems referred to above are discussed in detail.

II. LITERATURE REVIEW

[1] Snehal R Pawar and Ankur B Mokal, and Pankaj P Patil note that this value in the form of safe and efficient traffic flow throughput. Intelligent traffic monitoring, as well as management of traffic as well as intelligent road design, is a product feature. The primary purpose of this research paper is to point out the cars in relation to several zones such as schools, hospitals, and other places where traffic rules are broken. The goal of this paper is to design a Smart Control and Display (SDC) that runs on a computer with inbuilt software and keeps an eye on the area. SDC is designed to be mounted Display's vehicle information on the dash board. As soon as evidenced by the data gathered from the embedded zone a single is available, SDC will show the driver automatically. If the driver does not respond, SDC will automatically reduce speed.

[2] Saket Yadav, Rushikesh Gujar, Mayur Jadhav, and Tushar Limbore discuss ASCMS, an Android application that is friendly, instructive, and time saving. The user can use this app to find and communicate with any nearby automobile servicing center. It also allows the user to select any of the services that are publicly available on a specific site. The user is able to schedule a test drive, have a certain amount of dialect is that, the app and receive an answer via a push-notifications. This app also serves as a reminder of the need to follow up on the services, to EMI, and in the second installment.

[3] This paper describes the design, implementation, and operation of the Fuel Management Systems (FMS) fuel- efficient computing platform. The main purpose of the design is to create a system that can monitor the level of fuel in real time. It is, therefore, intended for the carriage of the preparation of the fuel tanks from the tank farms to the customer, such as gas stations . This application is built with the hard-and software.The fuel level in the diagram, Arduino, Gsm and modules, the make up of the equipment.

III. BLOCK DIAGRAM

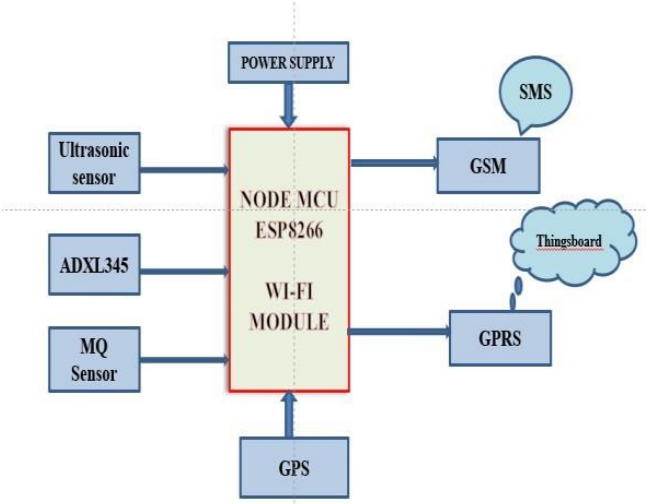


Figure 1 : Block Diagram: Vehicle fleet monitoring system functional pattern.

Fuel theft is a growing problem in today's vehicles. It has an impact on financial loss. A wireless fuel level monitoring system was built to avoid this paper [6]. The Hall Effect sensor and GSM modem are used in this system. The Hall Effect sensor detects the amount of fuel in the vehicle as well as the amount of fuel utilised. The PIC 18F458 in this system provides information to the owner about the amount of fuel in the tank. Microcontroller, GSM module, LCD, and keypad are all part of the system.The fuel level sensor will continuously monitor the gasoline level, and if there is a significant change in the fuel level, the sensor will send a signal to the microcontroller, and the user will receive information in text format via the microcontroller. This smart technology provides access to gasoline use 24 hours a day, seven days a week, and sends out alarms when the tank's fuel level drops suddenly.

As the number of vehicles on the road grows, so does the amount of fuel consume. Fuel prices are fast rising in tandem with the massive growth in fuel use. Fuel bunkers are stealing fuel by exploiting this advantage, and users are unaware because we have no control over the equipment. To keep track of the gasoline level, you'll need a monitoring system. As a result, article [4] offered a methodology for indicating the quantity of gasoline for the amount paid. A sensor for the amount of oil is utilized, which is It's immediately connected to the Arduino Mega and gets real-time data about it. the. To obtain the price of gasoline, a website is built. The user is given a username and password for the administrator on this page. The price of gasoline is only updated on that website. Once the petrol price has been updated, the IOT module will receive it and transmit it to the Mega Arduino. To make the cost showing functionality work, we must send a signal to the controller signalling the need for the petrol price to be displayed. The TFT show off is now utilized to show the price of gasoline when the switch is pressed, and when the key is depressed, the cost is reset to zero[5].

This proposed system includes a mechanism for reducing disasters by monitoring road obstructions and the driver's inebriation level. Accidents, fuel levels, fuel leaks, vehicle tracking, and the vehicle's location are all detected. This system has capabilities such as

database storage. GPS modules are part of the project. Ultrasonic waves and the tank's diameter are used to check the fuel level. The GPS module is used to track the location of a car by measuring its length and distance. To monitor the vehicle, the fuel level and vehicle position are sent to the Thingsboard IoT platform. Alcohol consumption and risk detection are also determined by the framework (ADXL345 sensor). This system employs an ESP8266 NodeMCU for detecting and delivering data to an IoT platform. The data is sent from the controller to the cloud via GPRS technology. Ultrasonic sensor, also known as an ultrasonic transducer, is a device that measures the distance between a target object and the sensor using a transmitter and receiver. The distance between the sensor and the object is determined by the time it takes to extract and receive waves. As a result, the application plays an major role in post-accident services and may help to mitigate the effects of an accident. A system that uses an open source platform for monitor and tracking the location of a vehicle, fuel, and the framework also checks fuel consumption, fuel leakage, and alcohol consumption was described (MQ-3 sensor).The proposed work block diagram consists of following modules:

Alcohol Sensor:

The alcohol sensor detects the presence of alcohol gas in the air, and the analogue electricaloutput rate. With an electrical power of less than 150 Ma to 5V, the sensor can operate at temperatures ranging from 10 to 50 ° C. The sensitivity range is 0.04 to 4 mg / L, suitable for air conditioners.

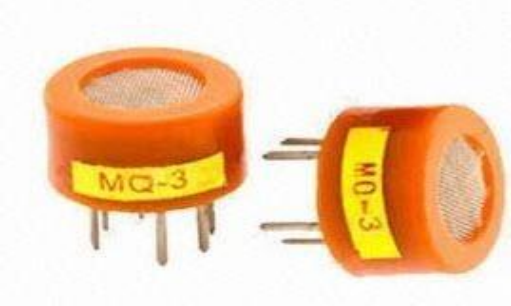


Figure 2 Alchol Sensor

Digital Accelerometer ADXL345 Module:

The ADXL345 features a 3-axis accelerometer, high- resolution sensor with 13-bit, up to 16 g with low power. The digital output according to the 16-bit one, two, or more, can be received via the SPI (3 - or 4-wire) or digital (I2C) interface.The ADXL345 is well-suited for measuring gravity acceleration and strong acceleration caused by movement or shock in the auditory senses. Its high concentration (4 mg / LSB) allows it to measure inclination changes below 1.0 °.

Figure 3 AXDL module

Ultrasonic sensor:

Here an ultrasonic sensor is used, the reason for choosing an ultrasonic sensor, as its function is not affected by sunlight, it has a high level of precision and stability of the expression, it is used to detect obstacles in the vicinity of the vehicle. The sensor was used for the prototype model, the range from 2 cm to 400 cm.

The ultrasonic sensor is mainly used in the four pins, VCC, GND, of the Echo, the Trigger, the VCC power supply to the ultrasonic sensor is usually a 5 pin GND connection to the MCU, the node, the TRIG and echo pins are connected to the digital I / O interface of the Arduino board. In order to generate an ultrasound, you will need to set up the trigger to the high state, it created sounds that made the echo of the input data, and output data. We are able to compute the distance between the two vehicles, use the formula: Distance=(0.034*as)/2

Figure 4 Ultra Sensor

Node MCU:

The node microcontroller unit (Node Controller) to be used as a gateway. It has a built-in Wi- Fi module, which is used for the transmission of the information, sensors, storage, and analysis. The main reason for the choice of the node of the unit is that the sensors used in our project is the use of digital communication and the demands of an analog pin. In addition, it does not waste power in (3.3 v) is a low-cost when compared to other microcontrollers /processors such as Arduino and Raspberry pi. The MCU of the node associated with the ultrasonic sensors, gas sensors, temperature sensors, IR sensors. All the values are plugged in, and will be sent to the cloud server.

Figure 5 photo representing node mcu

ESP8266 design and manufacturing company, Espressif Systems. NodeMCU, all of the key elements of a modern computer's cpu, RAM, networking (Wifi), and even a modern operating system and SDK. When you're buying in bulk, the ESP8266 chip is priced at only $ 2 a piece. Features are designed to detect the connection, and Wi-Fi internet access in just a few lines of code in a Plug- and-play mode, Programmable Module, Wi-Fi and Arduino the software and hardware that provides for input and output, it took a NodeMCU Internet of Things is a tool that is best suited to make it possible for a variety of internet of things (iot)-based applications. It has been in a deep sleep mode, which consumes 60mA, which is useful for low-power applications. Here are a few more of the features of the NodeMCU:

- Operatig Voltage:3.3V.
- Wi-Fi Direct (P2P),soft-AP.
- Operating current Average: 80mA
- Flash memory attachable: 16MB max (512Knormal).
- Integrated TCP/IP protocolstack.
- Processor: Tensilica L10632-bit.
- Processor speed:80~160MHz.
- RAM: 32K +80K.
- GPIOs: 17 (multiplexed with other functions).

GPS Module:

This module is used to identify our location,time, and speed.The figure below shows an NEO-6M GPS module.It does not include header pins because it comes with an external antenna.It has an built-in EEPROM.There are four pins VCC, GND, Tx, Rx.

Figure 6 GPS module

lV. ALGORITHM:

STEP1: When the controller is turned on, it is initialised. The alcohol sensor begins to heat up. The GPS and GSM systems begin looking for a signal.
STEP2: Alcohol sensor begins detecting alcohol level; if alcohol level is found, all users will be notified.
STEP3: GPS device finds out longitude and latitude value and sends data to cloud and display in Google maps.
STEP4: Accelerometer monitors the car inclination; if inclination is greater, an alarm is sent to users , along with the longitude and latitude values in link format for simple tracking.
STEP5: Using a GSM/GPRS modem, the data is transferred to a cloud database.
STEP6: The cloud database will save all information on the vehicle's status, and a website will be built to showcase the results.
STEP7: Every minute, the entire process will repeat again.

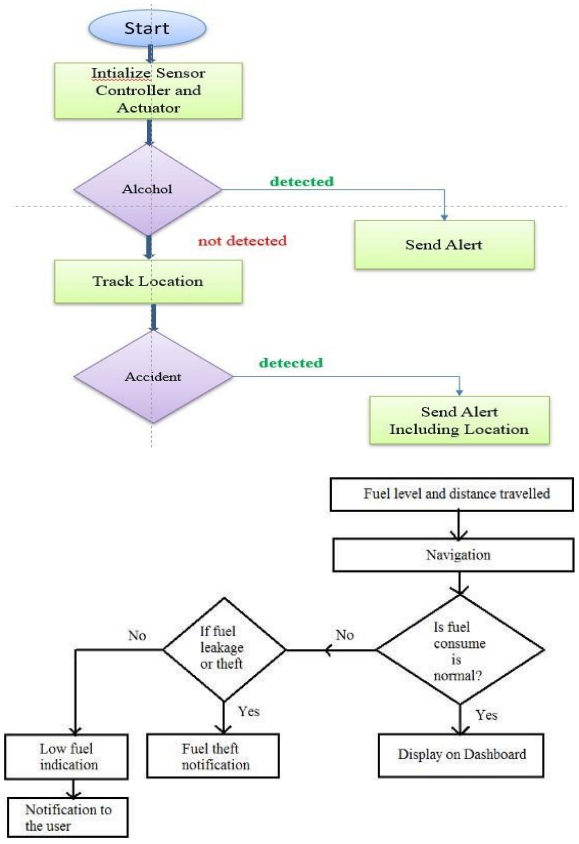
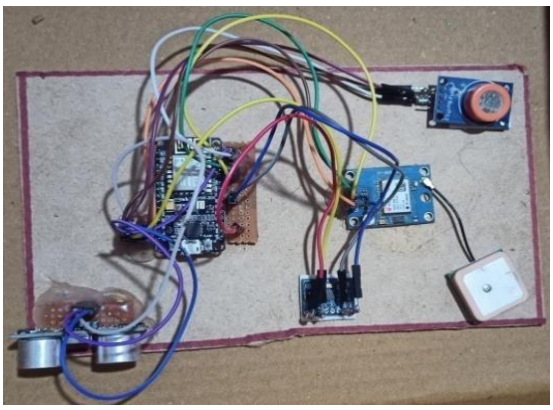


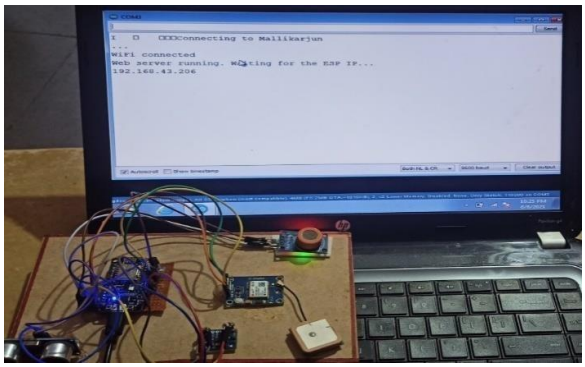
Figure 7 Flow of Execution

V. RESULTS:

We conducted numerous experiments in our college's laboratory in order to determine the vehicle's functionality. The research setting had dimensions of 5m 14m and a surface area of 70m^2. Six BS were mounted in total: one at the initial point, one at the destination point, and furthermore four are strategically placed to ensure that the whole area was covered.

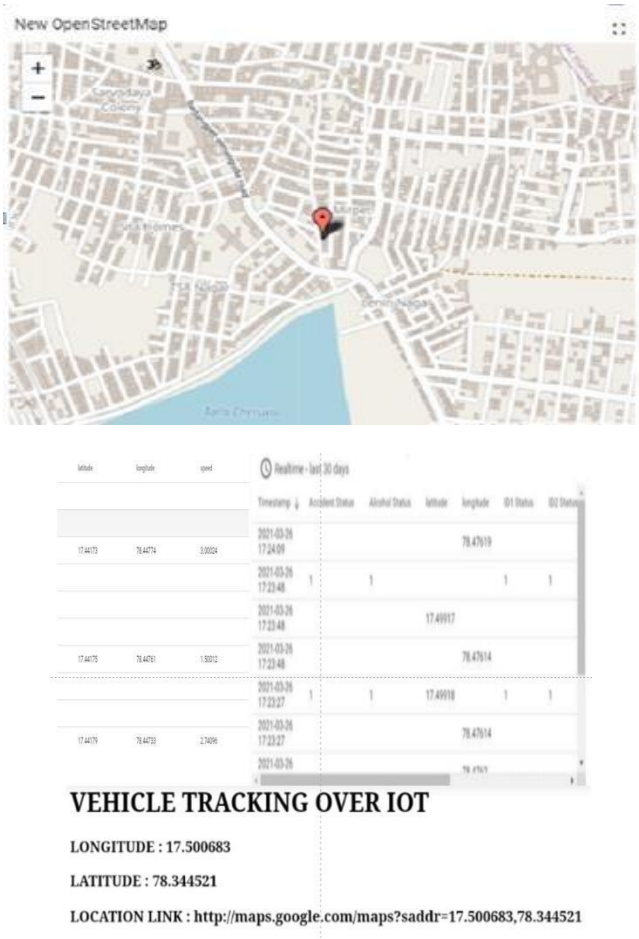


Multiple obstacles of different sizes were strewn about the landscape in various locations. In 5 minutes and 31 seconds, the vehicle navigated from the SP to the GP. The vehicle's average speed was 0.31 meters per second. The Raspberry Pi and LIDAR used an average of 9.5 W, while the installed Direct Current motors used 7.31 W.



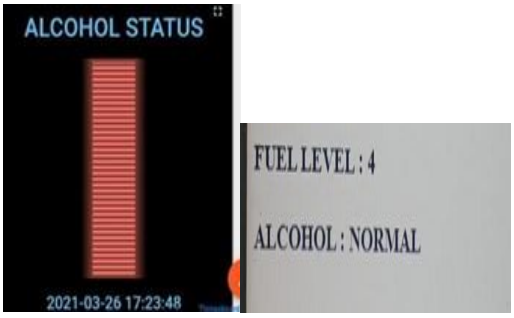
A) **When we need to keep track of the vehicle**:

After blocking the vehicle and finding the exact location, the owner must send a tracking message. The owner finds links to a wide area and tags them in a Google map, as shown below. The car will not start until the owner sends the first message; otherwise, it will be in block mode. At the same time Thing Speak will also log the Latitude and Longitude of the vehicle and present them in the graphs as shown below:

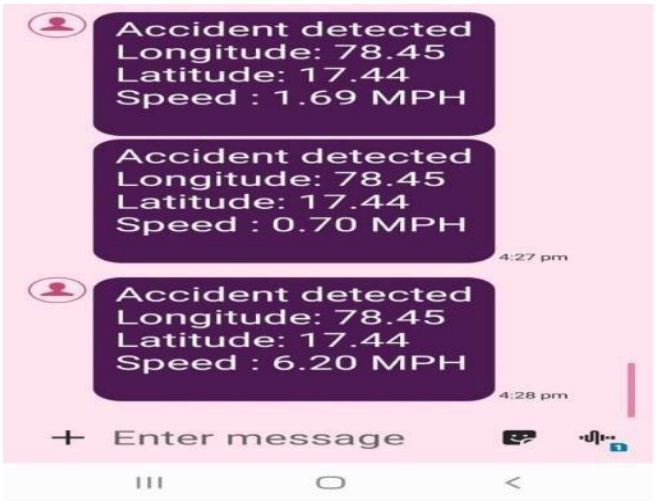


B) When the sensors are active:

We're utilising two sensors here: An alcohol sensor to detect alcohol level and an ultrasonic sensor to detect the distance between the target object and the sensor. When the alcohol sensor is turned on, the controller sends a message to the car owner and updates the data on the Thing speak channel.



C) When an accident occurs, the appropriate sensor will be activated. When the vehicle is in active mode, the owner receives a message with the position information as shown below, and the vehicle immediately stops.



Conclusions:

Ultrasonic sensor, alcohol sensor, and ADXL345 are used in the vehicle monitoring and reporting system. The GPS Module is used to improve driver safety and prevent accidents. The system constantly monitors the driver, as well as the vehicle's condition and location. The driver or occupant of the vehicle is notified. It is a cost-effective, dynamic, and efficient system.

FUTURE SCOPE:

The driver's RF id sensor can be added to the system in the future, and car details can be linked to the driver. The installation of this technology in more vehicles, as well as the development of a separate server and database, will provide more flexibility. GPRS technology consumes more power, thus finding a technique that consumes less power will make the system more energy efficient.

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