

1) The Real-Time Bus Tracking System

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ABSTRACT

India, a populous country, sees most of its citizens rely on public transport as their primary means of communication. Buses travelling to the nooks and crannies of towns and cities are highly convenient and safe. Public buses are preferred by people of all kinds: from students and office-goers to senior citizens and even the handicapped, as they provide door to door services at menial prices. Along with this, public transport also helps in reducing the carbon footprint and the traffic density by decreasing the number of private vehicles out on the streets. But when it comes to public transportation, time and patience are of the utmost essence. In other words, people experience time loss because of indeterminate waiting at the bus stops. Even though buses follow a fixed schedule, their arrival time is tremendously uncertain owing to traffic and other unexpected happenings such as accidents, weather conditions and so on. This has led to a greater need for an organized public transport service. In this paper, we are reviewing existing systems and proposing a new smart bus tracking system. Any passenger with a smartphone can view the bus routes on the map as well as the current location of the bus number that the user wants to view. GPS (Global Positioning System)- based devices owned by the driver or the conductor of the bus will send real-time location updates as soon as the bus starts which will be sent through a real time database to user devices. In addition to tracking, we will also be reviewing the functionality of estimating the crowdedness on the bus.

Keywords: Estimation, GPS, Location, Real-Time, Tracking

I. INTRODUCTION

Buses have been around for a long time and are one of the most popular mode of transport all around the world. In India, there are public buses available for passengers travelling distances by road like BEST buses in Mumbai, but not all passengers have complete information about these buses. It may be because they aren't traveling regularly or because they might have to travel to new locations frequently. Complete information namely the numbers of the buses that go to the required destination, bus timings, their routes, estimated time of arrival, maps that guide the passengers with his/her route and most

importantly, tracking of the current location of the bus is not available in a consolidated form to the users. Due to this, it becomes difficult for people to rely on buses in spite of the tremendous convenience they give. With such advancements in technology, it seems unnatural for a live tracking and crowd estimation system to not exist. The proposed bus tracking system offers solution for overcoming the problems stated. The platform chosen for this kind of system is android, reason being Android Operating System has come up on a very large scale and is used by majority of people. Also, Android is a user-friendly platform, thereby allowing ease of access for all the users. Android is an open source mobile software environment for

smartphones. Brought up by Google, the Android OS has been made Linux based and uses Java programming language. It has a virtual machine that is used to optimize memory usage as well as resources. This application has been developed using IDE (Android Studio 1.6) with ADT (Android Development Tools) and Android SDK (Software Development Kit). There are a number of constraints that need to be satisfied.

Many cities have found that GPS tracking system not only improve the efficiency of city roads operation, but also encourage commuters to take the advantage of public transports like bus. City bus systems have discovered that GPS tracking system which allows us monitor the location of their bus actually increase the number of people using public transport buses for routine commuting.^[2] This application is user friendly that anyone passenger can access for free of cost. The base idea for this project is to guide the bus passengers with the routes, display maps and track the bus location. The aim is to generate fast and accurate results which save time.

II. METHODS AND MATERIAL

The proposed system consists of three parts, the android application front-end and the real-time database and the RFID. The block diagram of the real-time bus tracking system is shown in Fig. 1. The real-time location of the bus will be updated to the cloud server. Then all the information will be processed in the server and displayed on the android application. Crowd estimation and ticketing are the additional features.

A. Android Application

In this project, a web application is developed as the graphical user interface (GUI) to assist user in monitoring real-time location of the bus and plan their journey based on bus stop number and bus arrival time. Development of the web application incorporates the use of servers. ^[1]

Google geolocation service is used to request location of user based on user's device (mobile phone or personal computer) and plot the location onto the map so that the user is able to see her/his location compared to the location of the bus on the same map. Users have control to grant or deny the geolocation.^[3]

B. RFID

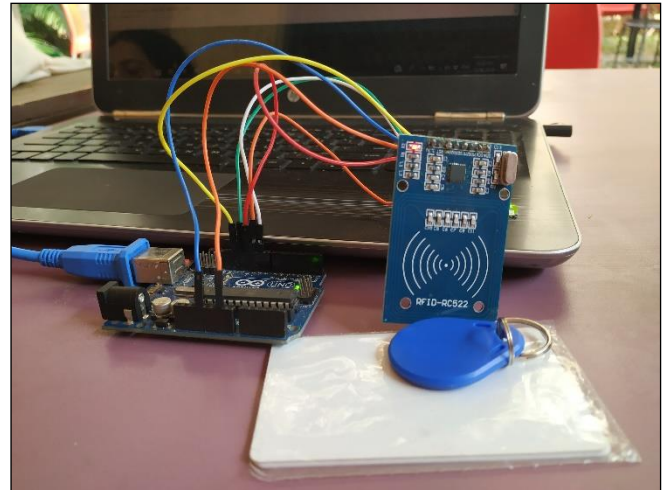


Figure 1: Ticketing system using Arduino Uno and RFID

RFID- “Radio-frequency identification” is a shortrange radio technology that enables communication between devices that either touch or are momentarily held close together. The RFID tags are used for the crowd estimation and ticketing. The passenger can scan their RFID card at conductor's RFID reader and get the ticket from conductor while money gets deducted from the card. As soon as the RFID reader reads the card, the passenger is added in the crowd list as +1. And the database is updated on the server. The crowd estimation in database decreases, assumed that the passenger departs as soon the mentioned stop arrives. “Insufficient balance” is displayed if the card doesn't have sufficient balance.

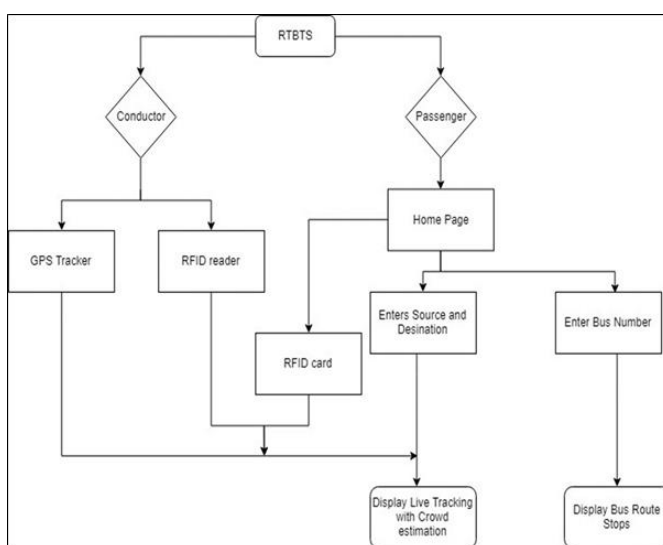
C. Real-Time Database

The Firebase Realtime Database is a NoSQL, cloud-hosted database that uses data synchronization to automatically receive new information in real-time from every connected client, without requiring you to setup your own application server.

We first created a connection between the project android application and the Firebase Console. Then we connected our app to Firebase and add support for both Firebase Realtime Database and Firebase authentication. We need to add playservices-location as a project dependency. Now, we need to get the access to the location for which we must have the access permissions. Every app that uses location data needs to request either the ACCESS_COARSE_LOCATION or the ACCESS_FINE_LOCATION permission. We're sending location data to Firebase using the setValue() method, which replaces the previous data entry. A location-tracking service is created from the Android Studio Toolbar. After this we test the application. Now the location will be forwarded to the database. The real-time database in Firebase is represented as JSON objects, which are the sets of attribute-value.^[4]

III. DISCUSSION

Figure 2: System Block Diagram



The Android based Application for Real Time Bus Tracking System to be developed is expected to facilitate the process of viewing the location of buses in real-time and estimate their time of arrival. People get an estimate of the time of arrival of buses from the comfort of their homes. It eliminates the need of waiting for an indefinite period of time at the bus stops. Ease for those who don't have an idea of the bus numbers which go to the required destinations. Greater level of convenience to the daily commuters as they can get live location updates by just entering source and destination. It is not necessary to have extensive technical knowledge to start live tracking. This similar application can be adopted for creating school bus tracking system for parents can be updated about their wards when and where they are while in the bus. The application can be modified for this system into two modules both while the ward leaves for school from home, and when it leaves from school. Also, the same methodology can be implemented for transport agencies where cooperation's can use real time bus tracking systems for tracking the bus location while it is off for deliveries.

IV. CONCLUSION

This app can be used by wide range of people using BEST services. This application can be implemented in public buses, helping the passengers waiting at the bus stop for long hours, this application gives location of the buses, hence making your journey a sweet experience and a smooth travel without any further waiting for long hours. Various featured attributes added to the project will prove to be beneficial to the system. The requirements and other specifications have been listed above. RTBTS is implemented using Android Studio. The applications will automatically

display the maps and routes to the different locations and also track the bus location and display them using Firebase as the real-time database and the client-server technology and forward it to the client device.

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