A REAL-TIME GPS-BASED ANDROID SYSTEM FOR ENHANCED FLEET MANAGEMENT

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ABSTRACT

The proposed solution of an android application that provides real-time updates on the location and the estimated time of arrival of vehicles can certainly be beneficial for people living in busy metropolitan cities like Mumbai and Delhi. By providing users with real-time information about the location and ETA of public transport, the application can help them save time and plan their commute more efficiently, which can lead to increased productivity on the whole.

It is based on a real-world problem. It is an app that tracks available public vehicles live (e.g. buses, E-Rikshaws, and Auto Rikshaws, etc.) and provides mobile tracking solutions for these vehicles as well as passengers looking for options to commute. If someone is new to a city then they have to book Ola and Uber even for a shorter distance which costs much whereas autos and E-rikshaws are available at very lesser prices, but people don’t know about the available options in the beginning and end up paying high fares. The app will show all the people which auto and buses go from where to where. And if he wants to check which bus has reached where then he can easily track it. The user can compare the vehicle fare also.

The use of GPS as the basis for the application is a good choice, as it allows for accurate ETA of vehicles. The application can also be designed with user-friendly features and an intuitive interface, which will enhance the user experience and make it easy for users to navigate and access the information they need.

Overall, the proposed android-based application has the potential to provide a valuable solution to the problem of long waiting times for public transport in busy metropolitan cities. By providing users with real-time updates on the location and ETA of vehicles, the application can help users save time and increase productivity, which can ultimately improve their quality of life.

I. INTRODUCTION

Android has gained immense popularity globally because it is an open-source platform that does not require additional fees for the Java Virtual Machine (JVM). Mobile phones are an essential part of modern-day life and students, in particular, value their time greatly. Vehicle tracking systems are a popular application that is widely used for tracking vehicles. Traffic congestion, roadworks, and delays in vehicle arrivals can cause long waiting times for passengers. The primary focus of this project is to reduce the waiting time of students by providing accurate vehicle information. Vehicle Tracking System (VTS) utilizes different methods such as GPS and radio navigation systems to determine the location of a vehicle. The tracking system enables easy and accurate location calculation of a vehicle through triangulation or trilateration methods. Vehicle information such as location details, speed, and distance travelled can be viewed on a digital map with the help of software via the Internet. Data can also be stored and downloaded to a computer for analysis. Vehicle tracking systems are becoming increasingly popular for people with expensive cars as a theft prevention and retrieval device. Android applications are a reliable source for tracking vehicles as they provide real-time data on vehicle movements. Android phones are widely used for this purpose as they have a GPS device that acts as both a transmitter and a receiver. By combining automatic vehicle location in individual vehicles with software that collects fleet data, a vehicle tracking system can provide a comprehensive picture of vehicle locations.
Passengers often face a lack of information regarding the vehicles available for long-distance travel. Information such as the number of vehicles heading to the desired destination, vehicle numbers, timings, routes, travel duration, maps, and real-time vehicle tracking is crucial for passengers to plan their journeys effectively. The proposed solution is an Android application that provides all the necessary information about vehicles traveling in Pune. This system overcomes the limitations of the previously developed application, "Pune Vehicles Guide." Android was chosen as the platform for this system due to its wide popularity and user-friendly interface. With the increasing number of Android applications, this open-source software environment has become the preferred platform for mobile software development.

The operating system, developed by Google, is based on Linux and utilizes the Java programming language. It incorporates a virtual machine that optimizes memory usage and resources. The application was built using Android Studio 1.6 IDE, along with ADT (Android Development Tools) and Android SDK (Software Development Kit). Several constraints must be met in the development process.

**II. LITERATURE REVIEW**

A system for tracking the movement of a vehicle at any time and from any location can be highly advantageous. The current project involves the implementation of a real-time vehicle tracking system based on Google Maps and GPS. Several technical pieces of literature in engineering and technology describe the development of similar systems, however, they may have limitations that are not present in our application. These shortcomings will be discussed below.

There is an application in Pune called "Pune Vehicles Guide" which provides accurate directions to the destination. However, the disadvantages of this application outweigh the advantages. Despite being connected to GPS, the application does not display the passenger’s current location. Additionally, the application does not provide the numbers of the vehicles, making it challenging for passengers to identify their respective vehicles’ arrival times. Furthermore, the application does not offer real-time vehicle tracking services or generate maps for user convenience. The application has not been updated since its development and has bugs that make it difficult for users to use.

There is another application in Mumbai called "M-Indicator - Mumbai" that has several drawbacks. The application displays the same information that is available online, providing no additional value to the users. The latest updates of the application have created issues for users of all Android devices, including the most recent versions. The "A to B" module of the application, which provides directions from one location to another using public transportation, has experienced problems. Specifically, when selecting the source and destination options, the field remains blank, and no vehicle routes are displayed.

There is an application called "Delhi Vehicles Navigator" developed in Delhi that has several drawbacks. The application functions well offline but performs poorly when connected to the internet. It provides information about only the direct routes and does not offer any information regarding alternate routes. Additionally, the application experiences lag due to bugs, making it difficult to use. Most of the time, the application crashes when users request specific vehicle routes.

An application named "Bangalore BMTC Info" has been developed in Bengaluru, but it has various drawbacks. The app is not regularly updated and contains incorrect routes for several vehicles without any subsequent updates to correct them. Moreover, the application is unable to search for anything after being minimized and restored. The app crashes frequently, and its user interface is complex and not user-friendly.

The application "Chennai Vehicles Route," developed in Chennai, has some shortcomings. Although the application works well, it does not provide information about vehicle timings. Some of the vehicle stops are not updated in the app, and the app does not display any maps.

"Real Time Web-Based Bus Tracking System" [1] aimed at reducing the waiting time of remote users for buses. The system enables users to track buses’ real-time location from any location at any time, with all current information stored on the server and retrieved via a web-based application. However, the authors note that this system has limitations. In today’s world, people primarily use Android apps since they are more portable, and smartphones are more widely used. Additionally, a web-based system is inconvenient for users to access regularly while waiting for a bus at the bus stop.
The "Intelligent Bus Monitoring and Management System," [2] implemented by authors M. A. Hafizul, A. M. Mustapha, A. Hussain, and H. Basri, utilizes artificial intelligence through the use of an RFID module to reduce manual work in the Bus-Management & Monitoring System. The system tracks the bus through an RFID when it passes a bus stop, which provides an approximate location of the bus based on the stops. However, the exact location of the bus is not displayed, which is a limitation of this project. In today's world, accuracy is crucial, and this aspect needs improvement for better results.

The authors Süleyman Eken and Ahmet Sayar have implemented "A smart Bus Tracking System based on location-aware service and QR code." This system allows any passenger with a smartphone to scan the QR code placed at the bus stop to view the estimated bus arrival times and the current location of the bus. However, a limitation of this project is that the user needs to be physically present at the bus stop to scan the QR code, which can be inconvenient for some users.

Deebika Shree; J. Anusuya; S. Malathy, "Real Time Bus Tracking and Location Update System" [3]. The role of public transport in everyday life cannot be overstated as it plays a critical part in the economic development of a country. However, there are various challenges associated with this system such as tracking, monitoring, scheduling, and vigilance services. Currently, most of these services are operated manually, resulting in approximate data and limited access for the public. Therefore, the main objective of this project is to automate the services of public transport buses by implementing a real-time tracking system. This system will utilize a GSM module to send tracking messages to authorized persons, enabling continuous monitoring of the buses. Additionally, GPS technology will be employed to locate the vehicles accurately.

The authors R. Maruthi and C. Jayakumari have implemented the "SMS-based Bus Tracking System using Open Source Technologies." [4] The paper proposes a bus tracker application that uses a GPS transceiver to track the bus. The goal of this work is to develop a system that manages and controls transportation using a tracking device to determine the scheduled vehicle and its current location via SMS using a GPS tracking device.

The author Yusuf Abdullah Badamasi has implemented the "RFID bus ticketing system." This system utilizes RFID cards to replace the manual or traditional ticketing system which involves conductors.


In order to implement an automatic Vehicle Location system that can provide real-time location information, developers have created Active systems. These systems consist of a hardware device that is installed in the vehicle, as well as a remote Tracking server. The location information is then transmitted to the Tracking server in real-time via a GSM/GPRS modem on the GSM network, either through SMS or through a direct TCP/IP connection using GPRS. The Tracking server also has its own GSM/GPRS modem, which receives the location information from the vehicle via the GSM network and stores it in a database. This information is then made available to authorized users of the system via a website that can be accessed over the internet [7].

### III. METHODOLOGY

**A. System Design**

The Software Development Life Cycle (SDLC), which has numerous stages, is followed by a complex entity called a software product. The second step of the SDLC is the Design stage, which tries to create the software's overall design. The High-Level Design and Detailed Design stages are both parts of the Design stage.

The functional and non-functional requirements of the programme are examined at the High-Level Design stage in order to create a comprehensive solution architecture that can meet those criteria. The High-Level Design document's goal is to provide the existing project description with the essential specifics so that it may be coded more effectively. It also acts as a reference guide for how the modules interact at a high level and aids in identifying conflicts before coding. The High-Level Design document is essential in directing the development team in producing a productive and successful software product.

**B. Input Design**

Building an information system that connects people and the system requires careful consideration of input design. It entails creating guidelines and processes for processing transaction data preparation. Data created by
computers can be examined to obtain output, or users can enter data directly. Controlling the quantity of input required, reducing errors, preventing delays and additional processes, and maintaining process simplicity are the main goals of input design.

Input design must also guarantee security, usability, and privacy protection. To prevent errors in the data entry process and guarantee reliable information, input design entails translating user-oriented descriptions of input into computer-based solutions. This is accomplished by designing data entry panels that are easy to use, capable of handling massive volumes of data, and equipped with tools for data editing and record viewing. The ultimate aim of input design is to facilitate and improve data entering.

C. Output Design

In order to give the end user information that is pertinent and understandable, output design is essential. The basic goal of output design is to display data in a way that the user can easily understand and that gives them the knowledge they need to make wise decisions. Depending on the needs of the user, output design also entails selecting the output's format and medium, such as text, images, tables, or charts. In order to make sure that the output is compatible with these devices, output design also takes into account the many output devices that will be utilised, such as printers, displays, or mobile devices. Ultimately, output design is crucial in ensuring that the system gives the end user accurate and valuable information.

IV. DATA FLOW

A. Data Flow Diagram

A Data Flow Diagram (DFD) illustrates how data moves through an information system in a graphical format. DFDs are also useful for visually depicting data processing in structured design.

B. Process Flow Chart

Flow charts are a popular type of diagram that depict an algorithm or process using boxes of different shapes to represent each step, with arrows connecting them to show the order of execution. Flow charts are utilized in a variety of fields to analyse, design, document, or manage processes or programs.
V. IMPLEMENTATION

A. Android SDK

For devices that use the Android operating system, new applications are developed using the Android software development process. Google claims that developers may create Android apps using the Kotlin, Java, and C++ programming languages using the Android software development kit (SDK). However, other programming languages, such as non-JVM languages like JavaScript, C, C++, or assembly, can also be used with the aid of JVM language code, which may be provided via tools with restricted API support. The ability to create apps that work on both Android and iOS devices is provided by some programming tools and languages. Third-party tools, development environments, and language support have all developed and grown since the SDK’s original release in 2008.

B. SQLite and Firebase

SQLite is a relational database management system that runs on the C computer language. Unlike many other database management systems, SQLite uses an embedded database engine that is not client-server based. The majority of SQL standards are implemented by SQLite, which adheres to ACID compliance, but does not guarantee integrity because its SQL syntax is dynamic and poorly typed. It is frequently used in application software, such as web browsers, as an embedded database programme for local/client storage. Given that it is incorporated into numerous widely used operating systems, embedded systems, and mobile phone browsers, it is regarded as one of the most used database engines. SQLite has bindings to many programming languages and is known for its lightweight setup, hence the term "lite" in its name.

A wide range of applications, including those created for Android, iOS, JavaScript, Node.js, Java, Unity, PHP, C++, and more, can be hosted using Firebase’s extensive collection of hosting capabilities. It offers real-time NoSQL database hosting services, as well as social and content authentication for well-known platforms like Google,
Facebook, Twitter, and GitHub. Moreover, Firebase provides a number of services, including servers for real-time communication and notifications.

C. Testing

Testing's primary objective is to find flaws or faults in a work product. In testing, every potential flaw or weakness in a specific product is sought after. This aids in assessing the functionality of individual parts, subassemblies, assemblies, or a finished good. Testing is done to make sure the software system works as intended, complies with all requirements and user expectations, and does not malfunction in an unacceptable way. There are various testing methods used, and each has a particular function in the testing process.

D. Testing Methodologies

The following are the Testing Methodologies:

1. Unit Testing.
2. Integration Testing.
5. Validation Testing.

E. Testing Strategy

In order to guarantee the effective creation of software, a system testing strategy is a well-planned approach that includes system test cases and design strategies. Coordination of efforts for test planning, test case design, test execution, and data gathering and evaluation should all be part of the approach. High-level tests to confirm key system functionalities against user requirements should be combined with low-level tests to validate smaller code portions. As the final assessment of specification design and code, software testing is an essential part of software quality assurance. A number of tests are run to make sure the suggested system satisfies the criteria before the programme is prepared for user acceptance testing.

F. RESULT:

VI. CONCLUSION

The study's findings suggest that knowing a specific domain can improve results. This project was developed for the Android platform and includes various attributes that enhance the system's capabilities. The requirements and specifications for the project have been outlined. The project was developed using Android and SQL domains. The application leverages GPS technology to display maps and routes to different locations.
and uses client-server technology to track and transmit vehicle location data to the client device. The application will be hosted on a cloud platform, making it accessible to all Android users. The Location Tracker feature will benefit bus travellers’ and tourists, as well as anyone using any means of transport. The Location Tracker will provide passengers with the exact location of the vehicle, making travel easier and more convenient.

VII. REFERENCES


