FLEET MANAGEMENT USING IOT

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ABSTRACT

Fleet refers to the group of vehicles it can be planes, cars, ships etc. which operate as a single unit. Management refers to monitoring fleet activities and making decisions about proper asset management, dispatch and routing, and vehicle acquisition and disposal. Fleet management refers to all actions that need to take place to keep a fleet running efficiently, on time, and within budget, at the same time the managers need to check for the health condition of the driver. It is important to create a comfortable and healthy ambience for the driver while travelling across polluted areas.

Our idea completely is to manage the vehicle as well as monitor the driver's health condition. Features of our project are authenticating the driver, detecting harmful gases, purification of air, monitoring the health conditions like pulse rate and the alcohol level consumed by the driver, and providing an emergency trigger which can send the location of the truck to the management hub. For the detection of toxic gases present in the cabin, we are using MQ series sensors. We are using the purification method which is 99.97% efficient. And we are providing a widget in the driver's phone which can be used during an emergency. This sends the current location of the driver to the management using IFTTT software without using any external GSM/GPS module. We aim to make smart fleet management using IoT and Image Processing by authenticating the driver such that there is no unauthorized entry in the container, continuously monitoring of truck's internal environment and driver health conditions. Toxic gas detection and purification will create a toxic-free environment in the driver's cabin. This toxic gas detection is part of fleet management.

1. INTRODUCTION

Reference:
https://www.sciencegate.app/keyword/165368

Fleet management:

Our lives would not be complete without transportation. Transportation is the act of moving people or things from one location to another. It plays a significant role in both our social and economic lives by facilitating the transportation of people and things between different places.

Fleet safety is prioritized as a strategic means of enhancing the overall safety of the fleet of vehicles, not just for fleet operators. High safety standards can be specified by corporate buyers of automobiles and transportation services, creating an economic incentive for manufacturers to uphold these standards. From the initial stages of equipment procurement to the final stages of asset disposal, fleet management includes all operations required to maintain and operate pieces of equipment over the course of their lifetime. They include training, safety concerns, inventory control, maintenance and repair, and repairs.

There are two ways to assess a business fleet management process: Haddon matrix is used to examine the organizational safety context in which the program for driver evaluation, monitoring, and improvement should fit.

For fleet safety, Haddon offers a comprehensive pre-crash, at scene, and post-crash systems-based framework. The network influence approach which is given as a risk management method.

The problem of synthesizing a management system has been resolved within the context of the methodological assistance being produced for the planning and management of the fleet of a small shipping firm. Based on the defined prerequisites for the system's operation and methods to guarantee the fleet management system of a small shipping firm functions as intended, the system's structure and parameters are established. The number of vessels under operational supervision determines whether a shipping company is small, medium, or large. The issue of coordinating the work of these elements only arises at the level of operational planning and regulation for small shipping companies because permanent "rigid" connections between the elements of the transport system do not form due to the variability of the economic situation in the transportation market in contemporary market conditions. Hence, limiting the system under study to the context of flight planning is both required and adequate.

The creation of vessel traffic patterns and the assignment of specific vessels to these schemes are two successive subprocesses that make up the fleet management system at this level in commercial shipping. The study's primary finding was the formation of a new management system structure based on a system analysis of processes under the constraints of working with a small fleet and the identification of additional duties and system requirements. Two auxiliary subprocesses have been added to the new structure to manage additional procedures if cargo needs to be unloaded on an unprepared shore. The process of organizing transport vessels has been replaced by the process of establishing the optimal composition of the leasedfleet.

Drivers are essential for transportation. They operate in a variety of fields, such as trucking where you move goods from one place to another place. Typically for a certain business, when transporting goods, a driver is exposed to a variety of environmental factors, including contaminated and toxic air. Asa result of the toxins present in the air, the driver may acquire lung and respiratory ailments. To establish a toxic free and the hospitable Environment, toxic gas detection and purification will be used.

Internet of Things (IoT):

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The network of physical items, or "things," that are implanted with sensors, software, and other technologies for the purpose of communicating and exchanging data with other devices and systems through the internet is referred to as the Internet of Things (IoT). These gadgets include anything from common domestic items to high-tech industrial gear.

IoT has emerged in recent years as one of the most significant 21st-century technologies. Continuous communication between people, processes, and things is now possible thanks to the ability to connect commonplace items such as household appliances, automobiles, thermostats, and baby monitors to the internet via embedded devices.

By means of low-cost computers, the cloud, big data, analytics, and mobile technologies, physical things can share and collect data with minimal human intervention.

There are two ways of building IoT:

1. Form a separate internet work including only physical objects.
2. Make the Internet ever more expansive, but this requires hard-core technologies such as rigorous cloud computing and rapid big data storage (expensive).

Soon, IoT will become broader and more complex in terms of scope.

It will change the world in terms of “Anytime, Anyplace, Anything in connectivity.”

Working with IoT Devices:

i) *Data Collection and Transmission:*
Sensors are frequently utilized in a variety of application areas for this purpose.

ii) Actuate a device in response to signals generated by sensors or processing apparatus:

The action that must be taken is indicated by actuator devices if a given condition is met or if it is triggered in accordance with user requirements.

iii) *Receive Information:*

A user or device can obtain specific information from network devices for analysis and processing needs.

iv) *Communication Assistance:* The phenomenon of communication between two networks or between two or more IoT devices on the same or separate networks is known as communication assistance. Several communication protocols, such as MQTT, Constrained Application Protocol, ZigBee, FTP, HTTP, etc., can be used to do this.

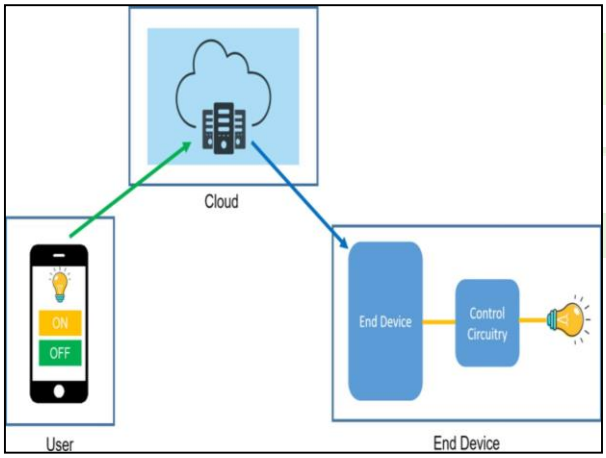

Fig. Working of IOT

2. LITERATURE SURVEY

The challenge of predicting the fleet's utilization rate and rational number. The problem of proving the reasonableness of fleet size and rate of utilization was not entirely resolved, according to the analysis results of the most recent literature. By calculating the necessary number of cars, the study aimed to improve the effectiveness of servicing transportation requests. The purpose of the study was to determine how the variables in the transportation process affected the truck utilization rate. It has been suggested to use the Any Logic software to create a simulation model for servicing automobile orders because the transportation process is probabilistic. Regression analysis techniques were used to process the experimental results, and it was discovered that changes in the vehicle usage rate are linearly dependent.

i) Vehicle Acquisition

A fleet manager must not only locate suitable vehicles (based on capacity, refrigeration, mobility, etc.), but negotiate the right price and finance the purchases or leases in line with the company's budget.

ii) Vehicle Maintenance

Likewise, a manager should leverage the company's position (having many cars, trucks, or vans), to negotiate beneficial maintenance deals and ensure fleet performance over FLEET MANAGEMENT USING IOT 2 times. They must also develop a maintenance plan or program to ensure that there is minimal downtime or accidents (which typically requires some type of proactive preventative maintenance). Monitoring data on vehicle usage like sudden breakage and engine fault codes can help guide maintenance decisions. Keeping a roadworthy fleet is essential.

iii) Vehicle Up Keep

A manager should use the company's position (having many cars, trucks, or vans) to negotiate advantageous maintenance agreements and guarantee fleet performance over a FLEET MANAGEMENTUSING IOT 2 period. They must also create a maintenance strategy or program to guarantee that there is little downtime or mishaps (which often calls for proactive preventative maintenance of some kind). Making maintenance decisions can be aided by tracking information on vehicle usages, such as unexpected failure and

engine problem codes. It is crucial to keep your fleet in working order. Compliance and Driver Safety.

A key duty of trucking businesses would be to maintain fleet safety. By using an ELD, dashcam system, or other methods, they must make sure that their drivers adhere to the rules as well as driver safely. To it, adding the condition of the driver also plays an important role.

iv) Fleet Tracking and Monitoring

Most FMS suppliers also include vehicle tracking system technology, which uses specialized telematics devices to track location via GPS and monitor each vehicle's condition by analyzing RPM, fuel usage, and engine failure codes. GPS fleet tracking for all the drivers and vehicles can be implemented at scale without additional hardware thanks to cell phones and mobile fleet management apps. By tracking driver location with our mobile app, Optima Route allows you to see the current location of a single vehicle or your entire fleet.

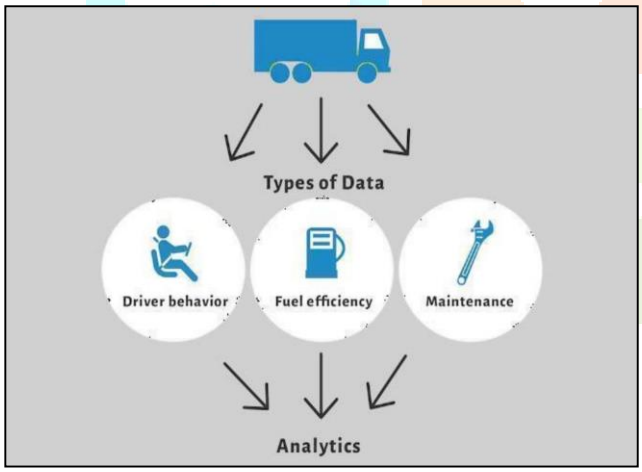

Fig. Analytics of Fleet Management using IOT

Reference:
https://www.sciencegate.app/keyword/165368

3. PROPOSED SYSTEM

Features:

i) Authenticating the driver

Algorithm used:

Our system consists of solutions for these major challenges Driver monitoring is also crucial as a part of fleet management. The Driver Monitoring System (DMS) the camera will identify the driver's identity via the face recognition algorithm. The face recognition algorithm that is used in this project is Haar Cascade. It is an object detection algorithm used to identify faces in an image or in a real-time video.

The algorithm is given a lot of positive images consisting of faces, and a lot of negative images not consisting of any face to train on them. The model created from this training is available in the OpenCV GitHub repository. These include models for face detection, eye detection, upper body and lower body detection, license plate detection etc.

Regularly inspecting your car is not only important to keep it running smoothly, but it also gives you peace of mind and prevents you from getting into car trouble on the road in the future. Regular inspections can not only solve current problems but can also detect potential problems before they occur.

A typical car service will include checking and topping off the brake fluid, changing the oil, changing the air filter, and checking the spark plugs and tire pressure. It also checks to see if other components are functioning properly. After having the service done, you will be assured that your vehicle is safe on the road for yourself and others on the road.

ii) Detecting harmful gases

The toxic gas that tarnishes the air quality is methane, ammonia, benzene, and carbon monoxide. The above-mentioned gases can be detected using MQ series sensors. Threshold limits will be set for each gas. Keeping an eye on the levels, alert signals are sent both to the driver and the management accordingly. The air purifier starts working after receiving the alert signals.

iii) Purification of air

Purification of toxic air that consists both organic and inorganic gases is done by using 2-layer filtration method.

LAYER 1:

It contains a HEPA filter which is 99.97% efficient in purifying pollutants (dust, pollen, mound, bacteria, and airborne particles) of size 0.3 microns. It is not efficient to purify volatile organic compounds present in the air (Pesticides, Gasoline, Fuels). This part is done by Layer 2.

LAYER 2:

It contains activated carbon which is the most consistently effective method for removing VOCs. This can be easily recharged by placing it in the sunlight once a month.

iv) Monitoring the health conditions

Health conditions like pulse rate are monitored using a pulse rate sensor. Safety measures are taken by the management immediately after receiving a message from the driver by tracking his/her location. The level of alcohol consumed by the driver is also observed using an alcohol sensor. In lethal consequences, an oxygen mask is provided to the driver with an alert message.

The alcohol consumption of the driver is been checked by using MQ3 gas sensor.

v) Autonomous temperature management system

The temperature of the driver's cabin is monitored by using DHT11 sensor that senses temperature and humidity. So, the sensor keeps an eye on the temperature and humidity in the cabin and if it goes beyond the threshold, the hand fan will be turned on.

vi) Providing an emergency trigger

We are providing a widget in the driver's phone which can be used during an emergency. This sends the current location of the driver to the hub without using an external GPS/GSM module. Management assigns a person to resolve the problem by sending him the current location of the truck.

4. FRAMEWORK

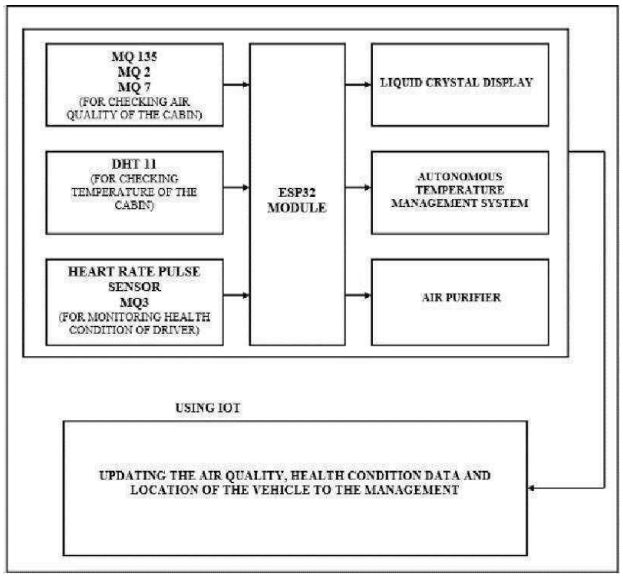

Fig. Framework of fleet management using IOT

The specific purpose MQ series sensors like MQ 135, MQ2 and MQ7 are given as inputs to theESP32 module for checking the air quality of the cabin. This air quality can be seen on the Liquid Crystal Display which is connected to the output port of the module. And if the concentrations of the toxic gases are high or beyond a fixed level of ideal concentrations, the air purifier gets switched on and the air in the cabin gets purified through 2- layers of the air purifier.

DHT11- temperature and humidity sensor is connected to the input port where it continuously monitors the temperature of the cabin and if it goes beyond the threshold, the autonomous temperature management system gets activated.

The heart rate pulse sensor and the MQ2 sensors are used to monitor the pulse rate of the driver and check if the driver is drunk respectively comes under the health monitoring feature where the input port of the ESP32 module takes the inputs from the respected sensors and output the display on the LCD screen.

All these data of toxic gas concentrations, health condition of the driver and the location of the truck will be updated continuously to the hub using IoT.

5. RESULTS

Fig.1 Authentication of the driver

Fig. 2 Checking the impurities

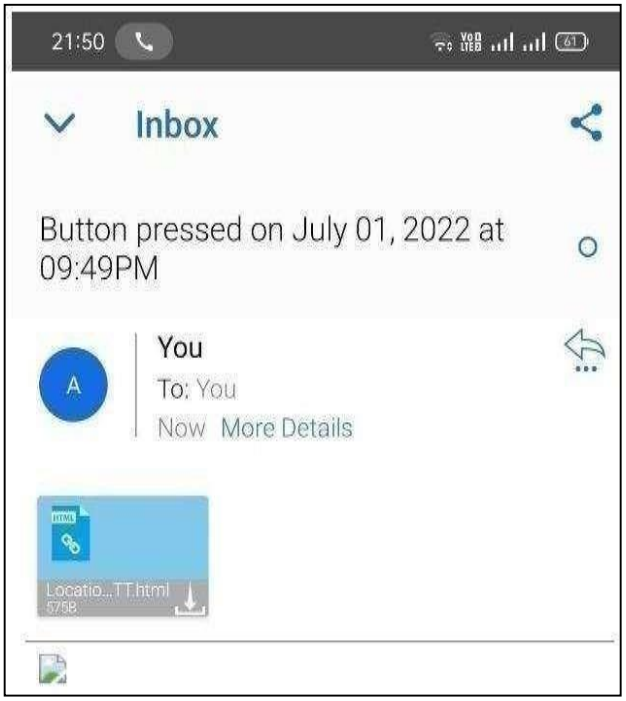

Fig.3 Location sent when button is pressed

a. Driver authentication is done based on the driver face captured during the training of the data set. The vehicle does not start if any unauthorized person enters the cabin.
b. And coming to the toxic gases identification, we can see the results in the below picture where the percentage of toxic air is displayed.
c. Figure 3 shows the location sent to the management When the widget is tapped in the lethal consequences.

6. CONCLUSION

Hence the fleet management is not the one, one can easily look at and ignore, it needs a lot more attention to take upon for the smooth running of them. Hence our project would help in doing so. It has great and efficient features of driver authentication, identifying and purifying the toxic gases, sending all the data to the management using IoT.

This project is very budget friendly and can be afforded by most of the people who drive. The proposed system is compact in nature and can be integrated into most of the driver's cabins. Materials used in this are tough and can and ensures to endure tough conditions. Hence the proposed system is portable and has greater efficiency in air purification.

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