Dynamic Vehicle Parameters Assessment using Web-application

Rajeshwari R. Rajput
Department of Electronics and Telecommunication
Dr. D. Y. Patil Institute of Technology
Pimpri, Pune-18, India.

Onkar K. Tarar
Department of Electronics and Telecommunication
Dr. D. Y. Patil Institute of Technology
Pimpri, Pune-18, India.

Abhishek Shrivastav
Department of Electronics and Telecommunication
Dr. D. Y. Patil Institute of Technology
Pimpri, Pune-18, India.

Dr. Shreenivas Jog
Department of Electronics and Telecommunication
Dr. D. Y. Patil Institute of Technology
Pimpri, Pune-18, India.

***Abstract*—The objective of this paper is to describe a dynamic vehicle parameters assessment system that remotely tracks the vehicle's location, speed, temperatures, humidity, door lock status, seat belt status, fuel level of the vehicle and displays all of them on a web application in real time with the help of an uninterrupted internet connection. It employs sensors to find various parameters of the vehicle, GPS module to find the location of a vehicle and a GPRS module that sends data to the data server of the web application. This system integrates all the existing technologies that are used separately to monitor individual parameters. The web application is specifically designed to view the vehicle's location on open source map and other parameters on the dashboard. The web application handles the user authentication by itself. This paper also discusses an additional proposition of offering a range of control over vehicle parameters, which can be implemented by using relay based control concept implemented in the same fashion.**

Keywords — Global Positioning System (GPS), General Packet Radio Service (GPRS), Web-application, Microcontroller, Real-time.

I. INTRODUCTION

Security systems and navigators have always been a necessity of human's life. The developments of advanced electronics have brought revolutionary changes in these fields. With advancements in technology, there has been an increase in the usage of vehicle tracking systems. [1] This system enables the owner to observe and track the vehicle and find out about vehicle movement and past activities of automobile. This technology popularly called real time Vehicle Tracking Systems and have proved useful in ensuring the security of vehicles. [1] But with some modifications, determination of factors representing the working of the automobile and the internal environment which surrounds the passengers will helps the supervisor figure proper handling of vehicle and ensuring passengers safety and can be very helpful to prevent catastrophes and help regulation in emergency situations.

Thus, there is a need of a very responsive system and the criteria of selecting hardware components of minimum size and minimum hardware limitations. This hardware is fitted into the vehicle in such a manner that nobody can see it. The vehicle position is updated every 03 seconds with constant movement.

The user has access to the web application by going to web server address http://trackitapp.tk which has user authentication.

II. OBJECTIVE

Currently there is no single vehicle tracking system that integrates all tracking, tracing and monitoring of parameters of vehicles. There are applications available for desired function but all of them are separate, so to integrate all of them was the source of motivation for this team.

The objective of this project is to display and assess dynamic parameters of vehicle like temperature, humidity, fuel level, engine oil, engine temperature, door lock status, seatbelt status, etc. on a web application in real time in economical way which would be easy to use and the resources would be available all the time.

III. SYSTEM DESCRIPTION

The Dynamic Vehicle Parameter Assessment System has been implemented using GPS Neo6m module, GPRS module SIM900A, Arduino uno as microcontroller unit and sensors for the respective parameters. Fig. 1 shows the block diagram implementing Dynamic Vehicle Parameter Assessment System with the GPS module and GPRS module.

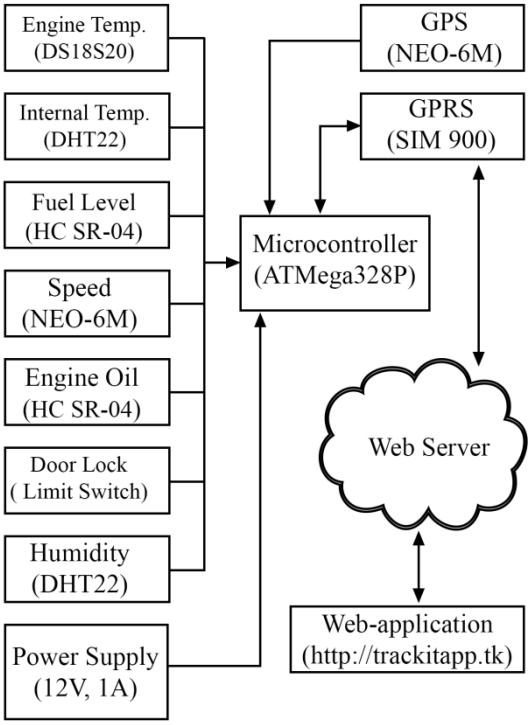


Fig. 1. Block diagram of Dynamic Vehicle Parameter Assessment System.

Sensors are deployed in the various regions of automobile, sensing physical parameters like engine temperature, fuel level, engine oil level, speed (region of car mechanism), internal temperature and humidity, door lock status (region where the passengers sit and luggage is stored), and the GPS module detects the location of the automobile as a whole. A web server is setup on which a database and web application is hosted and can be accessed from anywhere. The obtained data is processed and formatted by arduino uno and send to GSM/GPRS modem through which it is sent to web server where the data is stored in database. The user access the web application by going to web server address (http://trackitapp.tk). [2] The web application on the first page request the user the authentication credentials like username and password. After successful authentication only then user is allowed to use services provided by web application for security of the users. On successful authentication web application get data associated with that user from the database and displays location on the open source map and other parameters on the web application.

The system contains following hardware modules:-

A. Arduino Uno as microcontroller unit-

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The reason to select ATMega328Pu as the microcontroller is it provides two UART ports for simultaneous communication between GPS and GPRS module. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. The ATmega328 on the Arduino Uno comes pre-programmed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. [3]

B. SIM 900A as GSM/GPRS module-

SIM900A is a second generation digital mobile cellular technology, which covers a fairly broad geographic area, and gives a complete Quad-band GSM/GPRS solution in a SMT module. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3 mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design. It has embedded Powerful TCP/IP protocol stack. The reason for selecting SIM900A is that it supports 2G as well as 3G mobile networks making it reliable in case of connectivity. [4]

C. NEO6m as GPS module-

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine which provides position as well as speed. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. They have excellent navigation performance even in the most challenging environments.[5]

D. DS18S20 for measuring engine temperature-

The DS18S20 digital thermometer provides 9-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points. The reason for selecting it as engine temperature sensor is it's temperature measurement range suffices the industrial standard and produces digital output, hence no need of external ADC.[6]

E. HC SR-04 for measurement of fuel and oil level-

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. [7]

H. DHT22 as internal Temperature & Humidity Sensor

DHT22 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a highperformance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.[8]

IV. Software Implementation

In this system the provision of viewing the dynamically changing parameters of the vehicle during its movement in real time on a web application is done. A Web application

(Web app) is an application program that is stored on a remote server and delivered over the Internet through a browser interface. It is coded in PHP, a browser-supported language. For this a web server is setup on which a database and web application is hosted and can be accessed from anywhere with internet access. The GSM/GPRS module sends parameters to the web server. The data is then parsed by web server and stored in the database. Fig 2. Shows the flowchart of how the transmitter system works.

The user has to visit http://trackitapp.tk to access the web-application. Fig 3. Shows the flow of the Web-application. After successful authentication the data associated with the user is requested from the database. The database provides the information that is sent by the hardware system and then web-application displays it to the user in real-time. The web application also provides some analytic over the data obtained from the vehicle and shows the statistics of that vehicle.

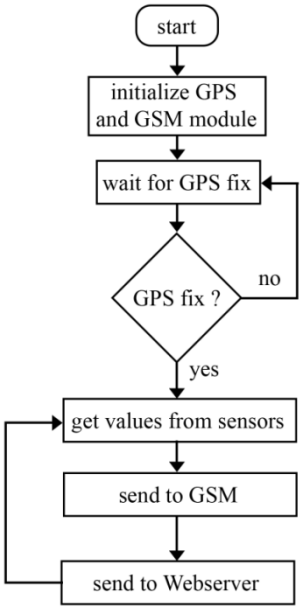


Fig. 2. Flowchart for the transmitter system.

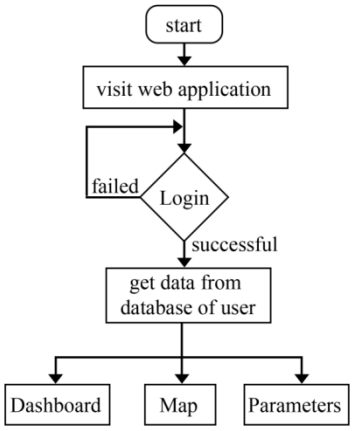


Fig. 3. Flowchart of the web-application.

V. RESULTS

The hardware prototype is shown in fig.4. The parameters are calculated by microcontroller with the help of various sensors and then send the same to the web server at location http://trackitapp.tk. The data sent by the system is to be stored by the web-server in the database. The data stored in the database is to be requested by web application and displayed to the user on the browser. Fig. 5 shows the dashboard page. The parameters like location are to be shown on the open map by the web application which can be seen in fig.6.

The parameters like engine temperature, oil level, fuel level, speed, internal temperature and humidity, door lock status, seatbelt status are to be displayed in the form of table or in the form as designed on the web application. It is shown in fig.7. All this process need to be in soft real time. The past activity of vehicle parameters is also stored and can be accessed. Fig. 8 shows the history of the vehicle parameters. Fig 9 shows the assessment part of the system.

Fig. 4. Hardware prototype model

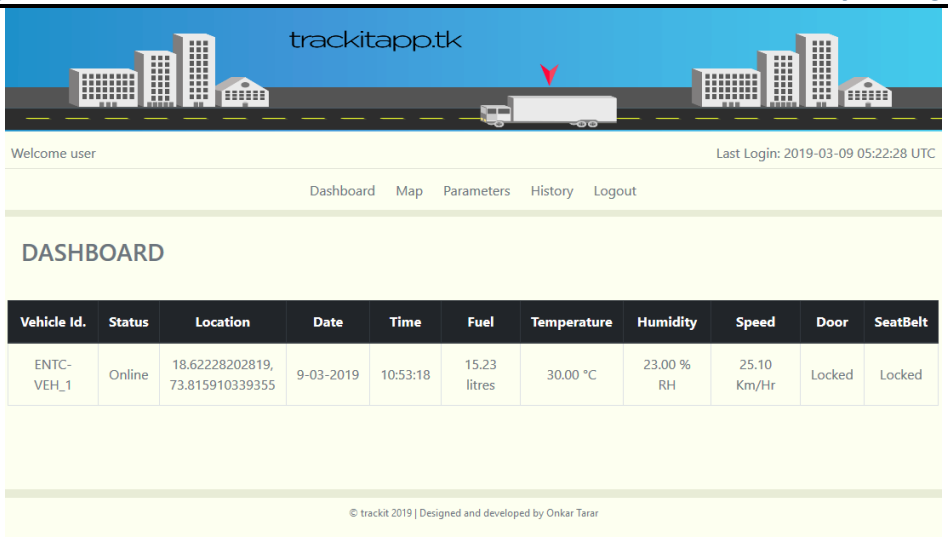


Fig. 5. Dashboard of web-application.

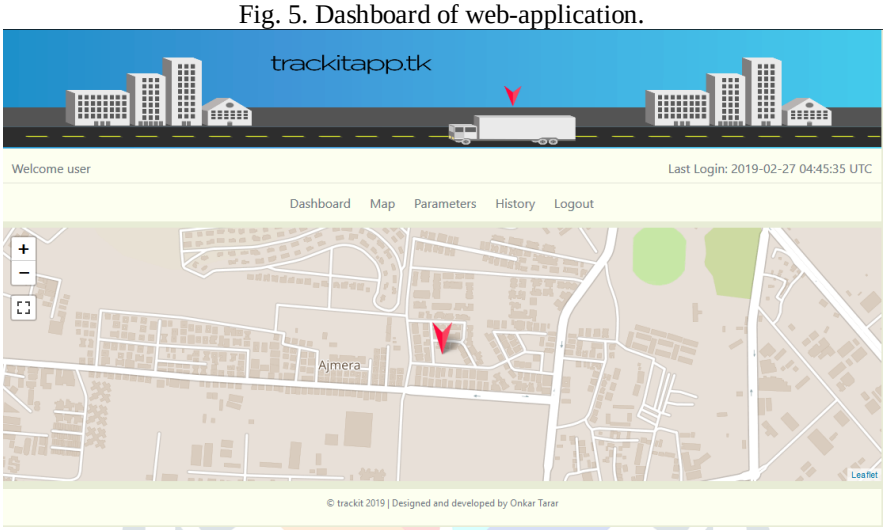


Fig. 6. Location is displayed on the map.

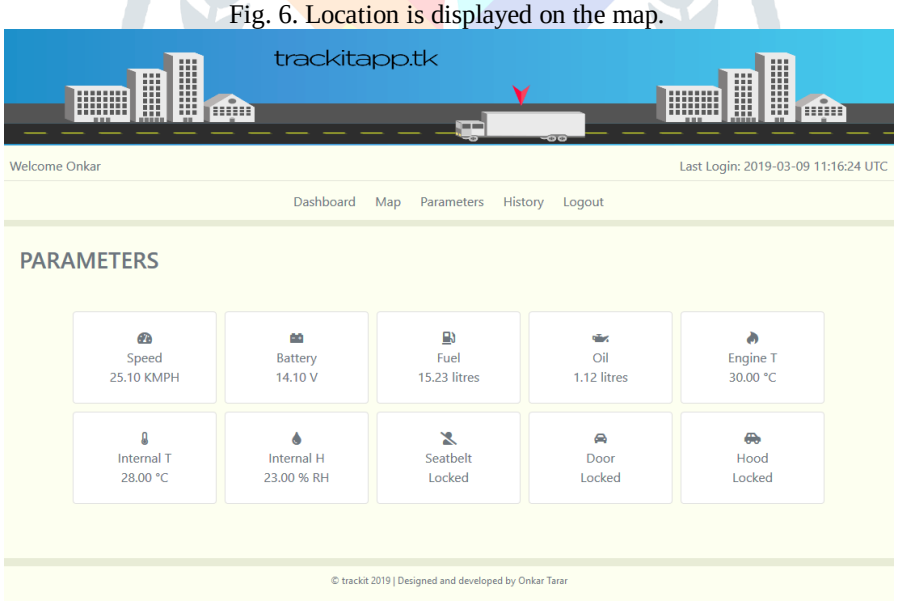
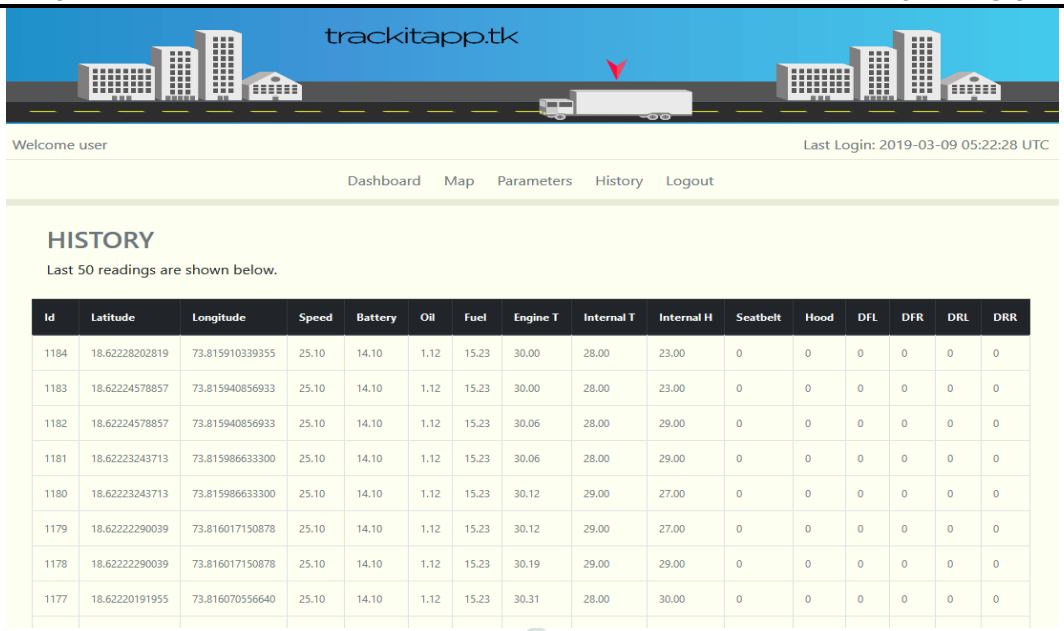


Fig. 7. Parameters displayed on the web-application.



Id	Latitude	Longitude	Speed	Battery	Oil	Fuel	Engine T	Internal T	Internal H	Seatbelt	Hood	DFL	DFR	DRL	DRR
1184	18.62228202819	73.815910339355	25.10	14.10	1.12	15.23	30.00	28.00	23.00	0	0	0	0	0	0
1183	18.62224578857	73.815940856933	25.10	14.10	1.12	15.23	30.00	28.00	23.00	0	0	0	0	0	0
1182	18.62224578857	73.815940856933	25.10	14.10	1.12	15.23	30.06	28.00	29.00	0	0	0	0	0	0
1181	18.62223243713	73.815986633300	25.10	14.10	1.12	15.23	30.06	28.00	29.00	0	0	0	0	0	0
1180	18.62223243713	73.815986633300	25.10	14.10	1.12	15.23	30.12	29.00	27.00	0	0	0	0	0	0
1179	18.62222290039	73.816017150878	25.10	14.10	1.12	15.23	30.12	29.00	27.00	0	0	0	0	0	0
1178	18.62222290039	73.816017150878	25.10	14.10	1.12	15.23	30.19	29.00	29.00	0	0	0	0	0	0
1177	18.62220191955	73.816070556640	25.10	14.10	1.12	15.23	30.31	28.00	30.00	0	0	0	0	0	0

Fig. 8. History of vehicle displayed on the web-application.

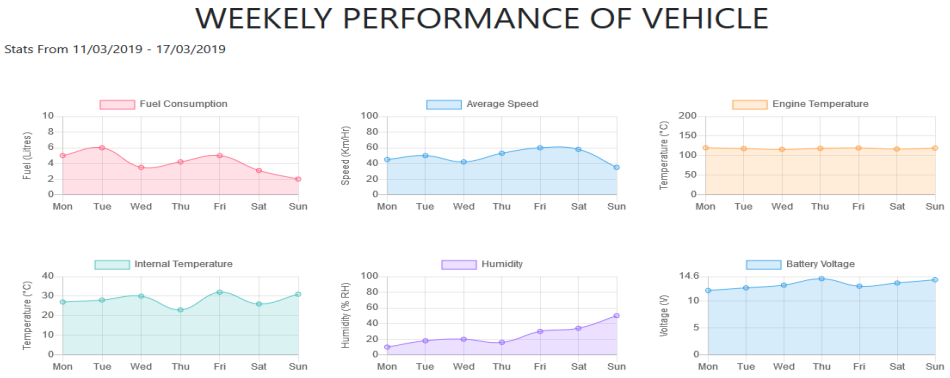


Fig. 9. Statistics of vehicle shown on web-application

VI. Conclusion

The system can be monitored, can successfully communicate and necessary corrective action can be initiated if it is not under normal operation. Our main objective of design here is mainly intended to achieve communication between vehicle monitoring system and owner for monitoring various parameters of the vehicle and the system provides acceptable accuracy. The data update rate is quite fast. Instant update to the user reflects quick response. Effective control over the drivers, check on over-speeding can be achieved. As the system is fully automatic, automation of fleet operations minimizes human intervention which results in better services. This system also prevents the alteration in the license plate of the vehicle. System size is small thus making it simple to mount into vehicles. With more modifications, user can be provided with control over the parameter by setting a limit to ranges of the operation of the automobile parts. By using relay based control concept, number of control features such as turning ignition on/off, heater on/off, radio on/off etc. can be implemented in the same fashion.

Acknowledgment

The authors would like to sincerely thank Dr. D. Y. Patil Institute of Technology for their valuable support and technical help for this project work.

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