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College Bus Tracker Android Application

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Abstract - *Due to many problems in today's world such as traffic congestion, unexpected delays, randomness in passenger demand and irregular vehicle dispatching times, passengers do not know when to expect their buses to arrive. To overcome this, a system can be introduced which will show the real-time location of buses. This project focuses on implementing this system, which uses a real-time bus tracking system. From the global positioning system on the driver's phone on college buses, the location of the bus will be transmitted. This real-time bus tracking system is a system designed with special features to display the real-time locations of college buses provided by the university. It can also be used for many other transportation services.*

***Key Words*: Android, Real-time Systems, GPS, Google Maps, Java Programming**

1. INTRODUCTION

In today's world, every second counts. And because of this everything has become a challenge, especially the traffic. We all know the most perfect schedule is that of schools and colleges. The time in which we start and end is very crucial in colleges, so by default transportation becomes a big challenge. College buses are the most convenient way of travelling for students, professors and all the other faculty members. Not only for colleges even companies use buses to pick up and drop their employees. But factors such as traffic congestion and breakdown increases the delay for passengers and increases waiting time and is indeed a waste of time. Because of the unexpected traffic and delay, people are afraid that they may fail in punctuality. To overcome this, college buses can use technologies such as the global positioning system, cellular network and real-time vehicle tracking to stay on track of their schedule. The advent of real-time vehicle tracking which uses the global positioning system which displays the fetched data and also allows the user to monitor its activities and the passenger can find know where exactly their bus is, so they can arrive at the bus stop on time and can manage their time efficiently or they can take alternate transport in case of a delay. This system also allows scheduling and planning much before initiation. Thus, this real-time tracking can be achieved by our proposed system. The remote control of the system is given to the user which uses a mobile app-based application. This, in turn, displays the real-time location of a bus on the user's screen. In turn, college transportation will be smoother and passenger (students and faculty members) friendly.

2. RELATED WORK

Supriya et.al[1] projected a real-time college bus tracking application for android smartphones which provides the exact location of the college bus in Google Maps by providing information such as bus details, stops, routes, etc. It is a real-time system as the current location of the bus is updated every second in the form of latitude and longitude values which is received by the students through their application on Google maps. It will estimate the time required to reach a particular stop on its route. The application uses client-server technology. When students and faculty members open the application the location of the bus is visible in Google Maps. Students can track the location of their bus from any location through their login. But students and faculty members must make sure that their location service is active. It provides the exact location of the college bus, if the driver's phone cannot access the internet or if they do not have network coverage, the location of the bus can be obtained using the average speed of the bus that moves on a fixed route. Admins can send a message to the driver and the students in any case of an emergency.

G.Kiran et.al[2]s introduced an android application where the hardware unit is also used along with the software unit to track college buses. The hardware unit consists of a global positioning system module and an Arduino microcontroller. The Global System for Mobile communications (GSM) is inserted to a subscriber identity module card which is connected to the power supply. Using the commands dumped into the microcontroller, it takes the latitude and longitude values of the current position from the global positioning system and passes it on to the global system for mobile communications. The global system for mobile communications will be connected to the server by general packet radio service. Thus, the values get stored in the database on the server. Then, the location is fetched from the stored database on the server. This location is transferred as a Google Map which is visible to the user. The position of the bus is refreshed every thirty seconds and stored on the server database.

3. PROPOSED WORK

This project aims at tracking the real-time location of college buses making it easier and more convenient for the users. Tracking the bus is done by tracking the driver's phone using the phone's global positioning system. This gives the location of the bus in real-time. To access the location, permissions for accessing the location is required, which needs to be specified in the manifest folder of the application. An instance of the Location Manager class needs to be used as a reference to the location service. After requesting the location of the bus from the location manager, the location needs to be periodically updated as and when the bus' location changes, this is done by using an instance of the class Location Listener which will update the longitude and latitude values in the database as and when the values change and the changes will then be reflected on the user's device.

Instead of only tracking their assigned bus, the user's can also track the location of other buses that pass by their stop. This allows users to take another bus if they missed their bus. If a user wants to be notified a certain amount of time before the bus reaches their stop, they can do so by setting an alarm at a specific time or a specific location such as the previous stop. This makes travelling a lot easier and less time consuming for the user.

In the user's interface:

Step 1: The user should log in to their account using their email and password. This is validated using Firebase's email or password authentication. If the user does not have an account, they will need to register.

Step 2: Once, the user successfully logs in, the home screen is displayed which shows the user's current location as well as the real-time location of their assigned bus. On the user's home page, they can also access the menu which as different options such as setting an alarm, tracking other buses, their account details or settings, generating reports and an option to logout.

Step 3: In the "Set An Alarm" screen, the user has the option to set an alarm, either by providing a time or a location. If they set a time, they will be notified that amount of time before the bus reaches their stop. If they set a location, they will be notified when the bus reaches that specific location.

Step 4: In the "Track A Bus" screen, the user has the option to track other buses that pass by their stop in case they miss their bus.

Step 5: The users can also generate reports such as which students have paid their fees and which have not. This will allow the bus in charge to prevent students who have not paid their fees from riding the bus. This report will be generated in a Portable Document Format (PDF) which will be downloaded on the user's phone storage.

Step 6: In the "Settings" screen the user has the option to update their details such as name, email, address, bus number or bus stop in case they change. The user also has the option to delete their account. When this option is clicked, they will get a warning to confirm that they will not be able to retrieve their account once it has been deleted.

Step 7: The final option is that the user can logout from their account and will get a confirmation once they click it.

For the driver' interface:

Step 1: Similar, to the user's login and registration, the driver needs to login to their account which will also be validated through Firebase's email or password authentication. And if they do not have an account, they would need to register.

Step 2: In the driver's home screen, they can see their current location as well as the location of other buses.

Step 3: The driver also has the option to edit his details, such as their name, email, phone number, address and bus number.

Step 4: The driver also has the option to logout similar to that of the user.

This level 0 of the data flow diagram. The admin has control over the registration and validating new users to make sure they are a student or professor at the university. They can also delete accounts for students no longer studying at the university and also update user's details. The driver is the server whose location is accessed to determine the real-time location of the bus. The user is the client who uses the application.

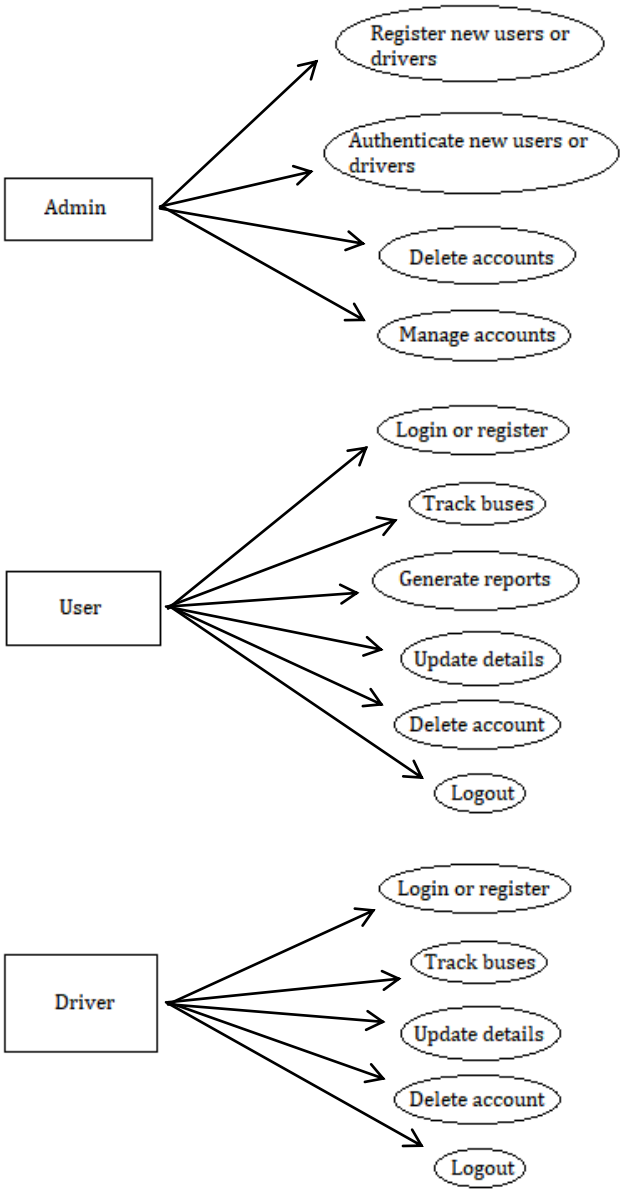

Fig -1: Data Flow Diagram - Level 0

The system architecture diagram shows that when the user opens the application, they will need to log in or register if they do not have an account. Once they successfully log in, they will see the home page which will display their current location on a map as well as the current location of their assigned bus. The current location of their assigned bus will be obtained by getting the longitude and latitude values of the bus from the database with is updated from the global positioning system and the location of the bus is displayed on the user's map. The driver's details such as their name and number will also be retrieved and displayed to the user, in case they need to contact the driver.

Once the location is displayed on the map, the estimated time for the bus to reach the user's location will also be displayed. This will record the time it took the bus previously to reach the user's stop from its current location. The user can also set an alarm if they want to be notified when the bus is at a specific stop or a certain amount of time before the bus reaches their stop.

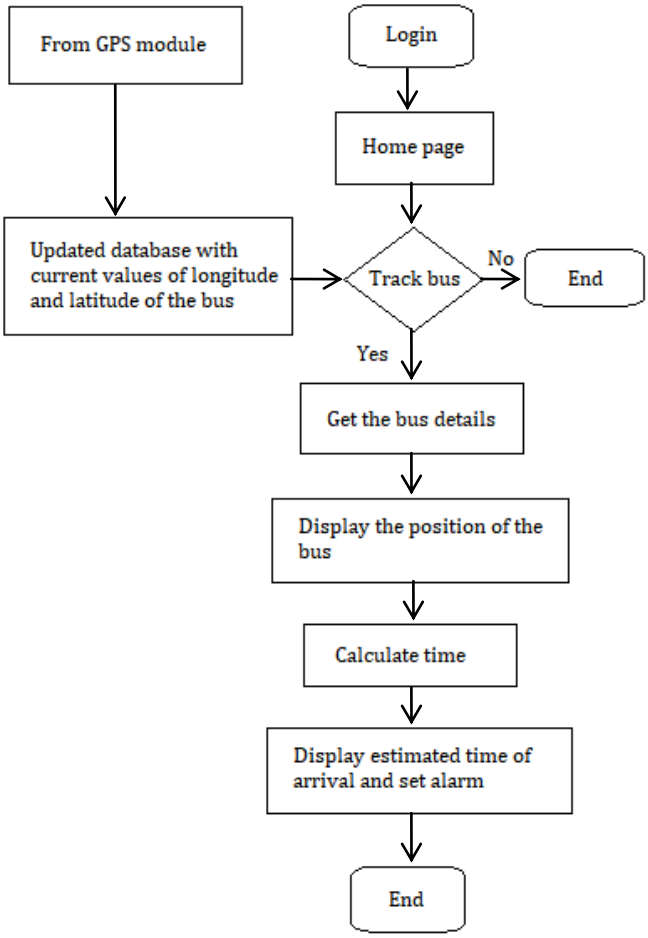

Fig -2: System Architecture Diagram

4. RESULTS AND DISCUSSION

This is mainly used in the college bus system, which allows the students and faculty members to know the current location of their respective buses. Here, we are using an android application to locate the bus by using the global positioning system on the driver's phone. First, if the user does not have an account, they need to register for the application. Then, the application will show the user's current location and their assigned bus's location.

- In the Home menu, the user's location and their bus's location is displayed.

- The user can set an alarm and be notified when the bus is near their stop.
- The user can also track the location of other buses in case they missed their bus.
- Reports are generated in a portable document format which shows the students who have paid their fees and who have not. This helps in putting a stop to students who ride the bus for free.
- In the Settings menu, the user can update their details or delete their account.
- The user can also log out of their account.

Here is a comparison between this project and other bus tracking systems which uses a global positioning system and a global system for mobile communications. This paper was published in 2017.

Table -1: Comparison between this application and an existing application.

College Bus Tracker Android Application	College Bus Tracker using GPS and GSM
The GPS in the driver's mobile is used to get the location.	An Arduino UNO board is used to track the location.
Cost-efficient	Expensive due to the hardware implementation
Easy and quick to connect	Takes time to connect
Dependent on software	Dependent on hardware

Fig -3: Registration Screen

Fig -4: Forgot Password Screen

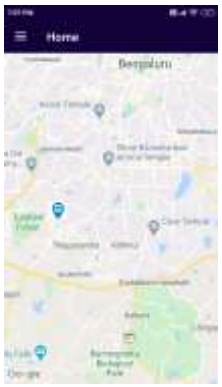

Fig -5: Bus's Location displayed on the user's map

Fig -6: Track other buses and see their stops

Fig -7: Student Fee Report

Fig -8: Account Settings

Fig -9: Account deletion confirmation

Fig -10: Logout Confirmation

5. CONCLUSION

This application will make it easier for users to students and faculty members to track the real-time location of their buses. This ensures that the user arrives on time to the university and does not get delayed trying to find a bus or wondering if they missed their bus. It is useful to first-year students who might not know the bus might arrive that their stop and lets them know if they have missed their bus in which case they can find other buses that might pass by their stop.

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