Vehicle Fleet Management System and Safety Functions

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Abstract: All over the world use of vehicles is increasing day by day. As well as accident ratio is also increasing with increase in number of vehicles. Maintaining regular service schedule for customers to become difficult in their day to day busy life. Proposed model detects oil consumption and coolant consumption concerns to real-time weather statics with the help of sensors. This system is designed by considering car safety. Which helps to reduce everyday rate of accident occur in all countries. As well as for automobile industries to improve the quality of production in future cars. As per the survey of India, 496762 number of accidents occur in 2016. The use of bright headlight at night time became one of the causes of road accidents. To overcome this problem designed model uses a microcontroller to operate all systems. Subsystems like sensors, RFID module, GPS module, LDR sensor module, Wi-Fi module are connected to the microcontroller to take real-time readings. So that, Microcontroller distinguish all positive and negative results. As per that remaining subsystem take respective action to avoid accidents. Also, the system provides gathering of real-time data with the help of sensors from cars to improve the quality of the product.

Keywords: Arduino, ESP8266, GPS, LDR, RFID.

I. INTRODUCTION

With the increasing number of vehicles all over the world, all countries are facing a big problem of road accidents occur due to mechanical fault or due to human negligence. For that this system allows automobile companies to gather data from sold cars so that consumption and quality of oil and coolant can be analyzed in different weather conditions with machine learning algorithms [2]. This system helps to manage oil, coolant, brake oil levels with the help of sensors [1]. And to overcome accidents due to bright headlight at night time. At the same time, GPS take geo-location of car and store all activities to the cloud, that in which area car is going. If in case an accident occurs. So, we can detect the exact reason for the occurrence of an accident. As well as, this model holds one RFID module. Hospitals, company campuses, school campus can set speed limits for cars inside the campus. Many people didn't follow speed limit instructions. In that case, RFID scan that instruction and automatically sets speed limit to car as per area instructions. Complete system is divided into multiple sub-module connected to one micro-controller [4].

II. LITERATURE REVIEW

Reza et al. [1] (2014) developed a wireless OBD fleet management system for term fuel consumption concerning airflow and distance. Luís et al. [2] (2019) proposed a machine learning model for fault diagnosis of vehicle fleet tracking modules. In this model proposed architecture use the random forest, Naïve Bayes and Support vector machine (SVM) for analysis purpose. Suresh et al. [3] (2016) proposed an automatic light control system for the classroom. Unnecessary consumption of energy can be saved with this proposed model. Roman et. al. [4] (2017) used to develop UHF RFID for automatic vehicle Identification, analysis, and simulation. Arun et al. [5] (2017) developed a location-aware lightning system for smart green buildings. The proposed model uses android application to control the intensity of lights in building as per user position. Dhiraj et al. [6] (2017) proposed an automatic street light management system using wireless sensor networks. But the continuous monitoring and control required for reducing energy consumption. Jyotiraman et al. [7] (2014) developed an adaptive headlight system. And mapping of the vehicle with the help of google maps. Headlamp focus can be control concerning steering wheel rotation. Arun Prakash et al. [8] (2018) proposed a model for automatic speed control of vehicles using real-time GPS coordinates. But has some accuracy issues.
Sharon et al. [9] (2019) developed an analysis model to track abnormalities while driving to avoid accidents. Thombare et al. [10] (2018) proposed a model for automatic speed control of vehicles using image processing technology.

Mohan et al. [11] (2016) developed a cost-effective road accident prevention system.

In this case study, several research papers have been taken into consideration based on the techniques used, tool used, advantages are mentioned in Table 1.

| Paper Reference No. | Conference/Journal | Micro-Controller Used | Technology or Sensors Used | Advantages | Drawbacks |
|---------------------|---------------------|-----------------------|---------------------------|------------|-----------|
| [1]                 | IEEE Sensors Journals 2014 | ELM327                 | Three basic modules complete this project as data acquisition, OBD interface with wireless communication and storage unit. | Analysis of fuel consumption in different weather conditions and as per wind flow and distance traveled can be managed using this system developed. Helpful for automobile industries to improve their designs in the future. | Proposed model only applicable for analysis of fuel consumption concerning distance traveled and wind flow. |
| [2]                 | 2019 8th Brazilian Conference on Intelligent Systems | --                     | Machine learning algorithms like random forest, naive Bayes and support vector machine for analysis purpose. | The technique achieved a precision of 99.76% for detection and isolation of faults, respectively on provided data sets. | Developed model still unable to achieve efficient real-time results after implementation. |
| [3]                 | Arduino             | Android Application with GSM | Students are having the habit of leaving the classroom without switching off the light. In this case, the model is used to reduce energy consumption by automatic switching off of lights. | Developed model proposed for smart classrooms. But the same system can be applicable in car dimming. |
| [4]                 | IEEE Journal of Radio Frequency Identification (2017) | --                     | K-ray model is used for identification and simulation of vehicle using UFH RFID. | Result of this system are tested on city buses to achieve speed limit in particular areas. Using this model 0.9 probability is achievable while vehicle speed is under 90 km/hr. | The proposed model is using a k-ray model which gives results with 0.9 probability at 90 km/hr. speed. |
| [5]                 | Android Application | Wireless sensor and actuator network | The system adjusts light intensities in building as per user comfort with the help of user-friendly android application. | -- |
| [6]                 | Raspberry-Pi 3      | Wireless Sensor Network and solar panel. | To reduce energy consumption by the street light model is designed with WSN technology. Which detects traffic on road and controls the intensities if street lamps. | -- |
### III. METHODOLOGY USED

If we focus on the everyday accident ratio in the world, vehicle safety is a very important issue. And analysis of sold vehicles for improvement in future automobile production. This model is designed after considering all possible factors causing road accidents one of the most important factors is the brightness of car headlamp at night time. Model helps to reduce the ration of road accidents and to alert as per a real-time basis.

In case of automatic speed control of vehicles using GPS gives less accuracy in some cases. Instead of GPS use of RFID for speed control of vehicles gives good results and more accuracy. So that speed of the car can be control automatically as per the area like schools, hospitals, company campuses.

**A. Proposed Architecture:**

The entire system adopted the Arduino micro-controller module. The hardware modules used in the system are represented in fig 2. The core components of the module are the LDR sensor module, IR sensor, GSM module, GPS module, Wi-Fi module (ESP8266), RFID module.

**ARDUINO:** Arduino using ATMEGA328 IC is works as a micro-controller. All the core components are operated with the help of the Arduino micro-controller.

**GPS AND GSM MODULE:** SIM808 module used as a GPS module to get the exact real-time location of the vehicle. This module gives results as latitude and longitude of the vehicle. As well as messaging facility to user using GSM.

**RFID MODULE:** Radio frequency identification is required for extracting information on the type of area through which the driver going to drive a car. Exist of antennas, RFID receiver, and RFID transmitter.

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| Reference | Module | Component | Description | Note |
|----------|--------|-----------|-------------|------|
| [7]      | OP-Amp relay, LED bulbs | Adjusting the headlight beam as per steering wheel motion for vehicle safety proposed in this model. | Developed model uses the motion of the steering wheel as data which is not efficient. |
| [8]      | Arduino | GPS Sensor | Motor Speed control as per area location. Such as hospitals, colleges, and company campus. | Proposed model using GPS technology which is not efficient in remote locations. |
| [9]      | Arduino | EYE blink sensor, Heart rate sensor | Tracking of accident causes due to human physical measures, like stress, drowsiness developed in this model. | -- |
| [10]     | --     | Camera    | Motor Speed Control using image processing | Uses of image processing slows down processing speed. |
| [11]     | Intel NUC kit | GPS, Proximity sensor, IR sensor, MQ-3 sensor. | Fire detection system using DHT Sensor | -- |

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**Fig 1. Arduino**

**Fig 2. GPS and GSM Module**

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**Fig 3. RFID Module**

**ESP8266:** Known as Wi-Fi module. Provides the facility of Wi-Fi with the Arduino board.

**Fig 4. Wi-Fi Module**

**LDR SENSOR MODULE:** Light detection register works on the principle of light intensity. Resistor value changes concerning the intensity of light. Use to detect the beam of a headlamp coming from the opposite direction.

**Fig 5. LDR Sensor Module**

**IR SENSOR:** IR sensor module used for object detection. In this model UV sensor used for the detection of traffic on road.

**Fig 6. IR Sensor Module**

**ULTRASONIC SENSOR:** Ultrasonic sensor used to continuously measure oil levels and coolant levels in oil and coolant tanks. Differentiate oil and coolant levels as low, high and intermediate.

**Fig 7. Ultrasonic Sensor Module**

**DHT11:** DHT11 is used to check real-time temperature humidity. After gathering data from the DHT sensor this model processed on that data and apply the ML algorithm and compare it with oil and coolant consumption.

**Fig 8. DHT11 Sensor**
B. Data Flow Diagram:

Fig 9. Data flow diagram for LDR with RFID

Fig 10. Data flow diagram for LDR Sensor

IV. RESULTS

A. Data gathered from sensors and histograms:

In this model, we use the matplotlib library to describe the dataset properly in the form of graphs.
Also, this model is using a library called pandas for faster backend processing. The developed model will be helpful in case of an analysis of oil and coolant levels in different weather conditions. With the help of the matplotlib library, based on dataset histograms plotted as follows.
The proposed model is using the thingspeak cloud to gather data on the cloud from all sensors.

Using thingspeak here we plotted correlation between humidity and temperature.
V. FUTURE WORK

- This model providing different input at different situations, we are setting some limit for inputs, if the input received from sensors extend the limit then there will be alert to the person and output result will be stored for analysis purpose.
- The System will be helpful for Automobile industries. It can help developers in the invention of new technologies. Analysis of data gathered from sold vehicles helps to improve the quality of production in automobile industries. Company can analyze the performance of the vehicle in different weather conditions.
- The extension recognizes what the thing is and isn’t, what it will and won’t do, what it will and won’t contain. The scope of output can be extended until the sensor detects the input from a person and provide it for processing and gives a real-time output.
- The future extent of this framework is to control the mishances caused because of different components. This framework enhances the security of an individual. Also, consequently, the proposed framework gives a compelling advancement in the car business to decrease the mishaps caused because of bright headlight at night time and for not following traffic signs for speed limit.

VI. CONCLUSION

We have given an extremely powerful answer for build up a savvy framework for vehicles for more secure human driving whose center is Arduino. Since the sensor has a fine affectability circumvent 2 meters, it can suit any vehicle and can without quite a bit of a stretch be gotten away from the suspects.
The entire framework has an additional favorable position of little volume and greater dependability. As the developing open observation is that vehicle wellbeing is more critical, progresses in broad daylight security are picking up acknowledgment than before. This framework is proper implementation of fleet management concern with oil and coolant consumption with respect to real-time weather statics. As well as help in reducing number of accidents occurs every day due to reason of use of high beam of light at night time. Also proposed system is reducing energy consumption by street by detecting traffic on road with the help of sensors.

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AUTHORS PROFILE

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