

## Real Time System for Vehicle Scheduling, Tracking and Monitoring and Analysis

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**Abstract-**An advanced vehicle scheduling, monitoring and tracking system is to be designed and implemented for booking and monitoring the vehicles from one location to other location in real time and provide safety environment to the traveller. The proposed system has to use GPS/GPRS/GSM Modules which includes all the three things namely GPS GPRS GSM. The GPS provides current location of the vehicle; GPRS sends the tracking information to the server and the GSM is used for sending alert message to vehicle allotted person mobile. The booking of vehicle is done through priority scheduling algorithm

The proposed system would place inside the vehicle whose position is to be determined on the web page and monitored in real time. The system will compare the current trajectory of the vehicle with the predefined path specified. If any deviation is observed, it will send an alert message to the related person. The cost analysis is done and cost is estimated based on the distance travelled.

**Keywords:** Arduino, GPS/GPRS/GSM, python, priority scheduling algorithm, cost estimation

### I. INTRODUCTION

In the past, the booking and allocation of the vehicle to user is done manually in the organisation. But in the proposed system it is automatically done once the vehicle is requested through the official webpage which contains the requisition page. The page contains the details like personal information, date, time and purpose of journey. The vehicle is allocated/scheduled according to the priority of purpose. The algorithm used is priority scheduling algorithm.

The vehicle missing or going in the wrong path is the main problem in the present days. In the proposed system the vehicle is tracked continuously and monitored using the system which contains arduino, GPS, GSM .If the vehicle is moved in the wrong path , then status of the vehicle is sent to the user as an alert message.

The wrong path is detected by comparing the customised path and the path the vehicle is moving. This is done in the server.

The billing is to be done automatically based on the distance travelled, after the trip.

**Real time system [1]:** The real-time operating system used for a real-time application means for those applications where data processing should be done in the fixed and small quantum of time. It is different from general purpose

computer where time concept is not considered as much crucial as in Real-Time Operating System. RTOS is a time-sharing system based on clock interrupts. Interrupt Service Routine (ISR) serve the interrupt, raised by the system. RTOS uses Priority to schedule the process. When a high priority process enters in system, low priority process gets pre-empted to serve higher priority process. Real-time operating system uses the process synchronization. So that the processes can communicate with each other and resources can be used efficiently.

**Scheduling:** It is a method that is used to distribute valuable computing resources, usually processor time, bandwidth and memory, to the various processes, threads, data flows and applications that need them. Scheduling is done to balance the load on the system and ensure equal distribution of resources and give some prioritization according to set rules. This ensures that a computer system is able to serve all requests and achieve a certain quality of service.

**Tracking [1,2,3,4,5,6]:** Collecting the location of a truck, car or any moving vehicle using the GPS system. A tracking module in the vehicle continuously picks up the GPS coordinates that indicate the real-time location of the vehicle.

**Monitoring [1,2,5]:** Observing the position of the vehicle using GPS in the computer/laptop. The position of the vehicle is observed on maps using mapbox .

**Analysis:** The actual path (used by vehicle) and mapbox path (given by maps) are analyzed and if any change exists, then an alert will be sent to user and admin. Cost is analyzed by calculating distance using latitudes and longitudes of vehicle trip and cost/km.

#### THE TECHNOLOGIES USED ARE:

1. **Arduino** - Arduino is an electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. The board can be configured to perform a task by sending a set of instructions to the microcontroller on the board. This can be done using the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based Processing.
2. **GPS [4,5,6]** - The Global Positioning System (GPS) is a satellite based navigation system consists of a network of 24 satellites located in earth orbit. The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. GPS works in any weather circumstances at anywhere in the world. A GPS receiver must be locked on to the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the vehicle position has been determined, the GPS unit can determine other information like, speed, distance to destination, time and other. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person through GSM technology.
3. **GSM/GPRS [4,5,6]** - GSM/GPRS module is used to establish communication between a computer and a GSM-GPRS system. Global System for Mobile communication (GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service (GPRS) is an extension of GSM that enables higher data transmission rate. The GSM modem is a specialized type of modem which accepts a SIM card and operates on a subscriber's mobile number over a network, just like a cellular phone. It is a cell phone without display.

#### ORGANIZATION OF THE PAPER:

Section I contains the introduction. Section II contain the related work, Section III contain the methodology, Section IV contain the Implementation, section V explain the Results, Section VI describes conclusion and future work, Section VII contain the references.

## II. RELATED WORK

### 1. Design and Development of Real time Vehicle Tracking System ,Sonali S. Solanke & C.S. Khandelwal

A vehicle tracking system is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system.

### 2. Vehicle Tracking, Monitoring and Alerting System: A Review Sumit S. Dukare Dattatray A. Patil Kantilal P. Rane

The goal of this paper is to review the past work of vehicle tracking, monitoring and alerting system, to categorize various methodologies and identify new trends. Vehicle tracking, monitoring and alerting system is challenging problem. There are various challenges encounter in vehicle tracking, monitoring and alerting due to deficiency in proper real time vehicle location and problem of alerting system. GPS (Global Positioning System) is most widely used technology for vehicle tracking and keep regular monitoring of vehicle. The objective of tracking system is to manage and control the transport using GPS trans receiver to know the current location of vehicle. In number of system, RFID (Radio Frequency Identification) is chosen as one of technology implemented for bus monitoring system. GSM (Global System for Mobile Communication) is most widely used for alerting system. Alerting system is essential for providing the location and information about vehicle to passenger, owner or user.

### 3. Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking System Kunal Maurya , Mandeep Singh , Neelu Jain

A vehicle tracking system is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. This paper proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system.

### 4. Real Time Vehicle Monitoring and Tracking System based on Embedded Linux Board R. Surender Reddy , M. Hymavathi, E. Shilpa

The proposed method would make just right use of latest technology that situated on Embedded Linux board particularly Raspberry Pi and Smartphone android utility. The proposed method works on GPS/GPRS/GSM SIM900A Module which entails all of the three matters specifically GPS GPRS GSM.

## III. METHODOLOGY

Vehicle real time booking, tracking and wrong path detection using GPS/GPRS/GSM SIM900A module: GPS

GPRS GSM SIM900A Module which gets interfaces with the Arduino gives the real time tracking information of the vehicle such as Longitude, Latitude, Speed, and Time of the vehicle. That information related to the vehicle will be taken from USB interface and stored into the database of Arduino .It further will send to the server using GPRS. The system architecture is shown in fig1. The system gives tracking provision to the user through web page as follows:

- Admin Login: The transport department admin can monitor the vehicles in his computer using the web interface.
  - User Login: The registered users can book vehicle from their Smartphone/PC using User Login on web page and only those users who get registered into the system can access the login.
1. Here, Amazon Web Services are used for hosting the website. In AWS tomcat apache server is setup and database is designed as the structure is shown in fig2. The attributes of the entities shown in fig2 are described in table1.The programming languages used like python, pip, flask, php, html, css.
  2. Vehicle allocation is done automatically based on priority using priority scheduling algorithm: The vehicle is booked by the user from the official webpage. Once the vehicle is booked a token is allocated. Afterwards according to the priority the vehicle allocated to the user. The Algorithm used for allocation of vehicles is priority scheduling algorithm.

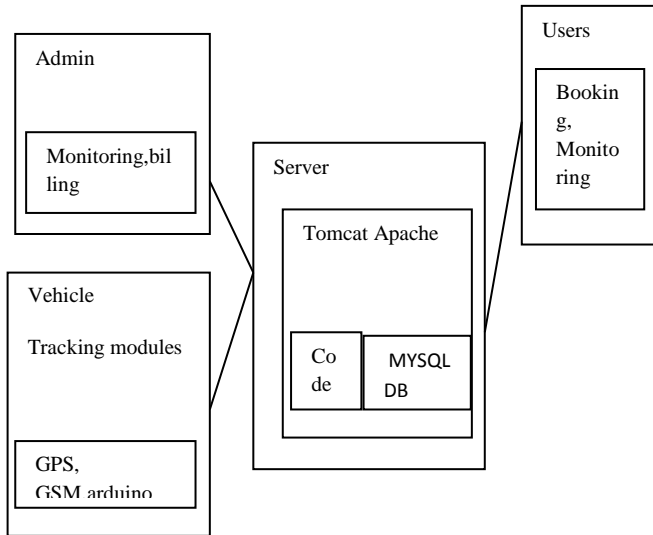


Fig:1 System Architecture

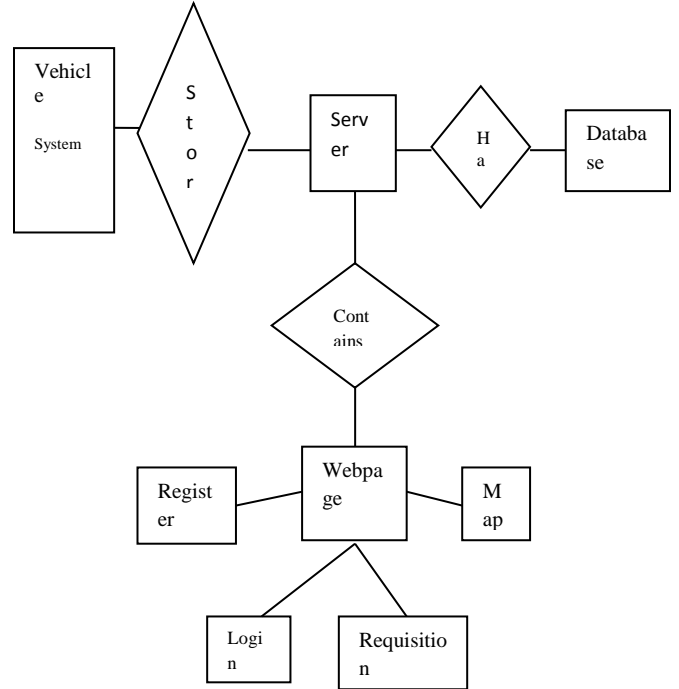


Fig2: ER diagram

Table1: Attributes of the entities:

Attribute	Entities
Register	Id, mail, name, designation, username, password
Login	Mail, password
Requisition	id, mail, mobile no., designation, date, time, purpose, start place, drop place
map	Latitude, longitude

**Algorithm:**

Priority scheduling is a pre-emptive algorithm and one of the most common scheduling algorithms in real-time systems.

1. Each process is assigned a priority. Process with highest priority is to be executed first and so on.
2. Processes with same priority are executed on first come first served basis.
3. Priority can be decided based on memory requirements, time requirements or any other resource requirement.

**IV. IMPLEMENTATION**

The tools are connected in this way, so that we can collect the data.

The tools used are Arduino, GSM/GPRS. GPS.

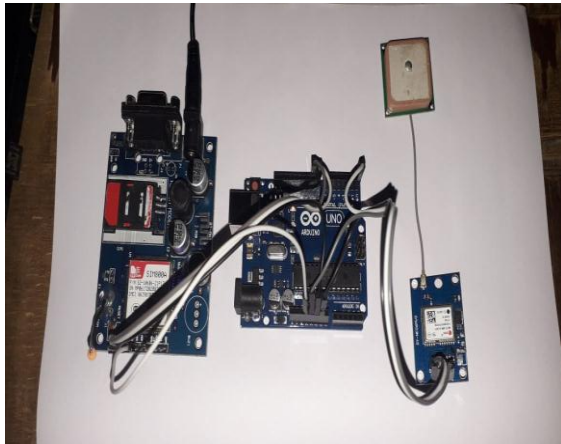


Fig. 3

- The database is created using mysql. Four tables are created in the database .They are users, booking, cur user, cur location.
- The process of collecting the data from the system that contains GPS, GSM, ARDUINO is done in the following way.
  1. In the system, GPS sends the latitude and longitudes of the place to server using GSM through internet that is collected using php script.
  2. The readings sent to the server are stored in the database.
  3. The database will be updated every moment when the vehicle moves.
  4. Through php script, the reading that are present in the database are checked and updated on the map through marker.
  5. The mapbox module is used for vehicle representation and path on the map.
  6. The trip requested by the user is pointed and the route is drawn through the points on the map through mapbox with shortest path.
  7. When the trip is started the marker moves on the map, when the vehicle is moves away from the customised route more than 500m, the alert message will be send to the user using way 2 SMS from the server.

**V. RESULTS**

Our experiment tracks the vehicle location 100% accurately through GPS, and GSM sends the location of the vehicle to server and stores in database. The location coordinates update every minute if the location changes.

The system is tested and the results obtained are furnished below.

1. Booking the vehicle:  
Following is the webpage that is used to book the vehicle.

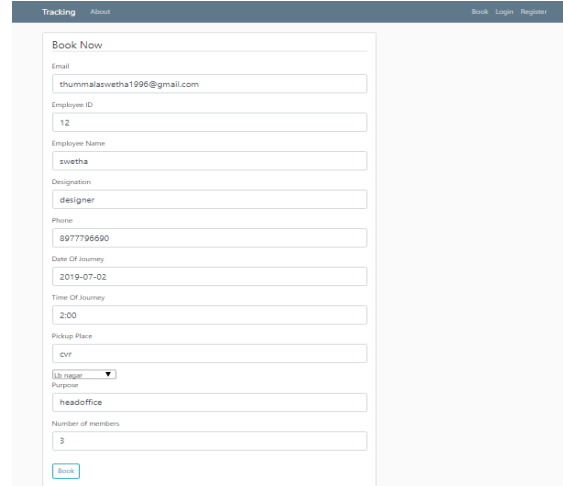


Fig. 4

The output the requisition page based on the algorithm used:

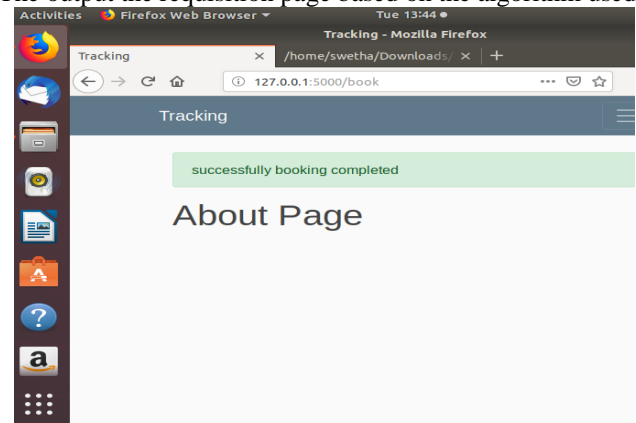


Fig. 5

2. Monitoring the vehicle:  
The following is the webpage that displays the represent of the vehicle and route.

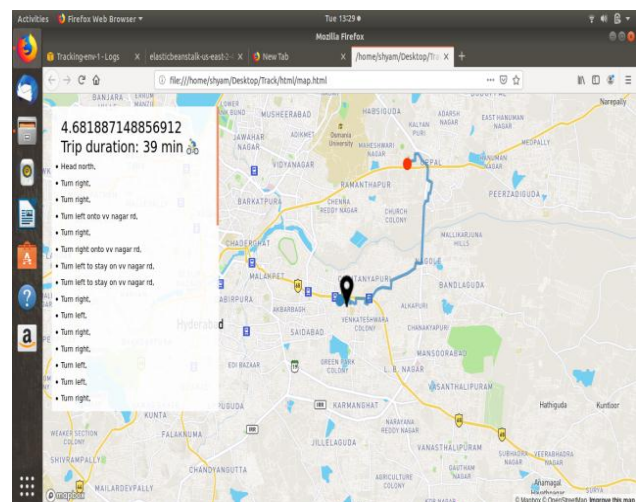


Fig. 6

The log file which is generated while the trip is ended is given below:

```

▼ Array (38)
▶ 0: (2) [78.595901, 17.196817]
▶ 1: (2) [78.593156, 17.20222]
▶ 2: (2) [78.593782, 17.205124]
▶ 3: (2) [78.597333, 17.204122]
▶ 4: (2) [78.597735, 17.203704]
▶ 5: (2) [78.598132, 17.201355]
▶ 6: (2) [78.599385, 17.20057]
▶ 7: (2) [78.599886, 17.201216]
▶ 8: (2) [78.601763, 17.201899]
▶ 9: (2) [78.603806, 17.202025]
▶ 10: (2) [78.604045, 17.201741]
▶ 11: (2) [78.604682, 17.202174]
▶ 12: (2) [78.605009, 17.20225]
▶ 13: (2) [78.605631, 17.200763]
▶ 14: (2) [78.605655, 17.200304]
▶ 15: (2) [78.608269, 17.199733]
▶ 16: (2) [78.608713, 17.199485]
▶ 17: (2) [78.609094, 17.198893]
▶ 18: (2) [78.611901, 17.198113]
▶ 19: (2) [78.614285, 17.197921]
▶ 20: (2) [78.615269, 17.199915]
▶ 21: (2) [78.617231, 17.199535]
▶ 22: (2) [78.619278, 17.203258]
▶ 23: (2) [78.619367, 17.204193]
▶ 24: (2) [78.619773, 17.204962]
▶ 25: (2) [78.619682, 17.205862]
▶ 26: (2) [78.618175, 17.206247]
▶ 27: (2) [78.617924, 17.206492]
▶ 28: (2) [78.617947, 17.207091]
▶ 29: (2) [78.618497, 17.207827]
▶ 30: (2) [78.619615, 17.208311]
▶ 31: (2) [78.620882, 17.208487]
▶ 32: (2) [78.622191, 17.209455]
▶ 33: (2) [78.623693, 17.209659]
▶ 34: (2) [78.623755, 17.210152]
▶ 35: (2) [78.625894, 17.211136]
▶ 36: (2) [78.627086, 17.21226]
▶ 37: (2) [78.628074, 17.211792]

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Fig. 7

## VI. CONCLUSION AND FUTURE WORK

In this paper, the vehicle booking is done automatically in official webpage by requesting the vehicle. Allocation is done by priority scheduling algorithm based on highest priority i.e., purpose of work. The vehicle is tracked using GSM/GPS/GPRS and monitored in computer, if the vehicle is in the wrong path an alert message is sent and the status of the vehicle path is also sent.

The system can be enhanced with more additional sensors to improve the safety of the users in the vehicle. The invoice generation can also be implemented as additional feature in future.

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