International Journal of Combined Research & Development (IJCRD)
eISSN:2321-225X; pISSN:2321-2241 Volume: 13; Issue: 7; July- 2024

AN ANDROID APP FOR VEHICLE TRACKING AND SEAT RESERVATION

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ABSTRACT

Encouraging people to use public transportation (in this case buses), live location tracking and seat reservation is the most important and significant strategy to consider and implement. The following explanation is that everyone lives a busy life and is in a rush to get to their destination. Therefore, it is not appropriate to wait at the bus stop without knowing the exact location or estimated arrival time of the bus. As a result, we suggest the Driver application and the User application as two distinct Android applications in this post.Here, the driver program serves as a GPS/GPRS module. The GPS technology in smartphones allows this driver application to continuously obtain the coordinates, or latitude and longitude, from satellites. It then transmits those values to Firebase, the system's real-time database. In addition to continuously transmitting the coordinates to the user app and updating the data in milliseconds, Firebase is also utilized to notify users via cloud messaging when the bus is expected to arrive at their stop. Using the user application, the user can choose their seats and monitor the bus's real-time whereabouts. As a result, the following framework was developed to provide clients with ever-more-efficient, quick, and user-friendly conditions. Traffic problems in big cities can therefore be somewhat mitigated as more people begin to use public transportation.

INTRODUCTION

Current location One of the most important things that can be done to encourage people to use public transportation is to track buses. the primary reason is that people can use bus tracking applications to schedule their activities or to leave their houses at the precise moment the bus arrives at their destination, saving passengers valuable time. A vehicle monitoring and seat reservation system is an Android application designed to make it easier for users to use public transportation, particularly in urban regions where traffic is a major problem. However, users can also use the program in rural areasOne of the main benefits of the developed application is that it allows users to locate and track the location of the bus as well as its movement on a Google map, saving passengers who want to use public transportation a great deal of valuable time. The bus status can also be checked with this application. Additionally, or as an additional component of the application, seat reservations are also possibleThis enables customers to reserve their seats in advance in accordance with the bus's seat availability. This allows the passengers to travel in comfort in the seats that they have reserved.

RELATED WORK

The authors of this study define the fundamental features of the mobile bus tracking technique in [1]. These features must be adhered to or included in the mobile bus tracking process. In this sense, the clever structure plays a crucial role in providing consistent transport data to distant clients. The paradigm that the authors present here overcomes the drawback of public transportation. The framework manages all of the data on the area of transportation that is now in use. By using this data, it is possible to follow the transportation process continuously. The data is then provided to a remote client who requires the constant transportation data. The primary benefits of driving city transportation include a reduction in overall pollution, less traffic on the streets, and a partially resolved stopping problem. The time of arrival, which is the most crucial element of a vehicle monitoring system, is the main topic of this study (In [2]). Here, the author illustrates how factors like traffic will affect when the bus arrives at a given location. Here, the author talks about resolving the conflict brought on by traffic and the disparity in arrival times.

PROPOSED METHODOLOGY AND DISCUSSION

The following technologies and applications are part of the proposed methodology.

- GPS Technology
- Driver Module/application
- Firebase Technology
- User Module/application
- Google Maps.

GPS Technology-

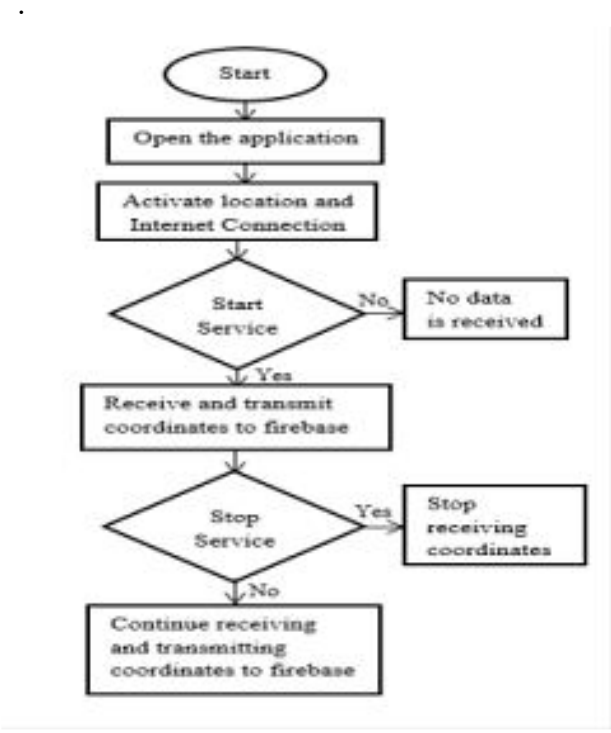
The Global Positioning System GPS is a key component of this project. Throughout the project, GPS is utilized to retrieve the coordinates of the place that will be used to track the location of the bus. After being received by GPS, these coordinates are transferred to Firebase, a real-time database. A satellite navigation system called GPS is used to find an object's position on Earth24 satellites in six earth-centered orbital planes make up the GPS satellite system. every one having four satellites. The position of the earth's surface is produced by three satellites, and the information obtained from the other three satellites is verified by the fourth satellite. The US military first employed GPS in the 1960s. Later, the technology expanded, and millions of people use it today all over the world. for a number of reasons, including location, tracking, and navigation.

Driver Application-

The purpose of this driver application is to communicate coordinates to the firebase after receiving them from the satellite. The official IDE (Intellectual development environment) for creating Android applications, Android Studio, is used to design an application for this purpose that gathers coordinates from satellites. In order to get coordinates from satellites, this program must be installed at the driver's end and have location and internet service turned on constantly. After inputting the required information, the user of the application must click "Start Service" to initiate the process of receiving the coordinates and sending them to Firebase. The application has background tracking so that if the user moves to another app, background coordinates will still be received. By selecting the "stop tracking" button found in the application, users can always opt out of getting coordinates.

FIREBASE-:

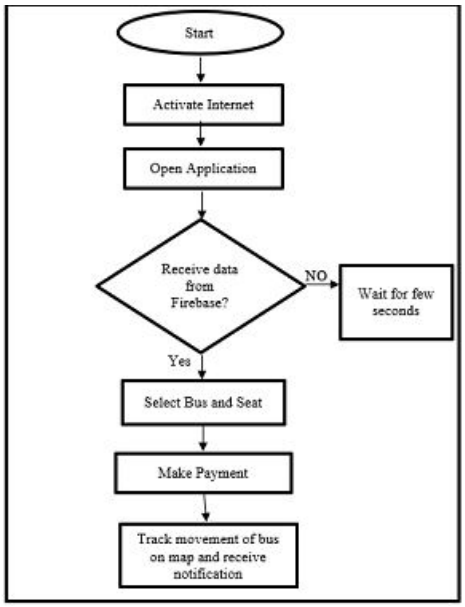
The back end of the project uses Firebase technology. Here, Firebase is utilized to send cloud messages to users and store all application data. Additionally, Firebase functions as a go-between for the user and the driver program. Google owns the Firebase platform, which aids in the development of both web and mobile applications. This offers resources and services that support the creation of real-time applications. This offers a real-time, back-end database as a service. quickly and with up-to-date data in real time. Firebase will store data in JSON format. In Firebase, server configuration is done automatically. Because there is no server-side code involved, using Firebase will save time and increase developer productivity. By using Firebase's FCM Firebase cloud messaging functionality, customers can also receive notifications from Firebase about the bus's arrival time.



Flow Chart of User Application

USER APPLICATION-

This is the second application that Android Studio has been used to develop. The user is the intended audience for this application. The driver application and this application share the same database thanks to the integration of Firebase. The information about the busses is obtained through a user app. In order to use the application, the user must have an internet connection. There are two actions in this application. first to choose a bus and reserve a seat. the second person to find busses on a map following seat reservations. The user must input his intended destination in the search bar in the first activity. Buses that are based on availability will then be offered for the user to choose from. Following the bus selection, the user can choose the seat of his choice and reserve it using the seat matrix that appears. After making a digital payment, the user will receive an e-ticket that has all the required information. After selecting a seat, the user can monitor the bus's whereabouts on Google Maps in the second activity.



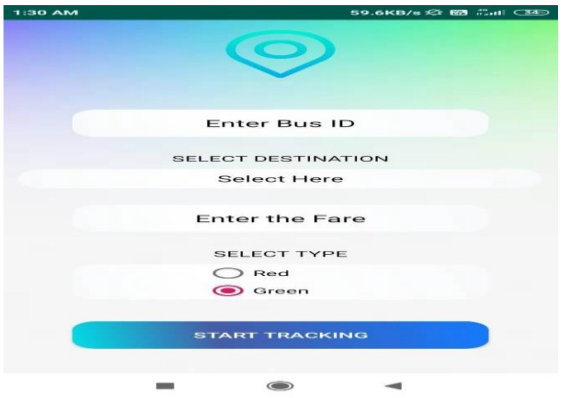
Flow Chart of User Application

GOOGLE MAP-

Google Maps is a software that uses satellite imagery to display 3D maps of the planet. It was introduced in 2005. With the use of Google Maps API keys, this version of Google Earth displays a map and can be integrated into webpages. This is another Google-developed tool that provides web mapping. Many people use Google Maps all across the world to find routes, travel updates, the amount of time it will take to go somewhere, and other information. If a passenger wants to travel to a specific place, Google Maps provides the most recent information about the traffic situation there. The Google Map API for Android shows the user application's real-time automobile information through an HTTP request. This HTTP is used to set up communication between the Google Maps application and the map. This kind of communication is made feasible by the design of HTTP. With the use of GPS, Google Maps is utilized in this project to follow or monitor the movement of the bus that the user has reserved.

EXPERIMENTAL RESULTS

Driver Application: This driver application is loaded on a smartphone in order to experimentally demonstrate how it operates. The following screenshots illustrate how the driver application functions.



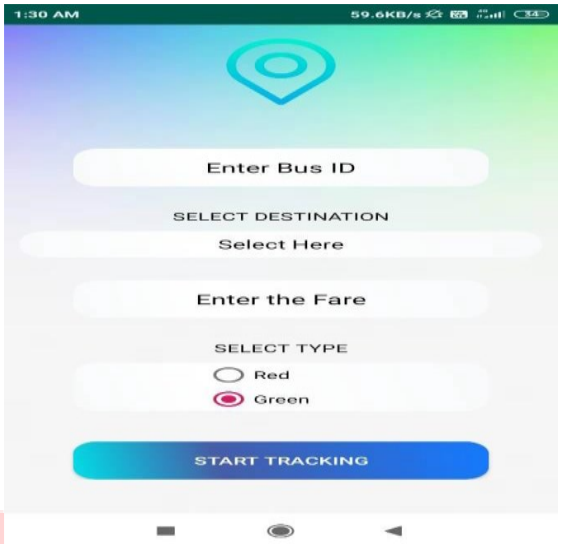


Fig 1 Screenshot Showing Stop Tracking Button

When the driver reaches his destination, he can click the stop tracking button, as shown in Fig. 1. User Application: The screenshots below display the user application's experimental findings.

SOFTWARE TESTING

The chapter provides a comprehensive overview of the test cases and validations conducted for the project. Software testing is an essential stage of the software development life cycle that acts as a vital checkpoint to guarantee the application's functioning and quality.

Testing is the step that comes right after development in this project, which uses the waterfall paradigm of development. Finding and fixing defects, confirming that all client requirements are fulfilled, and evaluating the overall effectiveness and performance of the program are the main goals of testing.

Test Case for User Application

The user application's test cases are listed in this table, which also shows how the application would behave under different input scenarios. It tests the application's responses to different scenarios, such as blank inputs, seat selection, and booking processes.

Test Case ID	Test Case Description	Sample Input	Expected Output	Actual Output	Remarks
T001	Checking for blank input	Blank text box	Alert Message "No route found"	Alert Message	Pass
			No Alert message	No Alert message	Fail
T002	Checking for available buses	Destination	Returns available buses if bus is present for destination	Returns the result of available buses	Pass
			No buses	No buses	Fail
T003	Displaying of seat matrix	Select seats	Display seat matrix	Display seat matrix	Pass
			Seat matrix not found	Seat matrix not found	Fail
T004	Booked seats	Selecting not available seats	Not Available for booking	Not Available for booking	Pass
			Available	Available	Fail
T005	Checking buses for destination	Entering destination	No Buses Found	No Buses Found	Pass
			Buses Found	Buses Found	Fail
T006	Ticket generation	Select seats and make payment	Ticket generated with Bus id, fare, date	Ticket generated	Pass
			Ticket not generated	Ticket not generated	Fail
T007	Receiving notifications about bus arrival	Generate ticket	Notification like "bus will arrive in 10 min"	Notification arrived	Pass
			Receive Notification	No Notification	Fail
T008	When multiple users book the same seat	Select seats	Error message for user who selected same seat	Error message	Pass
			Same seat allocated	Same seat allocated	Fail
T009	Bus movement tracking on map	Generate Ticket	Movement of Bus found on map	Movement of Bus found on map	Pass
			Movement of bus on map not found	Movement of bus on map not found	Fail

This table demonstrates various test scenarios, including input validation, seat matrix display, ticket generation, and notification receptionIt addresses situations in where the application must react effectively to various inputs and conditions.

Test Case for Driver Application

The test cases for the driver application are shown in this table, with an emphasis on background operations and coordinate recording.

Test Case ID	Test Case Description	Sample Input	Expected Output	Actual Output	Remarks
T010	Start getting coordinates	Enter details and click on start tracking	Save coordinates to Firebase	Coordinates saved	Pass
			Save coordinates to Firebase	Coordinates not saved	Fail
T011	Record coordinates when app is running in background	Enter details and click on start tracking	Save coordinates to Firebase	Coordinates saved	Pass
			Save coordinates to Firebase	Coordinates not saved	Fail
T012	Start Tracking with empty fields	No data Entered	Invalid data	Invalid data	Pass
			Tracking started	Tracking started	Fail

This table evaluates the driver application's background performance as well as its accuracy in recording and storing coordinates, among other aspects.

Integration Testing

Integration testing assesses the degree to which several application modules function as a unit to make sure the integrated system satisfies user needs and performs as intended.

Test Case ID	Test Case Description	Actual Input	Expected Output	Actual Output	Remarks
T013	Checking whether the bus in driver app is displayed in user app	Bus id, destination, Fare	Bus in driver app displayed in user app	Bus found	Pass
			Bus not found	Bus not found	Fail
T014	Check bus availability for destination where buses will not travel	Enter Destination	No buses for that route	No buses for that route	Pass
			Buses Found	Bus Found	Fail

CONCLUSION

The project's objective was to develop a dependable and efficient vehicle monitoring and seat reservation system that would enhance the convenience and usability of public transportation. This solution incorporates seat reservation and realtime bus tracking into an easy-to-use Android application. The primary objective was to enable passengers to monitor their bus's location in real-time, enabling them to monitor its progress and any possible delays caused by heavy traffic. With real-time information on the bus's location, the program assists users in making better informed travel plans and reduces uncertainty and wait times at bus stations. Apart from tracking, the application also makes seat reservations easier, which helps with the problem of finding a seat at busy times. With the ability to choose and reserve their seats in advance, travelers can ensure a more structured and comfortable journey. This functionality is particularly valuable in public transportation, where finding available seats can often be a difficult task, especially during busy periods. By using the application, passengers can reserve their seats ahead of time, thereby minimizing the stress associated with overcrowded buses and improving overall travel comfort.

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