

# VEHICLE SAFETY SYSTEM

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**Abstract :** According to a survey conducted in 2018, 50,000 liters was stolen, 5 lakh accidents took place, and almost 44000 vehicles were stolen in 2018. All these are big numbers and are increasing day-by-day. Various vulnerabilities and threats related to vehicle safety include vehicles being stolen, fuel being stolen, vehicle towing, Harsh driving leading to accidents, crossing unwanted areas, and much more. This paper proposes a model of a vehicle safety system that tries to cover solutions to all the problems mentioned above in a compact and cost-effective manner with the help of GPS, GSM, and ARM technology.

**IndexTerms** - GPS (Global Positioning System), GSM (Global system for mobile), ARM (Advanced RISC Machine).

## I. INTRODUCTION

Most of the people have their own vehicles nowadays. For business and extra income purpose, some of the owners give access to their vehicles to a third party on a monthly basis But the drivers drive the vehicle harshly and irresponsibly. There are also situations where the fuel of our vehicle is being stolen while it is parked in our parking. Also, some people are concerned when whether our vehicle is being towed or what. All these multiple problems regarding the safety of vehicles gave us the motivation to implement such a model that would maintain the safety of our vehicle through a single source. The reason for using the Global Positioning System (GPS) technology is that it is widely being accepted and used by modern phones and gadgets. In our project implementation, we are integrating the benefits and services of GPS and GSM together. Our vehicle tracking system can be used for accident detection, finding lost vehicles, identifying fuel theft and towing, and taking corrective decisions based on the meaningful insights generated by the system. Our system can be effectively used in tracking purpose of cabs/taxis, stolen vehicles, school/college buses, and much more. We have made the system cost effective by minimizing the hardware cost and software requirement. All the features are implemented without the use of any sensors. The hardware components we have assembled together can be fitted and hidden inside your vehicle from where all the reading will take place. Through a web application interface, you can monitor and control your vehicle. Our system offers real-time vehicle tracking, replaying of the places your vehicle has gone through, generating various reports, and sending appropriate alerts.

## II. LITERATURE SURVEY

### 1. Design and Development of GPS-GSM based tracking system with google map based monitoring

This system uses GPS and GSM technologies. The paper includes the hardware part which comprises of GPS,GSM, Atmega microcontroller MAX 232, 16x2 LCD and software part is used for interfacing all the required modules and a web application are also developed at the client side. The main objective is to design a system that can be easily installed and to provide a platform for further enhancement.

### 2. Vehicle tracking system using GSM and GPS

This paper proposes a tracking system that makes use of "GPS" and "GSM" technologies. It works as the most inexpensive form of the system that can help identify vehicle theft. It is an enclosed system that uses a GPS receiver along with a GSM modem monitoring the movement of vehicle and briefs the status. GSM modem shows the location with respect to longitude and latitudes.

### 3. GPS- and GSM-Based Vehicle Tracking System

This describes automotive localization system using GPS and GSM SMS service. The system permits localizations of the automobile and transmitting the position to the owner on his mobile phone as short messages (SMS at his request).The system is interconnected with the car alarm system and alert owner on his mobile phone. This tracking system composed of a GPS receiver, Microcontroller, and a GSM module. GPS receiver gets the location information from the satellite in the form of latitude and longitude. The microcontroller processes this information and this processed information sent to user/owner using GSM Modem.

### 4. A Review on vehicular monitoring and tracking

In this paper, we compare three different vehicle tracking techniques. First is by using arm processor second is by using AVL (Automatic Vehicle Location system) and third is by using the online fusion of colour and shape features

### 5. Land vehicle tracking application on the Android platform

A land vehicle tracking system determines the position of the land rover with a terminal with embedded GPS receiver or PCS phone and displays the position on a digital map. Recently, vehicle tracking technologies have brought some breakthrough in these areas: commercial vehicle operations, fleet management, dispatching, emergency rescue, hazard material monitoring, and security.

### III. BACKGROUND

#### 1. Global Positioning System(GPS) technology

GPS technology is possible due to the group of satellites present in the Earth's orbit. The satellites transmit accurate signals, which in turn enables the GPS receivers to calculate and show the correct time, location, and speed information of an object, precisely a vehicle to the user. GPS uses the mathematical principle of trilateration in order to find your actual location. GPS has already stored the topographic information, road maps, point of interests, and much more. With the help of all of this, it enables the GPS to calculate our exact location, speed, and time.

#### 2. Global System for Mobile communication(GSM)

It is a mobile communication modem. Bell Laboratories invented GSM technology, which is now widely used worldwide. It is a digital cellular and opens technology for transmission of voice and data from one end to other. This is with the help of different service providers. GSM is a digital system which uses Time Division Multiple Access (TDMA) technique. It is capable of reducing and transmitting data through a channel at a given time slot. Our system uses GSM to send the signals to the database as well as to notify the users about various changes in the vehicle.

#### 3. ARM Controller

ARM stands for Advanced RISC (Reduced Instruction Set Computer) Machine architecture. It is a processor capable of executing millions of instructions per second. Its designs enable to perform a reduced number of instructions by removing the redundant and unnecessary instructions. This improves the performance and speed of the machine. In our system, we need to deal with lots of processing related to the analog signals generated and the longitude and latitude captured. Hence, we have used ARM controlled for faster processing.

### IV. PROPOSED SYSTEM AND IMPLEMENTATION

#### 1. Hardware

We have assembled various devices on a single board to form our hardware part. We purchased an empty PCB, a sim card, GSM antenna, GPS and its adapter, lithium battery for backup power supply, ARM controller, and wires. This hardware is to be fitted on the front panel of the vehicle. There are total 4 wires, 2 for ground and VCC respectively, one for fuel indicator and others will attach to the ignition of the vehicle. The following figure shows the hardware device we have assembled.

#### 2. Working

The wired connections to the vehicle will give appropriate analog signals to the device. The controller will convert these analog signals into digital signals and with the help of GSM and GPS, the digital data will be transferred to the web server. The web server has the business logic written. It will process the digital data to give desired results. We are taking only three parameters-speed, longitude, and latitude. We have used google maps integration services to convert the longitude and latitude into the proper address and display it on the map to the users. The device will be connected to the GSM service provider through the GSM network. Using it, the data is sent over to the tracking server.

Our tracking server, i.e the business logic consists of a socket listener application running in the background, which keeps listening on a predefined port. The GPS parameters are received by the socket on that particular port and stored in the database after proper conversion. Finally, we have hosted our web app using AWS server and through this interface, all the functionalities can be seen and used by the user.

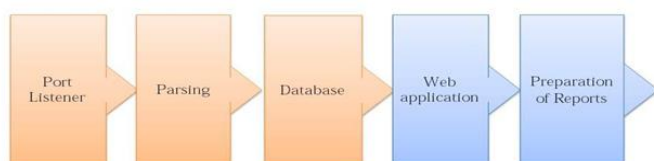


fig.1

Following are the different modules implemented in our vehicle safety system along with their features.

#### 1. Live tracking module

- i. Live tracking vehicle display on the map.
- ii. Displaying vehicle details on live tracking page – carrier, last seen, IGN, Door, Battery, Temp, GPS, Speed, Latitude, Longitude, Address, etc.
- iii. Selection for a registered vehicle

#### 2. Replay track module

- i. Showing animation of how vehicle travelled within date range
- ii. Playing, Pausing, stopping animation on the map.
- iii. The increasing/Decreasing speed of animation on the map.

- iv. Displaying details with animation like Time. Address, Speed, KM Travelled, Ignition, etc.

**3. Report module**

- i. KM travelled
- ii. Idle Time – Stopped time with the engine on.
- iii. Working Time – vehicle engine is on without stopping time
- iv. Speed Report – As per entered speed it will display the report
- v. Over-speed Report – Speed is more than defined regular speed.
- vi. Geo-fencing – If Traveled through some circular area.
- vii. Bold Stop – on which vehicle stopped for more than some interval.
- viii. An export report into Excel file.

**4. Notification module**

- i. Door open/close
- ii. The engine on/off
- iii. Over-speed
- iv. If location changed once stopped.

**V. EXPERIMENTAL RESULTS**

The Figure 2 shown below is the dashboard when you log in to the web application. On the right-hand side, you will see all the vehicles currently being tracked. Upon clicking a single vehicle, for instance, the demo vehicle, you will be able to see its live location, ignition status, longitude, latitude, battery, and temperature of the device.

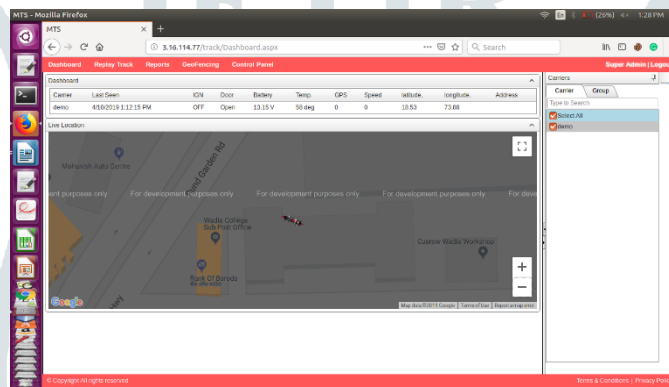


fig.2

The figure 3 shown below will show you the replay of the path your vehicle has crossed. You can select the start and end date and time. The track will start playing for that day. You can also see the date, time, address, and speed below the track playing window. The red stop sign shows where your vehicle stopped and for how long.

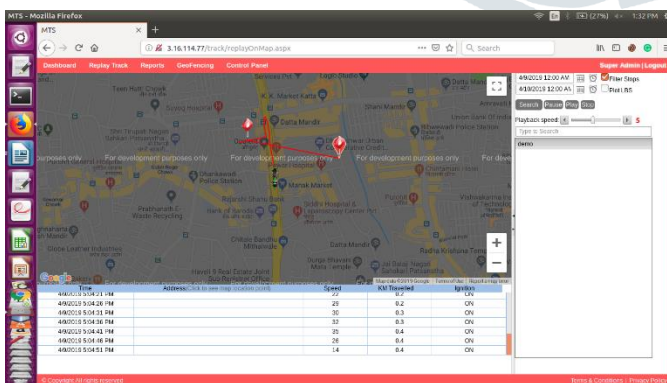


fig.3

The figure 4 and Figure 5 below shows the report generation module. When the start and end date is selected from the right-hand side menu the reports for particularly selected options get displayed. As a sample, we tracked our vehicle for 2 days and generated a report for Kilometers traveled as well as for geo fencing. The geo fencing concept allows you to restrict the area your vehicle can travel. We have two areas, namely my house and college. We got them in and out the timing of it along with the duration the vehicle stayed there

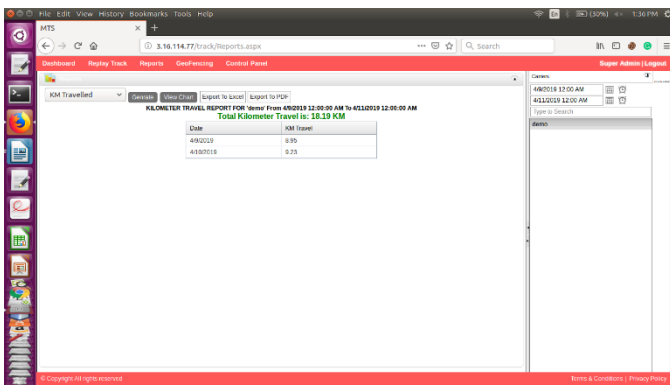


fig.4

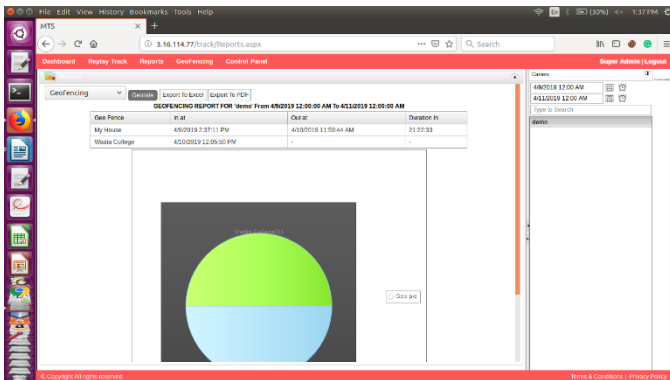


fig.5

## VI. CONCLUSIONS

WITH THE HELP OF GSM, GPS, AND ARM TECHNOLOGY, WE HAVE SUCCESSFULLY IMPLEMENTED AND TESTED THE VEHICLE SAFETY SYSTEM. THE FUTURE SCOPE OF THIS PROJECT IS WIDESPREAD. THIS SYSTEM CAN BE IMPLEMENTED BY CAB RENTALS SERVICES, SCHOOL BUS AND CARGO SERVICES, POLICE DEPARTMENT FOR VEHICLE TRACKING, VEHICLE MANUFACTURE AS A VALUE-ADDED SERVICE, AND MORE.

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