

# Public Transportation System - Implementation in Bus Transportation System

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**Abstract**— Time is precious in today's fast moving life. The wastage of time by waiting long time for getting bus can be avoided by Smart Public Transportation System. Here a methodology based on combination of GPS and GSM/GPRS modem is discussed to help the people who utilize the public transportation for traveling. GPS is one of the technologies that are used in a huge number of applications today. One of the applications is tracking the vehicles like public transportation vehicles or owned vehicles and keeps regular monitoring on them. This tracking system can inform you the location and route travelled by vehicle, number of passengers present in the vehicle along with time stamp and that information can be observed from any other remote location. It also includes the web application that provides you exact location of target. There is a mobile application through which we can access the web page directly. This system enables us to track target in any weather conditions. This system uses GPS and GSM technologies. The paper includes the hardware part which comprises of GPS, GSM, Atmega microcontroller MAX 232, 16x2 LCD, IR sensors and software part is used for interfacing all the required modules and a web application is also developed at the client side. Main objective is to design a system that can be easily installed and to provide user friendly platform for vehicle tracking and further enhancement.

**Key words:** GPS, GSM, GPRS Modem, IR Sensor

## I. INTRODUCTION

In this urban life transportation is very common. A lot of happenings occur on the road everyday. Therefore the need of safety and monitoring is developed. To resolve such problems, a system is developed using GPS and GSM technologies and an application is introduced in this research work.

Various problems that we face:

- 1) Whether there are any buses available or not.
- 2) If one has to go urgently.
- 3) To find the buses available in one's specified route.

All these problems are overcome by the system. This system has Global Positioning System (GPS) which will receive the coordinates from the satellites among other critical information. Tracking system is very important in modern world. This can be useful in soldier monitoring, tracking of the theft vehicle and various other applications. The system is microcontroller based that consists of a global positioning system (GPS) and global system for mobile communication (GSM). This project uses only one GPS device and a two way communication process is achieved using a GSM modem. GSM modem, provided with a SIM card uses the same communication process as we are using in regular phone.

## A. What is GPS ?

The GPS (Global Positioning System) is a "constellation" of approximately 30 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment. Accuracy can be pinpointed to within one (1) meter with special military-approved equipment. GPS equipment is widely used in science and has now become sufficiently low-cost so that almost anyone can own a GPS receiver.

## B. Transit System Benefits

GPS tracking for buses uses satellite technology and sophisticated computer modeling to track buses on their route. Bus estimated arrival times can be predicted with extreme accuracy, since estimates are constantly being updated in real time. GPS bus tracking, which is another form of asset tracking, is designed to improve bus operations and assist bus operations managers by having a sophisticated, user-friendly tool to help in managing, monitoring and reporting of bus fleet information. This type of GPS tracker provides a "big picture" view of how your buses are being utilized. Most importantly, this vehicle tracking technology helps reveal consistent schedule arrival time shortcomings as well as inefficient processes. This helps the manager to quickly identify problems and implement improvements.

## C. How Passengers Benefit

Riders benefit from an advanced GPS bus tracking system in many ways. Shivering in the freezing cold in the winter is a thing of the past with a fleet tracking GPS system that contains real-time alerts, as is sweating bullets on a hot summer day while waiting on a delayed bus. Bus riders waste less time, resulting in better planning of their schedules and enabling them to get more done. Real time bus tracking is also beneficial to college students who attend colleges with large campuses. With a bus tracking system, they can spend more time studying, or sleeping, rather than waiting on a delayed bus. Spending less time waiting for a bus, may improve student safety as well.



Fig. 1: Advanced GPS bus tracking system

## D. Bottom Line

Bus tracking lets you know where your vehicles are at all times. You'll know if a vehicle failed to follow its schedule

route. When a bus fails to leave or return when it's scheduled to, alerts can be made to notify potential riders of a delay. Finally, GPS fleet vehicle tracking also helps to monitor unauthorized use of a bus, excessive speeding and unnecessary idling, all of which impact profits.

#### E. Now, let's see how it works

As mentioned before, GPS is a satellite based technology which uses a Global Navigation Satellite System (GNSS) network. It uses a microwave signal which is sent to the GPS device. It gives provision for both real-time and historical data recording. This is made possible by the 27 GPS satellites orbiting the earth, in a time span of 12 hours. Of these 27 satellites 24 are currently operational and the rest 3 are reserved for when the others fail.

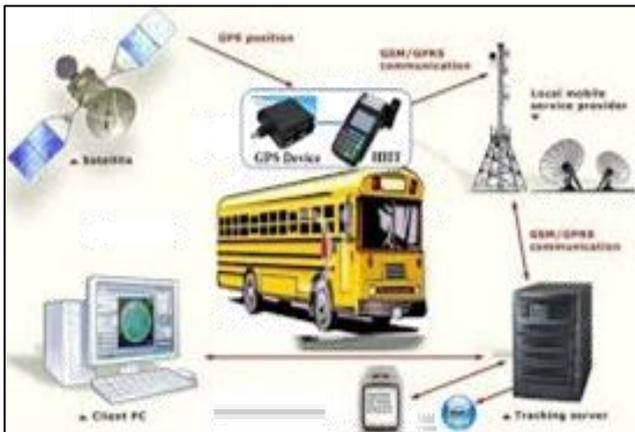


Fig. 2: Device carrying a GPS system

The device carrying a GPS system comprises of a GPS module which receives the signals and is also responsible for calculating the co-ordinates. Based on function, GPS trackers can be of three types – Data logger, Data pusher or Data puller.

- Data logger: It is basically used to log the position of a device at regular intervals. It uses an internal memory to store data. It also comes with a memory card slot or internal flash memory and USB ports. The data from the device can only be moved to a computer for further analysis once data recording is complete as it can only be used for logging purposes.
- Data Pusher: The GPS system which schools and fleet companies use these days belongs to the category of data pushers. Besides this, it can also be used for asset tracking and personal tracking. A data pusher records data like speed, altitude etc. and pushes them to a server where the further analysis of these data can be done.
- When used for tracking school buses, text messages are sent to a mobile phone that has a GPS tracking app installed, in the event of school bus arrival or the student boarding the bus, via SMS or GPRS. It can also transmit location and telemetry input data or when an event takes place like a door open/close or geo-fence border crossing or engine ON/OFF.
- Data puller: In this a remote system sends an SMS to get information from a GPS device. It is similar to a data pusher but the difference is that the data from the GPS system is sent only when it is requested by the remote server. It requires internet and GPRS only occasionally. These systems are used in situations where a constant source of energy is unavailable.

#### F. Why use GPS?

Not only does it allow data recording and transmission, but it does this in real-time. It is highly accurate and gives a precise location of your assets.

Buses follow pre-defined optimized routes set by school authorities, which reduces fuel consumption and also travel time. Hence, it is becoming more popular with schools and fleet companies.

It has helped to reduce pollution since the buses take the shortest routes possible and are well maintained.

Helps to monitor the school bus driver's driving pattern.

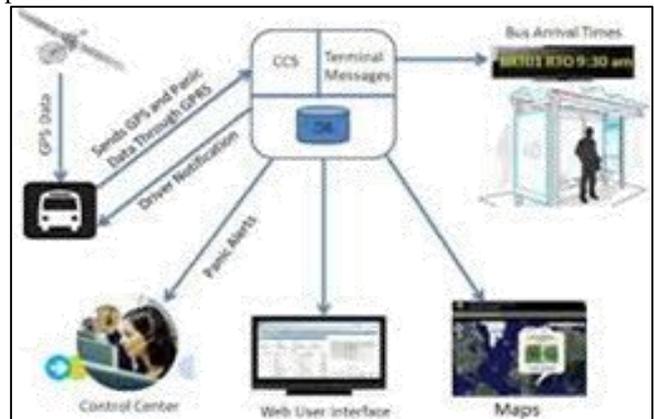


Fig. 3: RFID

RFID is another technology, which along with GPS improves asset or personal tracking. The radio frequency it sends out can be used to transmit information using the GPS system. Student ID cards using RFID's embedded on them can be used while entering or exiting buses. The information thus generated can be sent to parents via a GPS connection therefore informing the parents whether the student has boarded the bus or not.

## II. CONCLUSION

GPS Based Bus tracking System is an Application that has its client side on the Android platform. Application is free of cost and easy to install on device. The accuracy of this system relies on the GPS coordinates generated using satellites while reliability of the system depends on the GPRS facility. The system is effective where Internet is accessible. By including the concept of direction, the size of the database has reduced to half, thereby not exhausting the server and database with similar sets of data in different tables. The proposed system also predicts the average velocity of the bus using clustering and back propagation method. This increases the accuracy of the system as it also takes into account the traffic conditions during that day of week and time of the day.

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