

# Bus Tracker and Route Recommender using Google APIs

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**Abstract:-** Overcrowded cities like Mumbai, Delhi has a lot of commuting solutions so that the crowd is evenly distributed without stressing just one source. One of which are the busses. Sometimes there may exist several buses which can take you from the same source to your desired location. But sometimes people are unaware about the same as they don't know what route the bus is going to take. It is also true that people are unknown about the current status of the bus which causes wastage of time. Our proposed solution is an android application will help the user to know the current location of the bus along with the route that it is going to follow. The system will use Firebase as the backend for the application and a basic android application will be interfacing with the updated database on the server to provide the real-time data to the user, hence enhancing the user-experience. Some technologies like GPS (Global Positioning System), Google maps, GPRS (General Packet Radio Service) and Firebase will be used for development purposes.

## I. INTRODUCTION

There are many buses available for travellers going to different destinations. Most of them are not acquainted with the different routes that are available to them. It is important for people to know about the details of the different bus routes available along with the timing. This would help passengers to save valuable time by knowing the current location of the bus and the bus timings and information regarding the shortest route available. There should be a proper system the user can access to know the actual position of the bus route. We have developed an Android application connected to the firebase database that provides all relevant information regarding travel. The Android operating system is the fastest-growing platform and which has been largely accepted by people. This particular Android operating system is available on all mobile devices and everyone at least owns a basic Android phone. Technologies like Global Positioning System (GPS), Google Maps, and GPRS (General Packet Radio Service) are employed for development purposes.

The system includes a web-based application that displays the bus's current location on Google Maps. [1] Due to the ever-increasing population, there is undoubtedly a need to have a proper system in place. The ability to put in the best gets reduced due to overpopulation as we have to stand in long queues. So, it is important to real-time information about the bus. All major cities like Kolkata, and Hyderabad have a peculiar problem of overcrowding and people have barely any time to invest in transportation. As there is unprecedented growth in the population buses, trains, etc. The system has used firebase as a platform to build this application. The data has been updated on the database server where it provides information about accurate timings of the bus which makes it easy for the user.

## II. LITERATURE REVIEW

A vehicle tracking system allows the movement of a vehicle to be tracked at any time and from any location. In this study, a real-time tracking system based on a Google GPS-based map is implemented. These are a few examples of engineering and technology-related technical literature in which people sought to create systems similar to those described below.

Authors "Manini Kumbhar, Meghana Survase, Pratibha" have written a paper "Real Time Web-Based Bus Tracking System"[1]. The proposed approach shortens the time remote users must wait for the bus. The server stores all of the most recent data, which remote users can access via web-based applications. Although this system is web-based, people are increasingly using Android apps because they are more portable, and widely used smartphones are more often utilized than other platforms. A web-based system is also inconvenient for a user to use on a daily basis while waiting at a bus station.

"Real Time Bus Tracking and Position Updation System," Deebika Shree, J. Anusuya, and S. Malathy [2]. The public transportation system is essential in all aspects of society. It is having a significant impact on the country's economic progress.

The key issues that this system faces are tracking, monitoring, scheduling, and vigilance services. People currently have no simple access to the system's key services, which are currently operated manually. The project's goal is to automate public transportation bus services by providing real-time tracking. These buses will be equipped with RFID tags and readers will be installed at each bus stop. The central controller for this system is Arduino. The GSM module will be used to transmit tracking messages to authorized individuals in order to ensure continuous monitoring. Buses are tracked using GPS. Consumers will receive bus tracking information as a smartphone notification via IoT. Arduino is regularly updated with information from RFID readers for data processing. The processed data is delivered to the cloud, which serves as a conduit between the user and the system.

"Intelligent Bus Monitoring and Management System," M. A. Hannan, A. M. Mustapha, A. Hussain, and H. Basri [3]. The proposed solution employs artificial intelligence in conjunction with an RFID module to reduce manual labour. System for managing and monitoring buses. It employs RFID to track the bus as it passes through the bus stop. As a result, just the estimated location based on the bus stops is provided, rather than the specific location of the bus. Accuracy is critical in today's environment, which is why our project has constraints.

**III. PROPOSED METHOD**

Transportation is a crucial part in cities and town. Public transportations such as trains and buses are developing rapidly. A lot of people travel by train and there are many apps that give an accurate location and timing of the trains. On the other hand, the second most used public transportation is bus in which we can locate the current status of the bus and also are unaware of the timings of the bus. To make the transportation easy for the daily travellers we have built a bus recommender and tracking system. In this system the user can track the bus and know the live location of the bus. The user interface does not have to fill a lot of details. It only consists of the bus number and the location. After filling these details, you will be aware of live location of the bus and traveller can track the status. It is not only useful for the daily travellers but also for the new people who are traveling for the first time by bus can easily know the characteristics and features of the bus. The widespread use of smartphones and the burgeoning Internet of Things (IoT) technologies have made it possible to track a variety of visitor travel behaviours while they are on-site, such as visit durations, spatial-temporal travel trajectories, and tangible travel behaviours like taking pictures, standing, and walking. It goes without saying that one's on-site travel habits reveal his or her actual preferences and interests in certain things. For instance, if a tourist is more interested in something, they will stay longer, take more pictures, or stop more often to savour it on the spot. Consequently, observing how visitors travel while they are there and mining their personal preferences and frequent travel routes could be a successful strategy for providing concrete travel

routes for future travellers. Fig. 1 shows flowchart of proposed model.

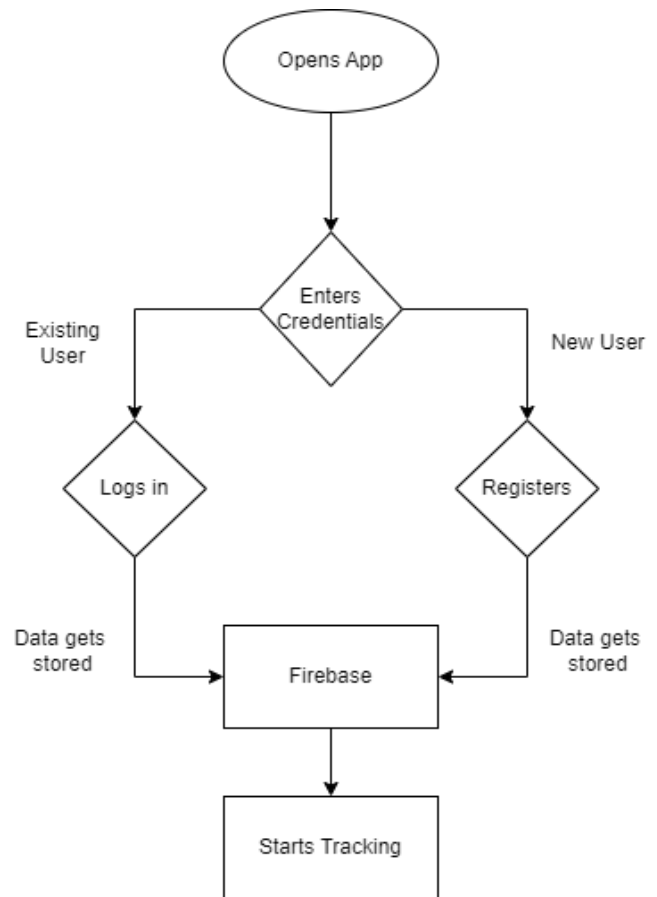


Fig 1 Flowchart of user Interface

The interface of the driver and customer are in the same app. Both interfaces share a common platform. If a person is a driver, he is choosing the driver interface and if he is the customer, he will choose the customer. The driver opens the app as he is already registered, he doesn't have to login again. The driver then must turn on his live location. As he has turned on the live location the route of the bus and driver will be visible to all the customers using the app. Since the driver's location being the location of the bus, the customer can track the bus. The buses' locations are determined using GPS. Using, users will receive notifications on their mobile devices with bus tracking information. Although GPS is widely used for navigation, it still has flaws and is prone to mistakes [3].

**IV. ARCHITECTURE AND FRAMEWORK**

The data contains images of the tracking and recommender system. It provides the live location of the bus. The live location of the bus is stored in the firebase. This live location is then transferred to customer module and that location is been displayed on the customers app. The customer can see the live location of the bus he wishes to track. The driver must first register himself using Gmail id and password. The driver will be registered, and his registration information will be stored in the database. Next time he has to login and enter the bus number he is going to

drive. Once his login is successful, he will see his location on the app. The current location of the driver will be sent to database throughout the journey and after the bus has reached successfully to its destination the tracking will stop automatically. The customer must install the app in his/her android phone. The customers should at least have android 8 or above for the following functions to work.

Once he opens the application the user needs to approve the access for the location and other requirements which are needed by the application to run successfully. Now the customer must register on the portal. Once all the details have been filled you have successfully logged in to the app. We don't have to login again and again. Once the login is done you can directly access the applications on the app.

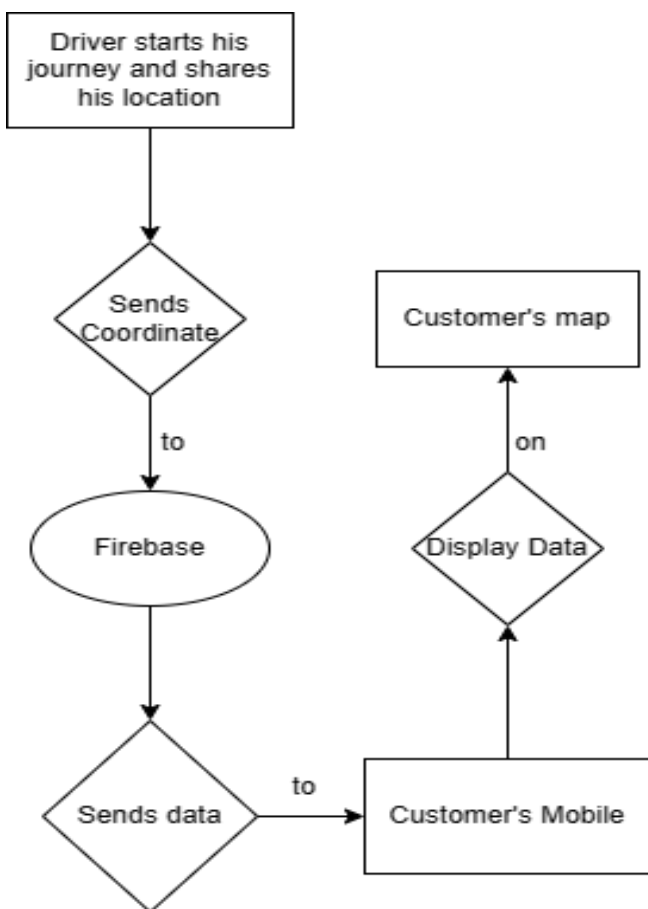


Fig 2 Flowchart Showing Transfer of Location

**V. DETAILS OF THE HARDWARE AND SOFTWARE**

➤ *Android Studio*

Android Studio is used by us in the project since it is the official Integrated Development Environment (IDE) for Google's Android operating system. Android studio is based on IntelliJ IDEA (Community Edition) created by JetBrains. We will also use different API in Android Studio. Android studio provides good graphical user interface to create android applications and hence is being used by us for this project.

➤ *Java*

Java is an object – oriented, class-based programming language which is used to develop various android applications, mobile applications, desktop apps and much more. We have used Java in the backend as it is easy to compute big data and android applications. It helps the client to interact with the server and access the given information.

➤ *Firebase*

Firebase is a platform that provides us tools to grow your app and android applications. Tools are available from Firebase for monitoring analytics, reporting, and resolving app errors, as well as developing marketing and product experiments. A backend-as a-service is Firebase (Baas). It offers a range of tools and services to developers so they can create high-quality apps, expand their user base, and make money. It is built using Google's technical framework. A NoSQL database application, Firebase stores data in documents that resemble JSON. A document in Firebase is a collection of key-value pairs that are specified by a schema. A collection is a group of documents.

**VI. ALGORITHM PROCESS**

Google Data APIs are uncommon among Google APIs. Only a small subset of the APIs listed in the Data API Directory are covered by this Google Data APIs documentation. Through APIs that make use of the Google Data Protocol, some Google services offer external access to data and functionality. The Data Protocol is a method for reading, writing, and editing data on the web that was inspired by REST. Google is frequently used for user registration since it enables users to safely log into third-party services with their Google account via the Google Sign-in system. Android apps frequently have a "Sign with Google" button because manually entering login information on a small screen is time-consuming. Signing in or signing up for a new service with a Google account typically only requires a few buttons clicks because the user is typically logged into their Google account on their mobile device. Drive apps are a variety of online applications that use the Drive API to function inside of Google Drive. Users can download these applications from the Chrome Web Store and add them to their Drive. The Distance Matrix API comprises of rows with duration and distance values for each pair of origins and destinations, and it gives travel distance and time for a matrix of origins and destinations. There are numerous ways to access Distance Matrix, including as a standalone API.

- *To figure out the length of a drive between two locations.*
- *To determine how long it will take to go from a starting point to a particular latitude and longitude.*
- *To determine the driving distance and time needed to get from one site to several.*
- *On a reliable internet connection, the Distance API must always answer within 100 milliseconds, while response times may vary when the connection is unreliable.*

- *Additionally, depending on the complexity of the route for which the distance must be calculated, the inclusion of each point may result in different reaction times.*

## VII. RESULTS & ANALYSIS

This system basically gives an overview of how the bus can be tracked and location can be known. This can help the user to know where the bus is and can estimate how long will it take for the bus to reach the destination. The user can accordingly reach the bus stop. The basis of this project is firebase and android application. The approximate distance is also given by the bus. The proposed system reduces the waiting time and increases the productivity. This increases customer satisfaction. The tracking system's success is due to the user-friendly interface it offers via an Android application. Anywhere that has access to the Internet can use the system. Because it minimizes the user's efforts to go for work and prevents the waste of waiting time for the bus, this system helps end users operate more efficiently and save time. It is advantageous for cars that regularly travel a particular route. The public transportation system will become more dependable thanks to machine-learning-based recommendation algorithms for navigational information. It is possible to add further improvements to the system, such as breakdown alert and over speeding alert. The inclusion of a security alert system would make it easier to report crimes to local police stations and ensure the protection of women.

This study built and implemented a recommendation system that identifies the bus route and walking segment combinations that follow the shortest path between a starting bus stop and a destination bus stop. Exists already are online directories that provide bus travel directions, including switching to a different bus route.

The most comfortable bus route, considering the waiting time, crowding, and driving time that passengers were most worried about, was suggested between the starting point and the destination. In conclusion, the suggested method enables bus users to select a comfortable bus route easily and effectively in accordance with their personal demand.

The solution is an android-based application that will enable the user to view the bus's current location and estimate the amount of time it will take for the bus to arrive at the user's current location. The system will utilize Firebase as the foundation for the application, and a straightforward Android application will interface with the updated database on the server to offer the user with real-time data, hence improving the user-experience.



Fig 3 After Login Page

Fig 3 shows the home page of the app. It is common for both the customer as well as the driver. As soon as the user selects the respective role, they'll have an option either to Login or to Register in the app respectively.

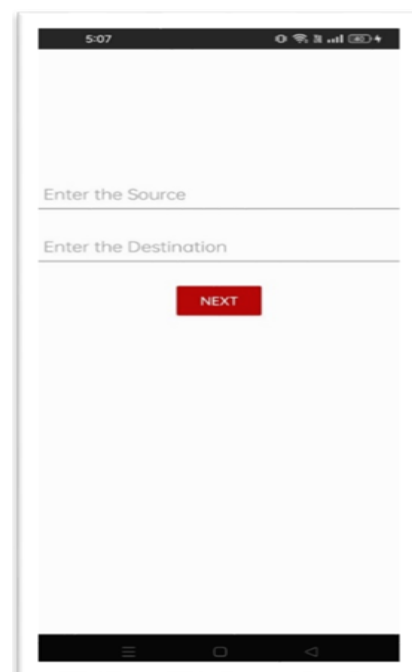


Fig 4 User's Module

The customer must first register for the app. The application will be displayed once he has finished enrolling as shown in Fig 4. If registration is completed, the consumer won't need to login repeatedly. Consumer application must be chosen by the customer.



Fig 5 User’s Module

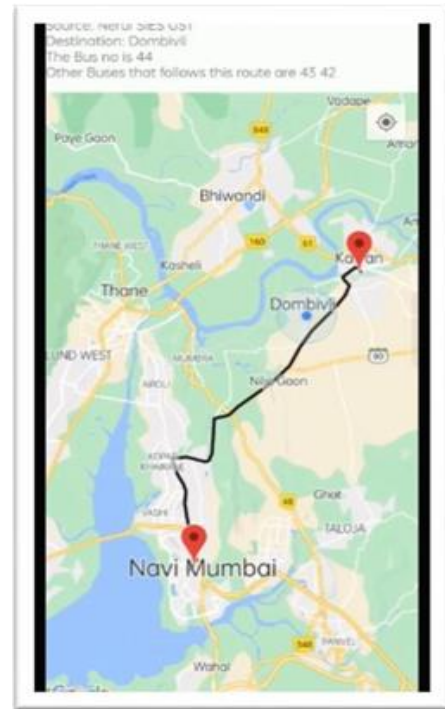


Fig 7 Bus Route and location

The customer must next enter the bus number for the necessary destination after making his choice. There are two options available after inputting the bus number: show route and bus location. You have the option of choosing from the following. If the bus location option is chosen, the bus's current location in relation to the user is collected, and if the show route option is chosen, the bus's route is displayed in relation to the user's location.

Fig 6 and 7 shows the route between two required destinations. The solution is an android-based application that will enable the user to view the bus's current location and estimate the amount of time it will take for the bus to arrive at the user's current location. The system will utilize. Firebase as the foundation for the application, and straightforward Android application will interface with the updated database on the server to offer the user with real-time data, hence improving the user-experience.

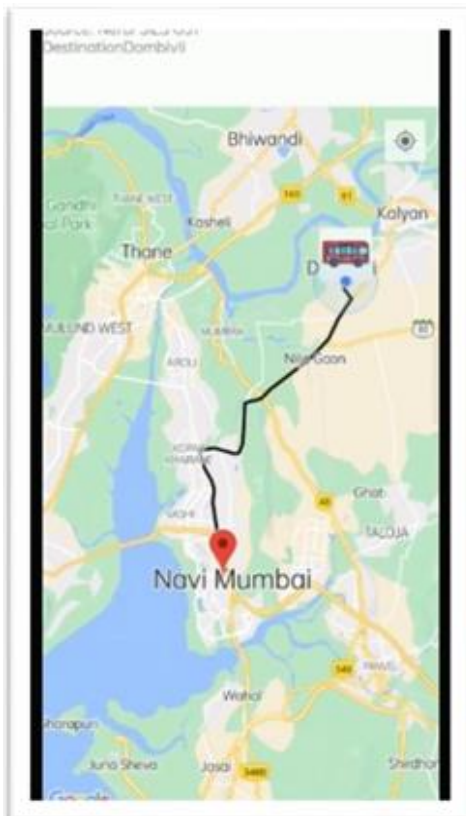


Fig 6 Bus Route and Location

### VIII. CONCLUSION & FUTURE SCOPE

The main aim of the given project is to build an efficient and effective bus tracking system using higher technologies. To improve the current application by adding more necessary features. The system should be feasible to all the types of people availing this application. The purpose is to design a simple, handy application that works in every circumstance. We can even use it for our personal vehicle. The installation in a private vehicle can help the owner to track if it is lost or stolen by somebody. The application can also be handed over to a private agency to keep a track of all their buses. It can also be alerted during any time of crisis as it knows the position and spot of the bus. Modes of payment can also be included by keeping online / offline transaction systems.

The future work includes implementing our system in a real-world POI, using more smartphone sensors to gather more types of onsite travel behaviours to precisely learn tourists' preferences, utilizing real-time congestion information at each scenic area spot to generate more reasonable travel routes and further improve tourists' travel experiences, and utilizing the querying tourist's current location and prior travel sequence to generate a real-time route.

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