

DIGITRACK - Real Time Vehicle Tracking System

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Abstract— There are a large number of vehicles on the road and the traffic there is no fixed time of the bus arrival at the stop due to which it is often that students miss their bus. Students travelling by school or college bus often miss their bus due to change in the bus arrival time. We are proposing a solution by which students/staffs can track their respective bus using their Android smart phones. The school or college administration will be also able to keep track on the buses using Admin Panel provided to them. The system consist of custom made tracking Device, a Web-Page (Admin Panel) and an android Mobile Application. Each bus will be installed with a device which will have GPS and GSM module in it. GPS will fetch the data and then GSM will transmit the data to cloud. Cloud will receive the data, and will map it with the respective bus. Cloud also contains the details of the bus which includes bus number, bus route and time of arrival at the bus stop. Web-Page will be used by management of the college or school to keep a constant eye on the movement of the bus, it is termed as Admin Panel. Admin Panel will also be surveillance for the bus speed. Mobile Application will be used by the user which will inform them about the ETA of their bus at their bus stop.

Keyword: - GPS, GSM, Microcontroller, Web-Page (Admin Panel), Mobile Application, AT commands.

I. INTRODUCTION

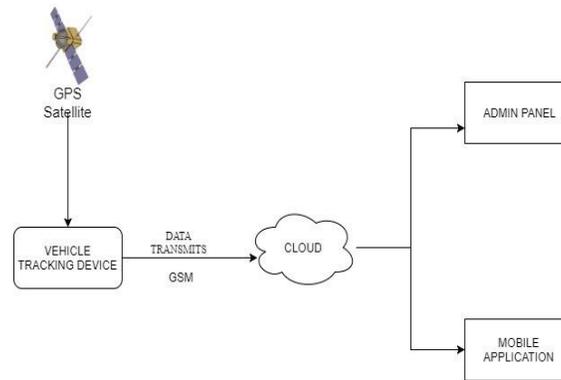
From past few years world is witnessing a drastic change and growth in the technology. Every day we witness a new technology or a device which ease the human effort and makes life more comfortable. Mobile device and its application are playing a major role in it. According to survey nearly half of the world has access to smart-phone. Smart-phone provides access to internet and helps an individual to connect to worldwide. These devices have lot of applications which proves of great help. One of the most amazing features of these devices is the ability to trace down the device. This project is based on the same feature, where the android application will be used to track the college bus in real time world on Google maps.

This application will track the real time position of the bus on Google Maps, to locate the current position of the bus, a device will be installed in it, which will be having GPS (Global Positioning System) use to track the position of the bus. GPS was meant to be used as a navigation system, but development in technology decreased the size of GPS module, and provided a solution to link it with the mobile devices. And now GPS is mainly used as a device to track the position.

With all the advance technology and development of world, human time is more important and wasting time is not affordable, especially waiting for transport or missing the transport is not worth, with more vehicles on road there is more traffic jam and delay in the arrival or departure of the transport vehicles, currently there is no solution available to avoid the problems like traffic jam and delay in transport service. This project provides an option for the passenger, where they can track the position of their vehicle and can check for its arrival at their pick-up point, tracking of the vehicle will help the passenger to save their time of waiting for the transport vehicle.

The main aim of the project is :-

- 1) To track the bus position on Google maps.
- 2) Get update on the vehicle for admin.
- 3) Passengers will get updated with changed routes on special days or special conditions.

Block Diagram:-**Fig 1. Block Diagram****II. Hardware Specification**

Hardware components which are used in the system are given below with their description.

- A. GPS:** - Global Positioning System, it is a space based radio-navigation system. The concept was introduced by the United State Air Force. It is a global navigation satellite system that provides geolocation and time information to a GPS receiver anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

Our system works on L80-M39 GPS module, it is an embedded with patch antenna (15mm x 15MM x 4mm) and LNA brings high performance of MTK positioning engine to the tracking device. It is able to achieve the highest level of sensitivity, accuracy and TTFF (time to first fix) with the lowest power consumption in a small-footprint lead-free package. L80 module combines with many advanced features including EASY, AIC, LOCUS, AlwaysLocate and Antenna Supervisor. These features are beneficial to accelerate TTFF, improve sensitivity, save consumption and detect antenna status for GPS system. The module supports various location, navigation and industrial applications including autonomous GPS, SBAS (including WAAS, EGNOS, MSAS, and GAGAN), QZSS, and AGPS. L80 module is a SMD type module with the compact 16mm*16mm* 6.45mm form factor, which can be embedded in applications through the 12-pin pads with 2.54mm pitch. It provides necessary hardware interfaces between the module and main board.

- B. GSM:** - It has become the world's fastest growing mobile communication standard. It allows for seamless and secure connectivity between networks on a global scale. Digital encoding is used for voice communication, and time division multiple access (TDMA) transmission methods provide a very efficient data rate/information content ratio. While GSM is becoming the standard for person to person communication, the circuit-switched network limits data transmission. General Packet Radio Service (GPRS) was developed to relieve this limitation.

SIM800C is a complete Quad-band GSM/GPRS solution in a SMT type, which can be embedded in the customer applications. SIM800C supports Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 17.6*15.7*2.3mm, it can smoothly fit into slim and compact demands of design. SIM800C is designed with power saving technique so that the current consumption is as low as 0.6mA in sleep mode.

- C. Microcontroller:** - Is a small computer on a single integrated circuit. It contains one or more CPU's (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

The Atmega324 based microcontroller is used as the brain to control the vehicle tracking system. A software program to control them is written in the Embedded C language, compiled and then saved into the microcontroller's flash memory.

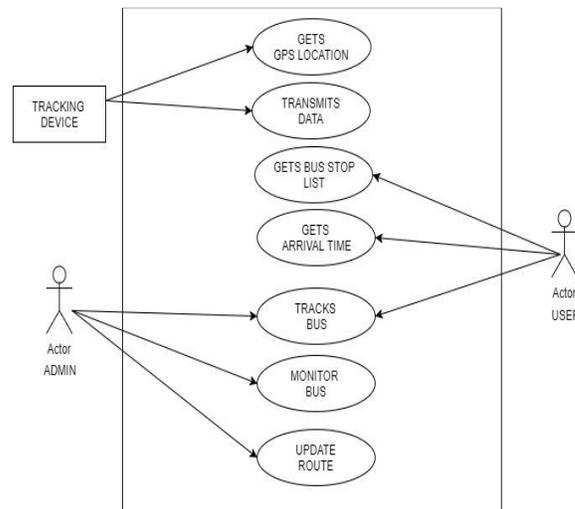


Fig 2: Use Case Diagram

III. SOFTWARE

- A. Web-Page (ADMIN PANEL):-** There is a need to manage the tracking system with the help of an user interface, thus we have designed Admin Panel. It is a web page which will be operated by the admin of the transport manager. It will have all the details of all the busses, which includes their bus number, bus route, bus stops and the time at which the bus is supposed to reach the respective bus stop. Admin can track all the busses at any time, admin is also responsible to maintain the database of the system. Managing of data also gives admin a power of changing routes or buses in special days so that the end user can get the accurate details of the bus which they are supposed to use in their route. Web page consists of four pages,
- a. **Home page:-** it will be divided into two parts, one part will display the bus number with their device id, as the admin will click on the particular bus number it will display the location of the bus in the second half of the page using Google Maps.
 - b. **Change Route:-** This page allows admin to change the bus route for particular bus, it is given with the option of bus number and route name, admin has to enter the details of the bus and then the route for the bus will be changed.
 - c. **Buses:-** It is a page which holds all the details of the buses. Page will have buttons with the bus number and the route code on it, which tells of the existing busses embedded with the device.
 - d. **Routes:-** This page provides the detail of each and every route of individual bus, there are buttons which will display the bus number and the route name, , after selecting a particular bus it will display the bus stops, and the timing of each bus stop.
- B. User Application: -** It is an android based application, which will be given to the user who can run the application on their respective smart phones to track the busses for their route. Application will have four different page:-
- a. **Track:-** This page will be having one text box, user has to enter the Route ID in it, after entering the Route ID the page will open another page which will show the current position of the bus in map.
 - b. **Bus Info:-** page will be holding the details of the bus, which will have Route ID and the bus stop it will be covering. It is basically designed so that user can select the proper bus route which he/she is supposed to be travelled.

- c. **About Us**:- Will hold the detail information of the transport manager, all the contact details will be kept over their so that user can contact the manger in case of any issue.
- d. **Help**:- it is a page where Frequently asked question will be published, so that the user can refer it in case of any issues he/she faces.

IV. Design Overview

Digitrack is the ultimate solution for tracking real time location of the bus. The product comprises of three main components.

- i) Tracking device installed in the bus.
- ii) Admin panel.
- iii) Mobile Application for the users.

A custom made tracking device is installed in the bus which is within the reach of the driver. The device will automatically boot up once the bus is turned on. The administrator maintains the server and updates the route information based on the working days. The mobile application will help the user to know the location of the bus on the specified routes. The user can view the list of bus stops when the desired route is selected. The user can check estimated time of arrival and distance to be covered by the bus to the desired bus stop.

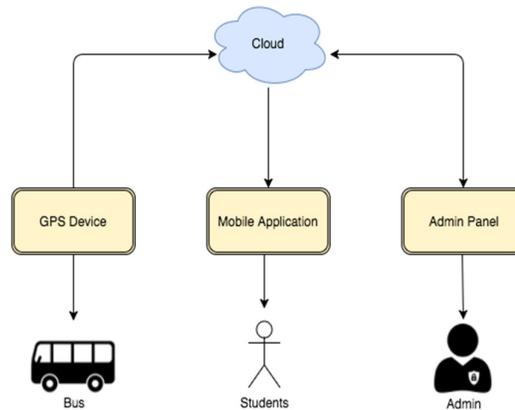


Fig 3: Architecture Diagram

V. Operational Overview

The current location of the bus is taken from the hardware placed in the bus consisting of GPS and a GSM module. When the user accesses the application it relays the data from the dedicated server which contains all the details and the current location of the bus selected.

The retrieved location is retraced back to the application and the user is made aware. So the student can also see information about their bus by either specifying name of the stop or their respective Route ID. A help option is provided for the student so that they can resolve any query regarding how the functionality of the application. Frequent bug reports are also collected.

- **Tracking device**

The device consists of a GPS module, and a GSM SIM card. The GPS module acquires the location of the bus and sends it over to the server with the help of mobile network.

- **Admin panel**

The Administrator will monitor and assign each bus to each route. If there are any updates in routes it will be handled by the administrator.

- **Mobile Application**

The mobile application will be the user interface where the user can track the location of the bus.

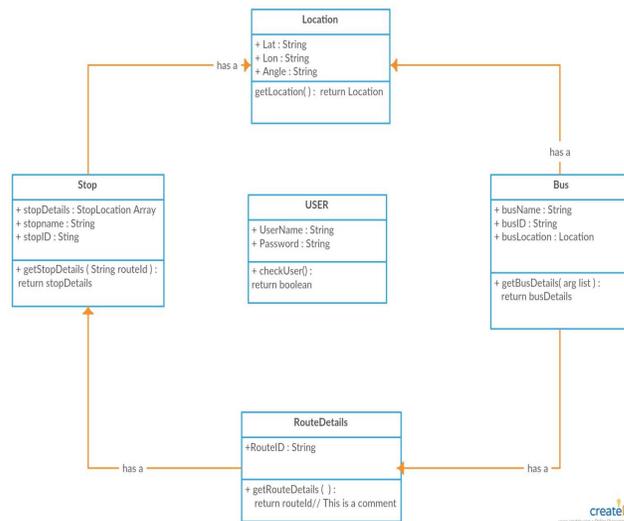


Fig 4: Class Diagram

VI. Conclusion

In this paper, we design and developed a low cost tracking system based on integration of GPS and GSM data. The system consists of various modules which are linked with GSM modems. The service provides the user with current location information of desired buses on an android application based on which the user can adjust their schedule accordingly. The service therefore reduces the waiting time at the bus stop. This system provides a user friendly environment to the college students to overcome the difficulty in finding bus route as well as saving lot of time.

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