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# A Survey on Prediction of Bus Arrival Time using Global Positioning System (GPS)

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**ABSTRACT**: Buses are an affordable means of public transport used by majority of the population in cities. Bus services are provided in many cities and have been proved to be an excellent means of transport; however, the commuters are uncertain about the arrival time of the buses, which leads to usage of private vehicles or taxis, thus leading to an increase in fuel consumption and pollution. Rather than waiting for buses it would be beneficial for passengers to know the tentative arrival times of the buses. Thus, for the convenience of citizens this application is proposed, which tracks the locations of the user as well as the bus using GPS sensors, and then calculate the approximate time required by the bus to reach the stop including the traffic analysis and various other parameters. Thus, the commuters can be aware about the waiting time for their respective buses, helping them in planning their journey accordingly.

**KEYWORDS**: Bus Service, GPS, Navigation, Tracking, Location.

## I. INTRODUCTION

Among all public transportation services available, bus service is the major transportation used by public. Especially in a busy town or city, bus is the easiest, convenient and cheaper transportation. Various reasons that people take bus instead of driving own vehicle such as traffic jam, heavy parking fee and lack of parking space availability in destination. However, bus transportation service has very poor transportation information system nowadays. Bus user do not know the exactly arrival time for a bus, but only know the scheduled arrival time. Compare to train or flight transportation system, bus transportation service does not have a proper system to track all buses position and the actual arrival time in every bus stops. These problems occur because current bus service system did not apply real time tracking technology to track on each bus on the road and also lack of a platform to update latest bus traffic information to bus users. In order to solve these problems and enhance current bus service system, real time bus tracking system has to develop and implement. With real time bus tracking system, bus position data is connected real time and transmitted to a central server for processing and extracting transit information. The main technology used to develop this system is **Global Positioning System (GPS)**. GPS technology able to receives the position of an object from space-based satellite navigation system through a GPS receiver. Some programming languages such as PHP, JavaScript, AJAX, Java Servlet and Java Server Pages (JSP) will be used to develop the proposed system. The developed bus tracking system will able to provide bus users a real-time platform to check on updated bus traffic information, for examples bus arrival or departure time. Besides, this system also able to reduce workload for bus management team and provide an immediate platform to update latest and accurate bus traffic information to bus users.

## II. LITERATURE SURVEY

In the system proposed in [1], the querying user queries the bus arrival time by sending the request to the backend server. The backend server is used for maintaining the database of the uploaded information and addressing the queries of the query user. The detection methods proposed in this for sequence generation are Audio Detection and

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Accelerometer Detection. The data which is obtained to the backend server is then used for predicting the arrival time which is calculated using the Smith-Waterman Algorithm.

The system proposed in [2] describes the design, analysis, implementation, and operational deployment of a real-time trip information system that provides passengers with the expected fare and trip duration of the taxi ride they are planning to take. This system was built in cooperation with a taxi operator that operates more than 15,000 taxis in Singapore. It has first described the overall system design and then explain the efficient algorithms used to achieve our predictions based on up to 21 months of historical data consisting of approximately 250 million paid taxi trips.

Paper [3] surveys a variety of current and emerging mobile, networked, sensing applications; articulates their common challenges; and provides architectural guidelines and design directions for this important category of emerging distributed sensing systems. It explains applications of Mobiscopes, which are a federation of distributed mobile sensors into a task able sensing system that achieves high-density sampling coverage over a wide area through mobility.

Paper [4] explains aboutStarTrack, a system that enables extensive works on tracks. A track is a discrete and sampled illustration of a continuous route. Mobile devices gather tracks and opportunistically upload them to a central server. StarTrack includes facilities for storing, comparing, clustering, indexing and retrieving tracks. It serves as the base for building large-scale track-based services.

Paper [5] presentsSurround Sense, a non-conventional approach to logical localization. The main idea is to fingerprint a location based on its ambient sound, light, colour, RF, as well as the layout-induced user movement. This fingerprint is then used to identify the user's location. Surround Sense can perform micro-localization based on the inherent properties of the ambience.

In [6] RADAR is introduced, which is a radio-frequency (RF) based system for locating and tracking users inside buildings. RADAR operates by recording and processing signal strength information at multiple base stations positioned to provide overlapping coverage in the area of interest. It combines empirical measurements with signal propagation modelling to determine user location and thereby enable location-aware services and applications.

[7] is a case study which describes an Android-based feedback mechanism, created to gain structured input on prototypes of Google Maps Navigation, a mobile GPS navigation system, during real-world usage.

## III. SYSTEM OVERVIEW

The application is a user friendly one, that anyone can access for free of cost. The main idea for this project is to predict the expected arrival time of the bus to the bus stop. The user logins or registers into an application and then enters the source i.e. present location and destination into the application. Let's say, if user is unaware about the nearest bus stop if he/she is new to a particular location so the application will help the user to navigate to the nearest bus stop and from there the user will get the details of the bus that will help him/her to reach the destination. Also, the user will be given the estimated time of arrival of the upcoming bus.

The aim behind this application is to digitize the present service offered by the bus transportation service, for example, BEST bus service offered in Mumbai. The main aim is to overcome all the drawbacks faced in the existing bus transportation system and generate a digital platform for the existing system.

## IV. PROPOSED SYSTEM

The basic idea for this project is to guide the bus travelers with the nearest bus stop and the estimated time of arrival of the bus at the bus stop and moreover, display maps and track the location of the upcoming bus at the bus stop. The aim is to overcome all the drawbacks faced in the previous system and generate fast and accurate results. The proposed system has been divided into two modules as follows. Module 1 gives the information of the nearest bus stops to the user/passenger. The passenger needs to add the source and destination so that it gives information relatedto all the upcoming buses at the bus stop and gives bus location on maps for the same. Module 2 give information about all the buses along with the bus numbers that go through the selected stops, track the location of the selected bus and send this information to the passenger giving him/her the estimate time required for the bus to reach. This is done using the Client-Server technology.

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1. Module 1 (Bus stops, Routes and Maps): The first module depicts the selection of the nearest bus stop to the passenger if he/she is unaware of the bus stop and then the process of selection of routes from source to destination as enteredby the passenger and presents the respective location on the map for the same details.
2. Module 2 (Location Tracker and Time prediction): The second module depicts the process of selection of the destination till where the passenger wants to travel.The Location Tracker is will detect the current location of the bus and send the location of the bus back to the passenger's device with the estimated time of arrival to the bus stop. The Client-Server technology is used in this kind of system.

The system provides the following functionalities:
A.Bus stop, Bus Information, Route Information, Map Generation, Location Tracking, Time prediction are the core functional parameters.

***B. DATABASE:***
The databases created in this application are created in SQLite. User passes a query to access the database. All the rows in the database that match this query are passed as a type of pointer(cursor) and then displayed to the user. The application maintains an Adapter class that handles calls that are made to the database. The databases play an integral part of the system as all the bus information, stop information as well as routes are all stored in these databases.

***C. GLOBAL POSITIONING SERVICE (GPS):***
The GPS tracker is a mobile application which depends on the location of a mobile phone. It is used as an IP service that uses geographic information in order to track the location of the bus. The bus is tracked and sent to the server and the server then forwards this tracked bus information to the client device which makes the user keep track of the bus location and get an estimate remaining time for the bus to reach his/her bus stop.It is a widely-used application in mobile data services which has led to the rapid development in wireless communication strategies as well as location positioning technologies. The travelers having the location-aware mobile phones can find out about the respective bus stops at any place.

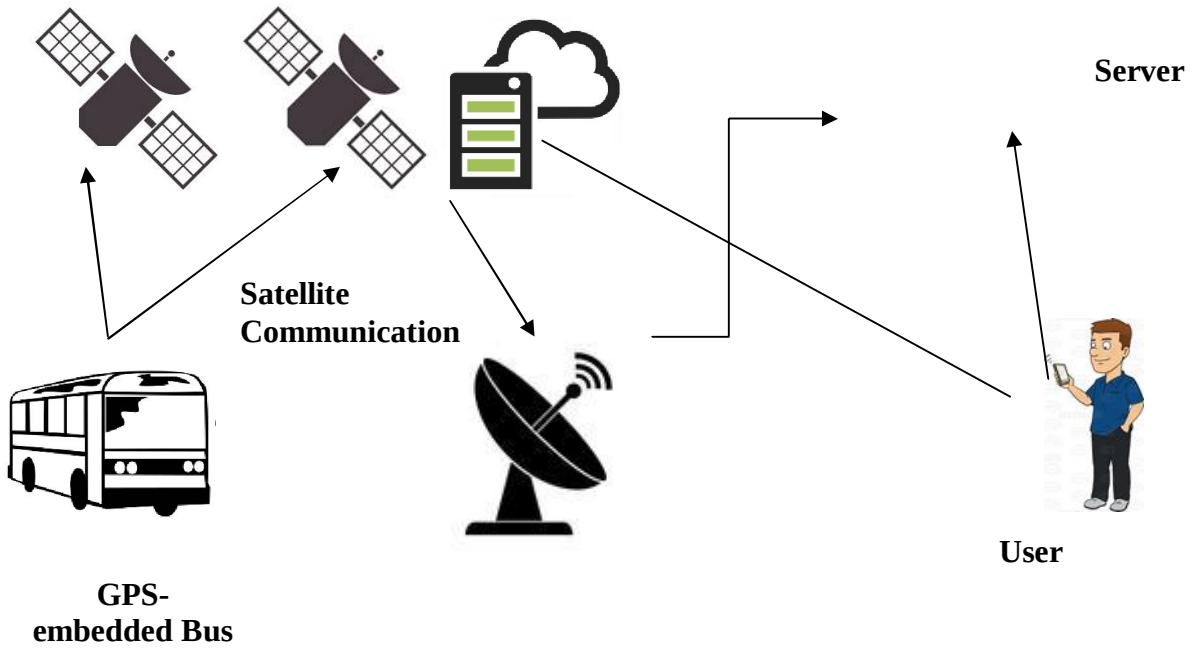


**Fig.1:** Architecture of Proposed model

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MODULE DESCRIPTION:

1. REGISTRATION: This module is provided for the user to register themselves with details such as name, password, confirm password, email id, mobile number and use the application for tracking the bus. The registered users can login with their credentials once they have registered. The details of the registered users are maintained in the database.

2. BUS TRACKING MODULE: In this module when the bus route is selected the appropriate bus is found using the IP address of that particular bus. Then the location of the bus is tracked using its latitude and longitude. Corresponding to the bus movement the change in latitude and longitude are updated in the database for every minute.

3. ROUTE FINDING MODULE: In this module, the updated latitude and longitude value in the database is used to find the exact location of the bus using maps and the bus source and destination, user, bus are displayed in the Google map with different colors to distinctly identify them. The distance between the user and bus along with the expected time is calculated and displayed.

## V. METHODOLOGY

The GPS tracker is installed in buses where the bus driver enters busnumber and tracking begins. Since buses are changed frequently, we identify a bus by its unique code or number assigned to it. This system can be implemented through an application which requiresdevices with GPS sensors embedded in them, where we can embed a fully functional map interface. The map view contains a flattened representation of user's surroundings. When a Coordinates of user are sent to the server where they are translated into known locations. Based on user's location, estimated time of bus arrival is predicted using GPSand presented to the user on the application screen.

This system has three main modules Transmitting Unit, Monitoring Unit and Server. Transmitting side performs tracking functionality. It tracks the vehicle through GPS and transmits its current location to the server. The main function of monitoring side is to provide login interface to user and to show the map with vehicle locations. Server woks as a central connector for transmitting unit and monitoring unit. As both transmitting side and monitoring side communicate with each other through Server only. As shown in mobile application communicates with server and access the remote database. Where at transmitting side Tracker application obtained its current location through GPS technology and update it to server.

## VI. CONCLUSION

While waiting for a bus, a person may feel impatient and anxious if he or she does not know when the bus will arrive. For the bus management side, it is very difficult to provide an accurate schedule for bus user due to some uncertainties may happen on the road such as traffic jam or bus break down. When a bus is delayed, bus management side should inform bus user immediately. However, they do not have a platform to inform bus user in real time about the latest bus traffic status. This system aims to eliminate these problems along with providing a platform for bus operators to monitor bus status and update latest information to user.In this proposed system, we present an effective way of predicting bus arrival time based on user's location using GPS technology.Primarily relying on inexpensive and widely GPS sensors, the proposed system provides cost-efficient solutions to the problem. We have demonstrated how high-value data such as routes, stops, and transit schedules, can be computed automatically from simple GPS traces. Our system produces high-fidelity route maps, extracts transit stops locations, and constructs transit schedules which are better and more accurate than the ones provided by the bus operators themselves.

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