VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY
Department of Computer Engineering

Project Report on

Real Time Bus Tracking System

In partial fulfillment of the Fourth Year, Bachelor of Engineering (B.E.) Degree in Computer Engineering at the University of Mumbai Academic Year 2017-2018

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(2017-18)

VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY
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Certificate

This is to certify that ***Bhoomika Batheja, Praveen Devnani, Lokesh Jeswani, Manish Chandwani*** of Fourth Year Computer Engineering studying under the University of Mumbai have satisfactorily completed the project on "***Real Time Bus Tracking System***" as a part of their coursework of PROJECT-II for Semester-VIII under the guidance of their mentor ***Prof. Richard Joseph*** in the year 2017-2018 .

This thesis/dissertation/project report entitled ***Real Time Bus Tracking System*** by ***Bhoomika Batheja, Praveen Devnani, Lokesh Jeswani, Manish Chandwani*** is approved for the degree of Bachelor of Engineering (Computer Science).

Programme Outcomes	Grade
PO1,PO2,PO3,PO4,PO5,PO6,PO7, PO8, PO9, PO10, PO11, PO12 PSO1, PSO2	

Date:

Project Guide:

Project Report Approval
For
B. E (Computer Engineering)

This thesis/dissertation/project report entitled Real Time Bus Tracking System by **Bhoomika Batheja, Praveen Devnani, Lokesh Jeswani, Manish Chandwani** is approved for the degree of Bachelor of Engineering (***Computer Engineering)***.

Internal Examiner

External Examiner

Head of the Department

Principal

Date:
Place:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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We express our hearty thanks to them for their assistance without which it would have been difficult in finishing this project synopsis and project review successfully.

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We wish to express our profound thanks to all those who helped us in gathering information about the project. Our families too have provided moral support and encouragement at several times.

Computer Engineering Department
COURSE OUTCOMES FOR B.E PROJECT

Learners will be to,

Course Outcome	Description of the Course Outcome
CO 1	Able to apply the relevant engineering concepts, knowledge and skills towards the project.
CO2	Able to identify, formulate and interpret the various relevant research papers and to determine the problem.
CO 3	Able to apply the engineering concepts towards designing solution for the problem.
CO 4	Able to interpret the data and datasets to be utilized.
CO 5	Able to create, select and apply appropriate technologies, techniques, resources and tools for the project.
CO 6	Able to apply ethical, professional policies and principles towards societal, environmental, safety and cultural benefit.
CO 7	Able to function effectively as an individual, and as a member of a team, allocating roles with clear lines of responsibility and accountability.
CO 8	Able to write effective reports, design documents and make effective presentations.
CO 9	Able to apply engineering and management principles to the project as a team member.
CO 10	Able to apply the project domain knowledge to sharpen one's competency.
CO 11	Able to develop professional, presentational, balanced and structured approach towards project development.
CO 12	Able to adopt skills, languages, environment and platforms for creating innovative solutions for the project.

Abstract

In the busy metropolitan cities, people don't have time to invest in waiting for transport. Waiting time for transport in such crowded cities leads to less productivity on a whole. People face this problem in their daily life where they have no idea about the current status of their transport.

So the proposed solution is an android based application that will help the user to check out the current location of the bus and also will help the user to know how much time the bus will take to reach the current location of the user.

The system will use IoT as the basis for the application and basic android application will be interfacing with the updated database to provide the real-time data to the user, hence enhancing the user-experience There are buses available for passengers travelling to different locations, but not many passengers have complete information about these buses. Complete information namely the number of buses that go to the required destination, bus numbers, bus timings, the routes through which the bus would pass, time taken for the vehicle to reach its destination location would assist the passengers with various routes, track the current location of the bus and give the correct time for the bus to reach its bus stop.

The system is an Android application that gives necessary information about all the buses travelling in Mumbai. 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 owned by almost every second person. As more and more applications of android operating system is developed day by day on large scale ever since it is advent.Android is an open source mobile software environment. There are various problems that require solution such as ‘the zone in which the bus is’ and ‘the recorded time that each bus passed through each zone’.

Content

Chapter 1 : Introduction

1.1 Introduction

There are buses available for passengers travelling to different locations, but not many passengers have complete information about these buses. Complete information namely the number of buses that go to the required destination, bus numbers, bus timings, the routes through which the bus would pass, time taken for the vehicle to reach its destination location would assist the passengers with various routes, track the current location of the bus and give the correct time for the bus to reach its bus stop.

The proposed system deals with overcoming the problems stated above. The system is an Android application that gives necessary information about all the buses travelling in Mumbai. 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 owned by almost every second person. As more and more applications of android operating system is developed day by day on large scale ever since it is advent. Android is an open source mobile software environment. There are various problems that require solution such as 'the zone in which the bus is' and 'the recorded time that each bus passed through each zone'. The limitation of this algorithm is that it is not suitable for large cities where both travel time and dwell time could be subject to large variations. Generally speaking, these models are reliable only when the traffic pattern in the area of interest is relatively stable.

1.2 Motivation

The motivation for GPS Tracking System is the desire for advanced features in an inexpensive receiver. Currently, all OEM GPS receivers i.e., the single GPS receiver boards with no case, display, etc, proprietary firmware which makes certain assumptions on the system dynamics or application which may not be appropriate.Also knowing the density of people in the bus is currently not available in any existing system. Currently there is no single system that integrates all tracking and tracing of any movable objects, there are applications but all of them are separate so to integrating all of them was the source of motivation for our team

1.3 Problem Definition

Among all public transportation services, bus service is the major transportation used by public. Especially in a busy town or city, bus is the most easy, convenient and cheaper

transportation. Various reasons that people take bus instead of driving own vehicle such as traffic jam, heavy parking fee and lack of parking slot in destination. However, bus transportation service has very poor transportation information system nowadays. Bus user do not know the exactly arrival time for a bus, but only know the scheduled arrival time. Compare to train or flight transportation system, bus transportation service does not have a proper system to track all buses position and the actual arrival time in every bus stops. These problems occur because current bus service system did not apply real time tracking technology to track on each buses on the road and also lack of a platform to update latest bus traffic information to bus users. In order to solve these problems and enhance current bus service system, real time bus tracking system has to develop and implement. With real time bus tracking system, bus position data is connected real time and transmitted to a central server for processing and extracting transit information

1.4 Relevance of the Project

The proposed system is aim to enable real time bus position tracking and build a real time platform to enhance communication between bus user and bus management team. There are several modules in this proposed system and the details are as follow.

1. Bus Positioning Module (Global Positioning System - GPS) This module is build for bus positioning purpose. An Android Smartphone will put in a bus which already installed with this module.

2. Central Server Processing Module Central server will receive position data from bus position module with interval 1 second. When central server received bus position data, this module will automatically store the data into related table in server database. Based on the latest position data received, this module will process the data and update latest bus arrival time in the main bus timetable. With this automatically updating module, bus user able to retrieve updated bus traffic information from server when request to view bus timetable.

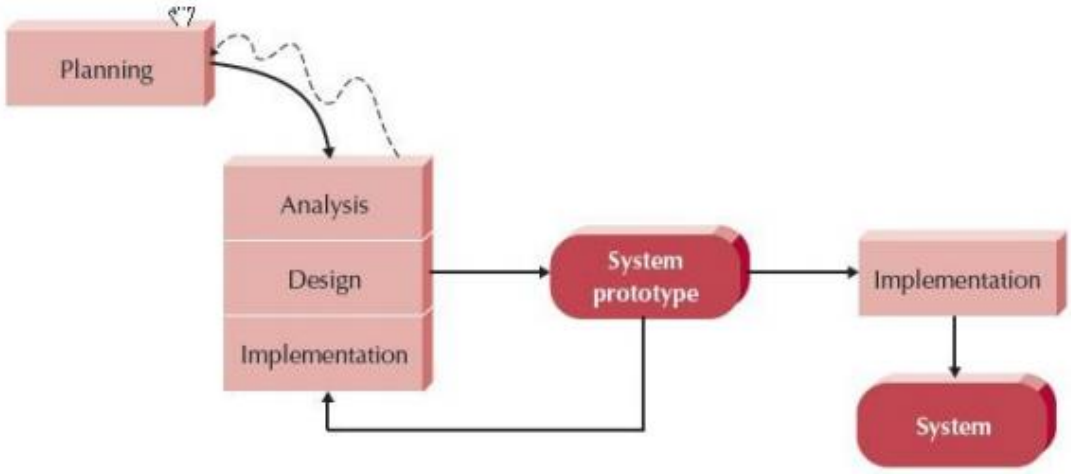
3. Real Time Bus Arrival Time Display - Web Pages This module will build in web page for bus user to check on bus arrival time through Internet. By applying AJAX technology, this module will continuously retrieve the latest data from central server and display the latest bus arrival time for every bus stop in the web page.

4. Bus Position Mapping Module - Web Page Bus mapping module is develop to show user about the bus position in a map. First, this module will load the map file from server. After that, this module will based on the latest bus position data in the server database received from the

"Bus Positioning Module" to coordinate the current bus position into the map loaded in user display.

1.5. Methodology employed for development

The evolutionary development is also known as prototyping. The prototype is a model of system which is not based on strict planning, but is an approximation of final system. The prototype is developed based on current known requirements. With the prototype, user can have "actual feel" of the system and have better understanding about the final system. With this, users may give better and further requirements to the final system, thus final system will developed based on the acceptances to the prototype from users and the final system should be perfectly meet user expectations.



ADVANTAGES AND DISADVANTAGES OF PROTOTYPE DEVELOPMENT

Advantages

- Reducing development time as an initial version of system (prototype) is developed in early stage.
- User get better understanding about the final system due to functioning model of the final system provided.
- Error able to detect during early stage, hence reduce risk of failure of the system.
- High user involvement in development

Disadvantages

- Prototype will rebuild as the previous prototype is not accepted by users. Thus, it is time consuming and expensive.
- Complexity of the final system increase as the scope of system may expand beyond original plans
- Resource wasted as the prototype is not able to reuse due to bad quality of code developed.

In development processes of bus tracking system, there are many uncertainty existed. In the bus tracking process, there would be many errors or unexpected results occur and this will affect the accuracy of estimated bus arrival time for users. In Users perspective, the accuracy of estimated arrival time will determine the success of the system. Therefore, prototyping approach is suitable to test on acceptance of final system from users. According to this methodology, if user rejected a prototype, a new prototype is developed based on new requirements from user feedback and test on user again. Once the prototype is accepted by user, it would be the model for final system. With high user involvement in prototyping process, the quality of final system will be increased.

STAGE 1 - PLANNING

Planning has been done in first stage. After discussion with project supervisor, the name for proposed project "Bus Tracking System" is produced. After confirmation of project title, studies on existing bus tracking system are performed. The fundamental of proposed system was clearly verified after studies performed on existing system. Based on studies performed on existing system, some common problems were found and problem statements were generated. The estimated bus arrival time is very important to determine the performance of bus service. Bus user have to know what is the exactly time the bus will arrive on bus stop. Furthermore, the existing systems are provided real time bus tracking in map view instead of just showing times table to user. Based on the studies, we can say that graphically view on bus tracking systems is one of the main expectations from user. By showing bus position is a map, user can know where exactly the bus now and how far or how long the bus will arrive.

STAGE 2 - ANALYSIS

In this stage, analyses on existing systems have been made. Few bus tracking systems available had been studied and the main system requirements had been founded. User want to know where is the position of the bus before arrive and showing bus position in a map is more meaningful instead of just showing estimated arrival time.

STAGE 3 - DESIGN

The development of proposed system is begun and functional system has to be developed in this stage. In prototyping methodology, this design stage will be the prototyping loop point and the first prototype is developed in the first loop. After the first prototype has been evaluated by user and came out with new requirements, development process will loop back to this stage. Redesign and rebuild the second prototype. In the first prototype design process, prototype is developed based on the main requirements acquired at stage 2. Prototyping is only focus on functionality of system instead of focus on user interface.Thus, prototype is build with simple interface and more effort will put on functions and features modules of the system.

STAGE 4 - IMPLEMENTATION (PROTOTYPE)

In this stage, prototype will be deployed and implemented in real environment. Selected users will test on the prototype and evaluate the system. First, users will test on the first prototype based on the test plan created in stage 3 and test result will be recorded for further evaluation. Evaluation for the first prototype will be performed based on the test result gathered from users.

STAGE 5 - IMPLEMENTATION (FINAL SYSTEM)

This stage is executed when the prototype is accepted by users. When the latest version of prototype is satisfied user requirements, development process will jump out from prototyping loop. The final system will then developed based on the accepted prototype. The accepted prototype will became the fundamental of final system and the user interface of final system will be enhanced. Functionalities in the accepted prototype will fully apply into final system.

Chapter 2: Literature Survey

2.1 Literature survey and its various sources

1) Kidwell, B. "Predicting Transit Vehicle Arrival Times". Geo Graphics Laboratory, Bridgewater State College, Bridgewater, Mass., 2001.

Analysis of Bus Tracking System Using Gps On Smart Phones www.iosrjournals.org 81 | Page Next to deployability under current conditions, another concern had a major influence in system design: user friendliness. The system should require as little interaction from the user as possible and little change of his habits. Furthermore, all interfaces between user and navigation system should be carefully designed so that users unfamiliar with the system or with technology in general feel comfortable using it. Finally, being user friendly also implies using technologies that most users are already familiar with, so that they do not have to acquire any new device or learn to handle one. A navigation system complying to these design requirements enhances the experience of users of a PTN in a cost effective way. Visitors and sporadic users are target user groups, as the system is especially helpful for people unfamiliar with the PTN. But also normal users would profit, being guided to destinations out of their current and known parts of the transport network, for example visiting a place for the first time in an area they do not usually use. In this way, the navigation system enhances the urban mobility experience and makes using the PTN more attractive to people unfamiliar with it. As with any application, it's important to consider the target audience. In this case, I can divide transit riders into new or infrequent riders, who aren't overly familiar with the local transit system, and frequent riders, who are familiar with it and use it every day. New or infrequent riders are less familiar with available routes and often need more trip-planning guidance, whereas frequent riders typically already know which sequence of stops and routes is the fastest to reach their destination, so they just want to know when the next bus is coming. The application presented in this article is targeted primarily at this second group of frequent transit users. While static schedules and timetables are an important base for rider information, the reality is that transit vehicles do not always run on time. Traffic congestion, weather, accidents, and passenger incidents: there is any number of reasons why a transit vehicle might not meet its schedule. As such, many recent transit traveller information system improvements have focused on providing real-time arrival information

The design of the navigation system was driven by a set of premises that distinguish it from other navigation solutions.

· The service should be deployable on short term, and not in a far future.

· Deployment cost for the service provider should be efficient.

· Usage cost should be low considering currently common communication costs.

· Service should be easily adaptable and extendable to a fast changing reality.

2) Taehyung Park, Sangkeon Lee, Young-Jun Moon, "Real Time Estimation 7 of Bus Arrival Time under Mobile Environment", ICCSA, 2004.

Public transportation systems play an increasingly important role in the way people move around their communities. I consider some of the benefits of public transportation, the challenges facing its widespread adoption, and the role transit traveler information systems can play in meeting those challenges. For individuals, public transportation provides mobility to those who cannot or prefer not to drive, including access to jobs, education, and medical services. In general, transport mobility - the ability for people to move around their community - is a strong indicator for employment, with studies showing, for example, a direct connection between car ownership and employment. By helping travelers move from single- occupancy vehicles to public transportation systems, communities can reduce traffic congestion as well as its environmental impact. An important feature of a modern mobile device is that it can position itself. Not only for use on the device but also for remote applications that require tracking of the device. Furthermore , tracking has to robustly deliver position updates when faced with changing conditions such as delays due to positioning and communication, and changing positioning accuracy. The realized system tracks pedestrian targets equipped with GPS-enabled devices. I concentrate on the tools it provides for real-time arrival information, which is available through a variety of interfaces for mobile devices. Such information is valuable for both new and frequent riders. users could access information by navigating through a list of stops for a particular transit route. For the full Web interface, users could see stop and route information displayed on a map but still had to search for stops by stop number, route, or address.Motivated by this consideration, I develop a location-aware native Smartphone application for BEST Bus that leverages the localization technology in modern mobile devices to quickly provide users with information for nearby stops and improved context-sensitive responses to their searches

3) Ganesh K and Thrivikraman M, Net Logic Semiconductors Pvt. Ltd., Bangalore "Implementation of a real time passenger information system".

RFID is a wireless identification technology that has been used in many fields, including solid waste bin monitoring human, animal, goods, and object tracking , and in street trees management. Past researchers have proven that the implementation of RFID in any identification and monitoring system can improve the overall performance of the system at affordable prices . For that reason, RFID is chosen as one of the technology implemented in the bus monitoring system. Along with RFID, other sensing technologies such as a GPS, GPRS, and GIS can be used in a monitoring system. GPS,GPRS, and GIS have been integrated together in various studies, and the good results demonstrate that the technologies are compatible. From the reviews, RFID, GPS, GPRS, and GIS are chosen to be integrated and tested in the realization of a bus

monitoring and management system. An intelligent system is a system that is able to act according to its situation without having to be instructed by humans. For instance, in an intelligent car cruise system, image processing is used in order to detect the car, base on the image signal obtained. In general, an intelligent system consists of a data processor, which can be an expert rule-based system or a machine learning system, such as an Artificial Neural Network (ANN), which is usually used as a data trainer .

4)M.Arikaa,S.Konomi,andK.Ohnishi,"Navitime:Supportingpedestrian navigation in the real world," IEEE Pervasive Comput., vol. 6, no. 3, pp. 21–29, Jul.–Sep. 2007.

Generally our system is operated by GPS which is attached with the bus. Firstly the satellite signals are received by it and then the position coordinates with latitude and longitude are determined by it. Proposed system uses (AVL) Automatic Vehicle Location. By using AVL the geographic location of a vehicle can be determined and transmitted this information to a remotely located server. With the help of GPS and transmission mechanism the location is determined. It could be a satellite, terrestrial radio cellular connection from the bus to a radio receiver, satellite or nearby cell tower. After receiving the data the tracking data can be transmitted using any telemetry or wireless communications systems. GSM is used generally to transmit the data. Generally remote user can access the information of a bus based on users ource and destination. Proposed system give the exact location of bus. Bus tracking technology is advantageous for tracking and monitoring a bus.

2.2 Patent search

[1] VEHICLE SYSTEM INCLUDING SECURITY UNIT PROVIDING DEGRADATION COMMANDS VIA A VEHICLE DATA BUS AND RELATED METHODS

Pagebookmark

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A vehicle security unit is for a vehicle including at least one data communications bus, an On-Board Diagnostic (OBD) port coupled to the at least one data communications bus, and a vehicle tracking unit to be coupled to the OBD port. The vehicle security unit may include a security unit housing, a short-range security wireless device carried by the security unit housing, and a vehicle security controller carried by the security unit housing and configured to establish a wireless communication link via the short-range security wireless device with the vehicle tracking unit and communicate via the at least one data communications bus responsive to the communication link.

[2] **Bus passenger tracking and monitoring system**

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The invention discloses a bus passenger tracking and monitoring system, and aims at providing the bus passenger tracking and monitoring system which is reasonable in design, convenient to use, and safe and efficient. The bus passenger tracking and monitoring system comprises a front-gate human face snap-photography camera, a rear-gate snap-photography camera and an on-board host computer, the front-gate human face snap-photography camera, the rear-gate snap-photography camera and the on-board host computer are all installed in a bus, and the bus passenger tracking and monitoring system further comprises a picture storage server, a comparison server and a public security system central server, the picture storage server, the comparison server and the public security system central server are electrically connected in sequence, and the on-board host computer further comprises a first network communication module which is in wireless connection with the picture storage server. The bus passenger tracking and monitoring system is applied to the technical field of monitoring systems.

Chapter 3 : Requirement Gathering

Requirement gathering is an essential part of any project and project management. Understanding fully what a project will deliver is critical to its success. Requirements gathering sounds like common sense, but surprisingly, it's an area that is given far too little attention.

3.1 Functional Requirements

1.Creation of users

Any user who wants to be followed needs to be register in the system first. The applications will offer a web interface to enter the following data.

1. First Name
2. Last Name
3. Street
4. Zip code
5. City
6. Phone
7. Password

Then the user receives a user Id (integer) and is recorded in the database. This part is done on the web client side. The password must be more than 4 characters long. Any fields must be empty otherwise the user is not register.

2.Mobile GPS Tracking

3.Modification of the user profile

Once logged, the user can modify its profile using the same data as above and same constraints.

4.User login

This web page is the first one in the system. The user must be identify in order to access any options. The web page contains two fields:

1. User ID
2. Password

5.Creation of a track for a given user

The user, once registered, can log in the system and create a track. There is two possibilities to do it.

1. From the web client application.
2. From the mobile application (mobile phone).

If a new track is started from the mobile application, the user must provide:

1. User Id
2. Password

Then the server will create a new track and be ready to store the future positions in under this track's id.

For a track started from the web client, the user can give:

1. North coordinates
2. East coordinates

6.Sending GPS Coordinates to a server using mobile data communication

The users get the coordinates (position) from its GPS device and send them to the server with mobile phone. The position must contain:

1. User Id
2. Time
3. North coordinates
4. East coordinates
5. Altitude

7.Mobile GPS Tracking

Then the server records the position under the user's current track id. If no track is created or the user Id does not exists, the system gives an error message and do not record the Position.

8.Delete a track

The user can delete tracks from a list of tracks. If the track deleted is the current one then the previous one become again the current track and all the future positions sent to the server will be save under this track id.

3.2 Non Functional Requirements

Non-functional requirements are the prerequisites which are not concerned with the particular function conveyed by the framework. They determine the criteria that can be utilized to judge the operation of a framework instead of particular behaviors. They may identify with emergent framework properties, for example, reliability, response time. Nonfunctional requirements emerge through the client needs, as a result of budget constraints, organizational policies, and the requirement for interoperability with other software and hardware frameworks.

1. Reliability

Bus tracking System shall be available 24 hours a day for application users.

2. Performance

Bus Tracking System shall not take longer than 15 seconds to respond to a page request client; when using an internet connection that is 56k or higher.

3. Supportability

Bus Tracking System application should be supportable in current equipment such as computers, monitors, printers, Smartphone's etc.

4. Implementation

The system implementation will be performed all day rather than in phases.

5. Interface

Bus Tracking System shall be accessible through a web browser such as Internet Explorer 5 or higher and android application. System shall provide printer friendly outputs of reports so that users can have easy to read printouts of the reports.

3.3 Constraints

1. The TPA should not be able to to view the contents of the data.

2. The TPA should not be able to know about the identity of users of the data.

3. The server must support and allow public verifiability.

4. Users are assumed to be static (i.e adding new users will require additional work)

3.4 Hardware & Software Requirements

1. Hardware Requirements

1. Proximity sensor.
2. GPS sensor.
3. Digital Display.
4. Power Supply 9 volt battery.
5. Mobile Device Android-based Device.
6. Microcontroller-Atmega328 pre-interfaced inside Arduino-uno board.

2. Software Requirements

1. Operating system : Windows XP.
2. Technology Used : Android 4.1 or higher.
3. IDE : Android Studio.
4. Emulators : Micro emulator 555.
5. Plug-in : ADT plug-in.
6. Back-End : php, SQLite.
7. Front-End : Android SDK.

Chapter 4 : Proposed Design

4.1 System Design

Generally our system is operated by GPS which is attached with the bus. Firstly, the satellite signals are received by it and then the position coordinates like latitude and longitude are determined by it. Proposed system uses GSM module to communicate & update data on the server. By using GPS, the geographic location of a vehicle can be determined and the related information can be transmitted to a remotely located Server.

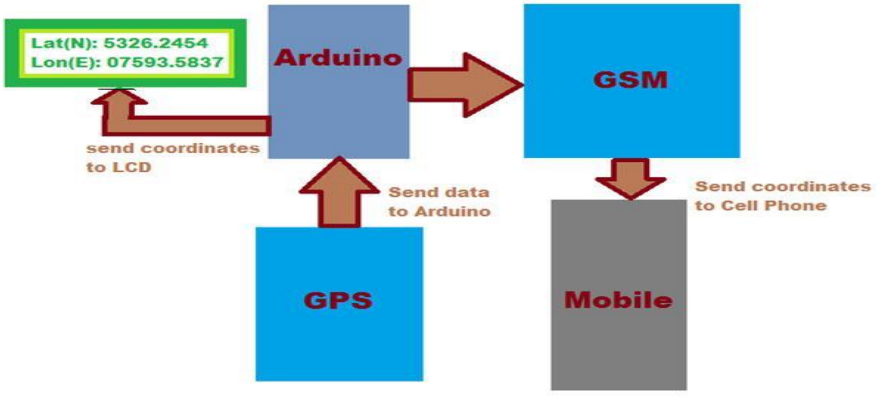


Fig 4.1 Block Diagram Of Bus Tracking System

Here in this system we are using the GSM module for sending the coordinates of vehicle on mobile phone via message. GPS is sends the coordinates continuously in form of string. After reading this string using Arduino extract the required data from string and then sends it to mobile phone using GSM module via SMS. This information is called latitude and longitude. GPS used 3 or 4 satellite for tracking the location of any vehicle.

In circuit diagram three main Components used. These are Global Positioning System(GPS), GSM Module and Arduino. GSM module's Rx pin is directly connected to Tx pin of Arduino and Tx pin of GPS is directly connected Rx pin of Arduino. And a 16X2 liquid Crystal display is also connected with Arduino for displaying coordinate.

GPS Module is attached to the vehicle, which is going to be traced. Using this Project we have to send the position of GPS Module (vehicle) to the control unit. The GPS receiver receives signal from the satellite. This signal shows the Latitudes and Longitudes of the GPS receiver. This signal is given to the microcontroller. Output from Micro controller is given to the GSM module. GSM module, which is kept at the receiver side, will read this message. This message contains longitude and latitude and receiving time and date. Using this information we can easily

find the position of GPS receiver, or simply the position of the vehicle. GPS receiver, which is fixed in transport, will collect the NMEA data from GPS Satellite, which incorporates Latitude, Longitude, time of receiving data, and date. ARM processor will receive these data through serial communication from GPS receiver

These data are used to identify the position of that transport on the earth. Collected information is given to ARM processor and will be displayed on display board of that vehicle. So ARM processor will send the exact position of that vehicle to GSM module.

This GSM module will send this information to another GSM module, which is kept at the receiver side, where the position of the Transport is needed to be displayed.

4.2 Modular Design

Application starts with instantiating Location Manager. This is needed to track user location. Detailed description regarding Location Manager is provided in this section. Next, UI and user interaction handling sets up all necessary selections. In order to provide a detailed view concerning system mechanism, project can be grouped in three segments. These are Location Manager, Fragments and sync Task & Services.

Fig 4.2 Architecture Of Bus Tracking System.

The process in activity class and broadcast receiver intent, core fragments takes place where they manage all handling and methods both in listing peers and establishing connection. Client has to enter in the application. To search for a bus, client has to enter the bus number in the search bar. Then map is displayed which shows the current location of the bus. He can also receive an alert notification when the bus came to the nearest stop. When the application is launched, the home Activity fetches the routes from the server and binds it to the spinner for the client to select it. When the client selects a route, corresponding stops are fetched from the server and binded to the spinner for the client to select. If the client selects “Track Bus” then the location details of the bus for that route is fetched. If the client selects “Show Map” then the location of the bus on the map will be displayed. This module depicts the process of selection of Bus number and presenting the current location of the Bus.

Maps

The application is developed using android API which has a very simple User Interface to use it. Google maps API is the core component used in it, which is very easy to use and explore maps with simple gestures such as pinch to zoom tap to point etc.

Bus/Route Information

The Routes of all Buses are recorded by Bus In-charge. For this reason we have used php-server side scripting. So the management can login the website and update/modify the bus details and details regarding its routes. Now when client makes request for the Bus Information it will be fetched from the database and delivered to client through server.

4.3 Detailed Design (DFD Diagrams)

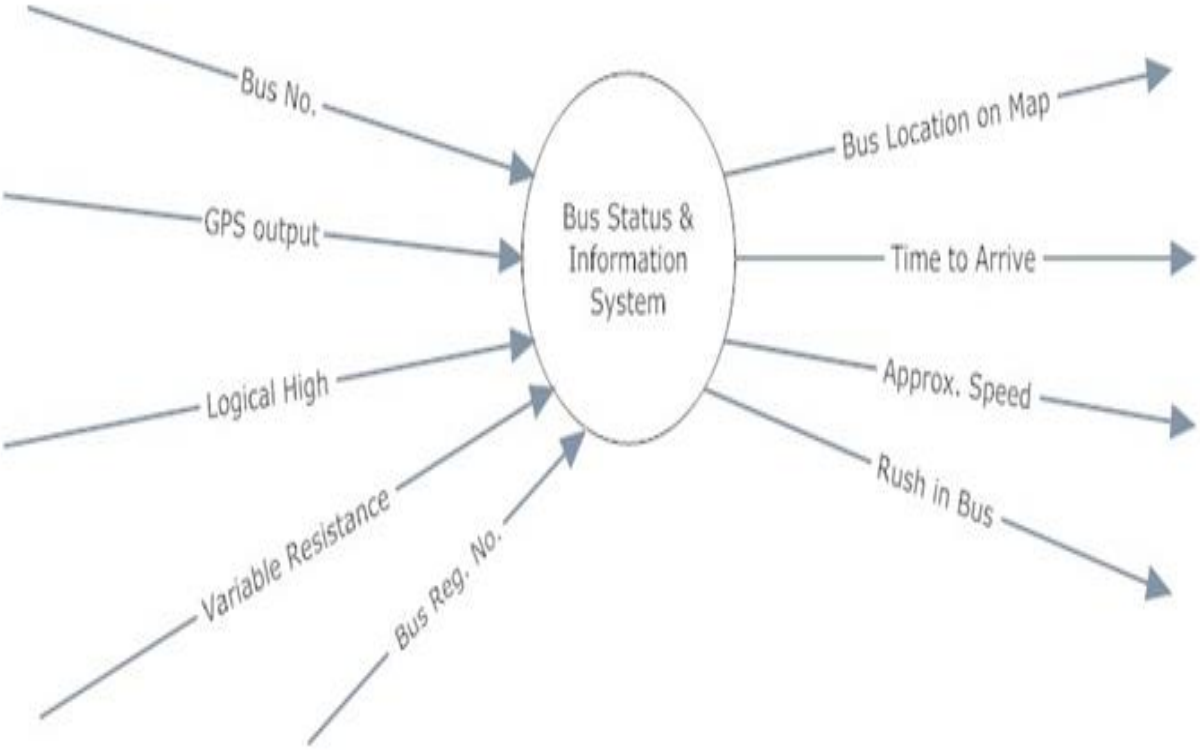


Fig 4.3.1 DFD Level 0

The user/ Local commuter requests for the 'location of the bus' from his smartphone. Wherein the smartphone sends request signal to the server for the current location.

Later, the data is fetched by the server from the database & the commuter receives the current location as explained.

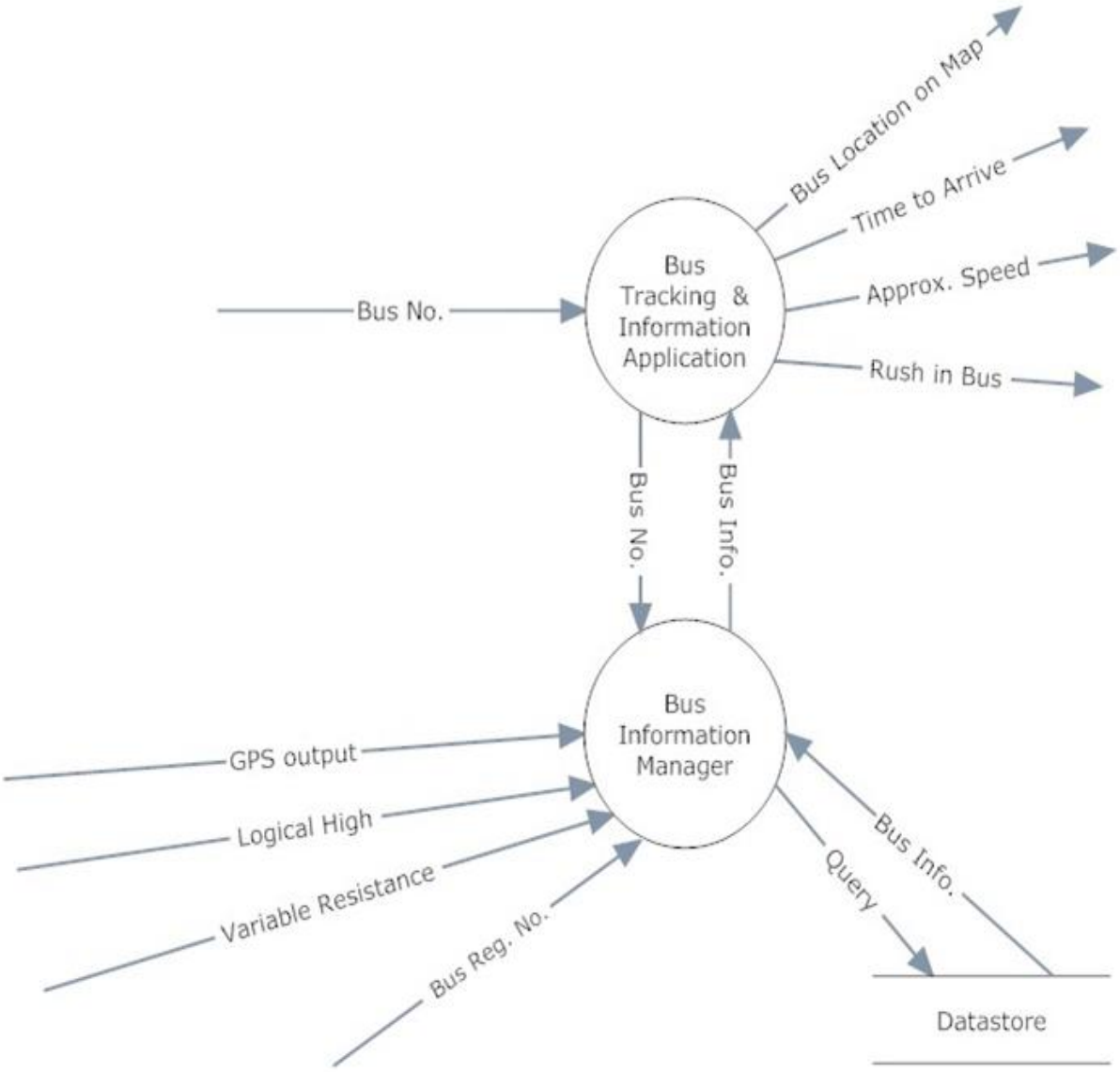


Fig 4.3.2 DFD Level 1

Here the local commuters or users request for the viable information regarding the current location of the bus and the density of people in it. Here the Data-Flow diagram shows that our system accepts the request from the commuter. Our system accepts the request and the servers fetch the location data from the arduino board attached in the bus. The arduino board is attached with two -other modules-

1) Proximity sensor:

Proximity sensor functions as counting mechanism in our system. Which counts the no of people from the entry point & reduce the count as people leave from the exit end.

2) GPS/GSM module:

This module tracks the location of the bus by matching the latitude & longitude readings to the data fetched from the google maps database. It sends the data to the server which stores and continuously updates it in the database with the help of GSM module which provides the stable internet connectivity

3) Digital Display:

This module is used to fetch/select the bus no. & its destination, this helps in reducing the manual work of updating the Bus no. & is directly updated in the system as it is connected to our system via arduino board.

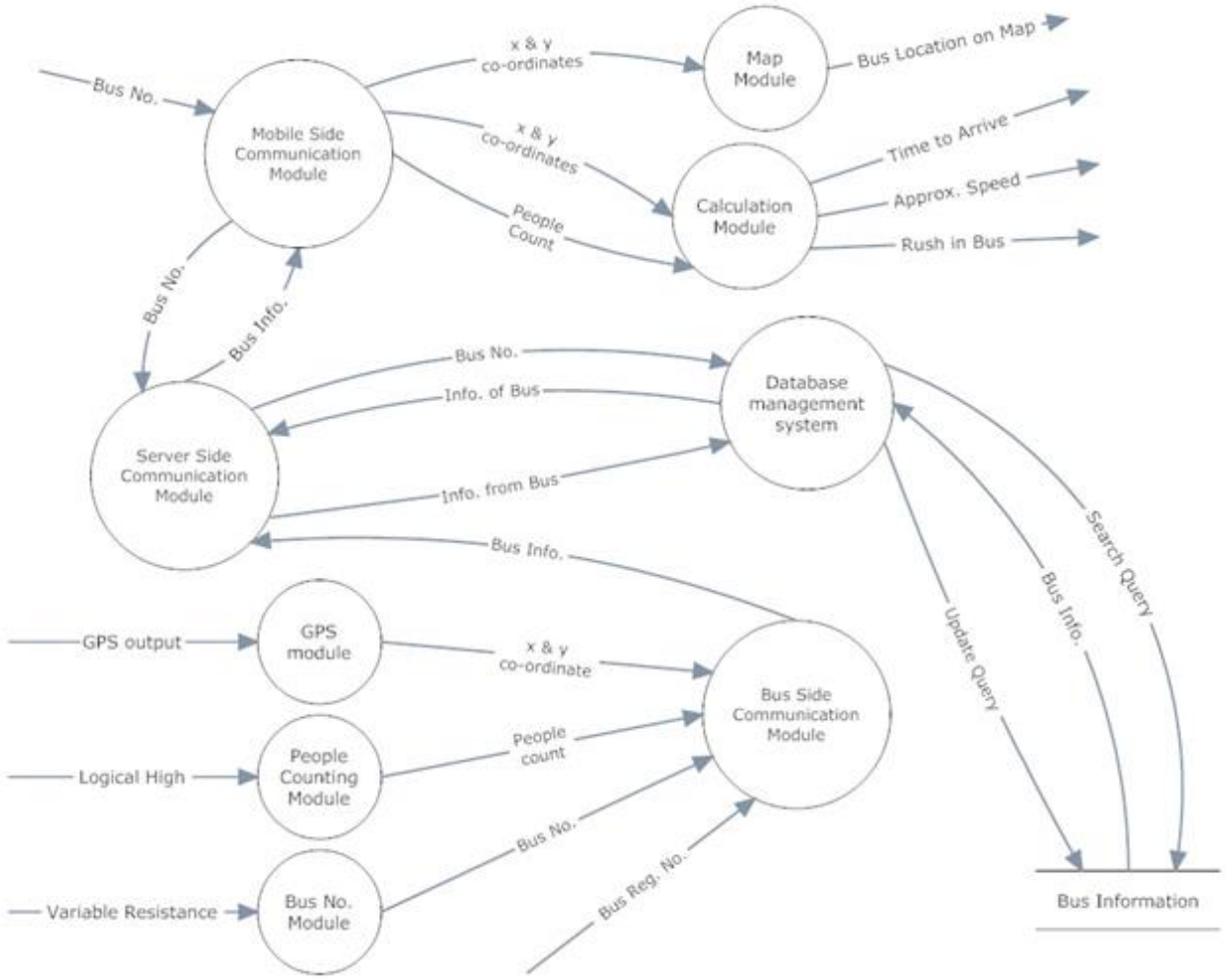


Fig 4.3.3 DFD Level 2

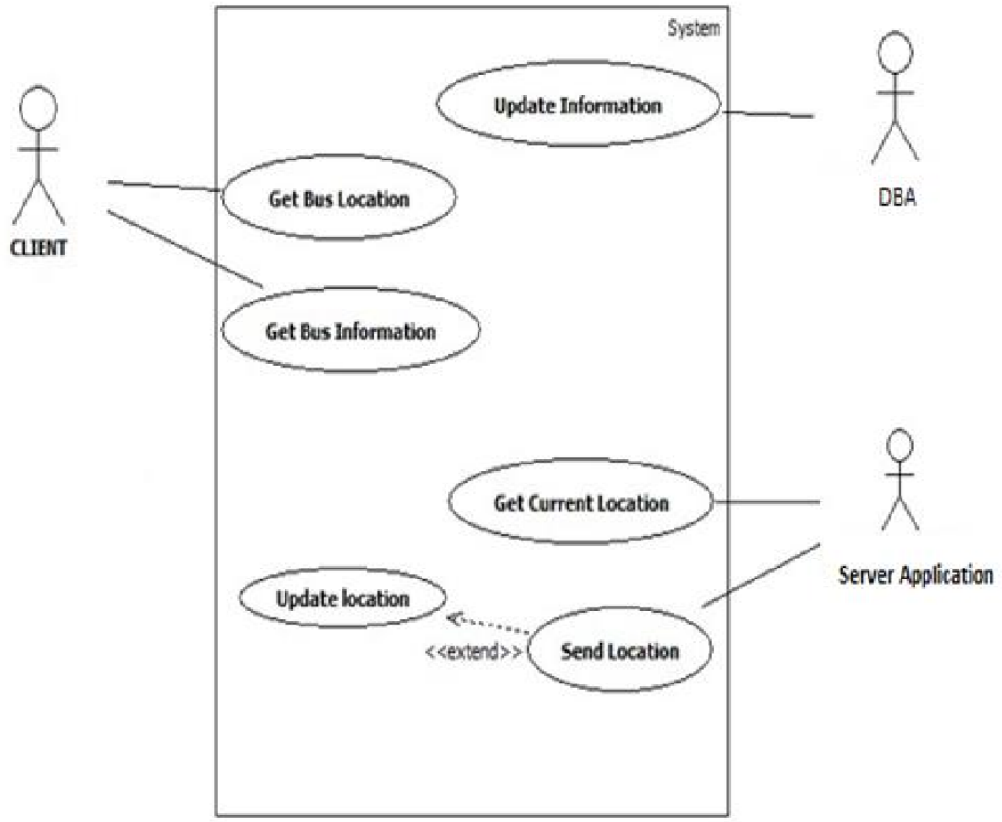
Here we provide a web-based interface to the Transport Management service where in the bus deployed is updated to out php-side server which is then updated in database. This data is later fetched by the local commuter to know the current location of the Bus & the estimated count of people in the bus.This web-based interface reduces the manual work of the officials and help in atomizing the work like:

1) Add/delete bus no.

2) Add/Delete bus conductor-id.

3) Fetch the Location of the bus from the server in various calamities to avoid any delay in transportation & decide whether to deport bus as per the density of People in the bus.

4) Cancel a specific service due to changes in future manipulation of routes.



Fig

4.3.4 Use Case Diagram

Here the local commuters or users request for the viable information regarding the current location of the bus and the density of people in it. Here the sequence diagram shows that our system accepts the request from the commuter. Our system accepts the request and the servers fetch the location data from the arduino board attached in the bus. Here the DBA updated the information regarding the bus information in the server.Here the arduino board with the help of GPS/GSM module sends the current location of the bus.The server fetches the location and constantly updates the data regarding the location in the database.The client receives the bus location & bus details from the database through our application

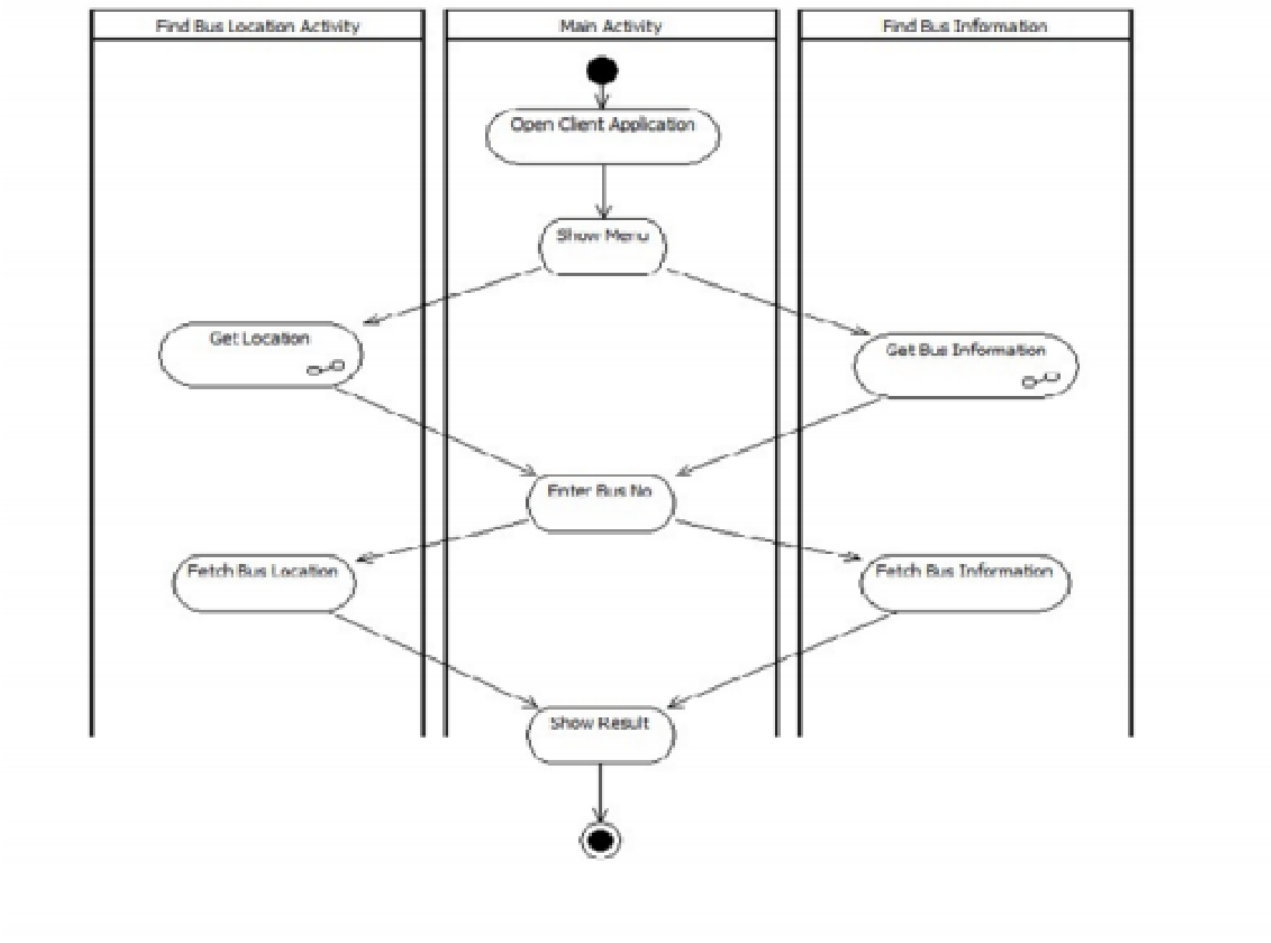


Fig 4.3.5 Sequence Diagram

Here the sequence diagram show the internal-sitemap of our android application & its functionalities. First, The commuters open the android application with a menu presented to them. The App retrieves the data from the database which has been updated with the current location of the bus constantly. This shows the data regarding the location of the bus & its stops. Secondly, If the commuter decides to change his decision regarding the route he is presented with an another option where he inputs the destination name or the bus. No. to fetch information regarding it. This secondary option helps in travelling to a destination via different route. All this information is fetched from the server & acts accordingly as per the user's request.

4.4 Project Scheduling (Gantt Chart)

TASKS	WEEK 1 - WEEK 3	WEEK 4 - WEEK 6	WEEK 7 –WEEK 9	WEEK 10- WEEK 12	WEEK 13– WEEK 15
ANALYSIS					
REQUIREMENT GATHERING					
PLANNING					
DESIGNING					
CODING					
TESTING					
IMPLEMENTATION					

Chapter 5: Implementation Details

5.1 Functionality of System

1. An Android application to assist commuters while commuting via public Transport.
2. The above client application is designed to work on Android Platform.
3. The Location data is fetched from the server & can be displayed on various platform.
4. When connected to the network, The commuter should be able to access the data on cloud regarding the location of the bus, its routes and the density of commuters in the bus.
5. While the bus is travelling via a specific route, the data regarding the stops on which the bus will halt will be updated on the server.
6. This data of the bus location is fetched via gps/gsm module, which is then integrated to the data in the cloud.
7. This integrated and combined data is fetched by the commuter via his device.
8. This data is helpful for commuters to reduce the travelling time, or choose alternate route if there is delay in the arrival time of bus.
9. The GPS module requires an active internet connection to upload the location data to the server in real time.
10. The proximity server on the door counts the no. of commuters entering the bus and this data is fetched from server in order to help the commuters to decide the bus which is to be used for travelling.

Functionality 1:

- Description: Bus Location
- Input: Bus No.
- Processing: Location of the bus is received via arduino board which gets the data via gps modem
- Output: The live location of the bus is fetched from server and displayed in the application.

Functionality 2:

- Description: Estimate count of commuters in the bus
- Input: Bus No.
- Processing: Count of people is done with the help of proximity sensor attached at the entrance & exit points of the bus.
- Output: The estimate count of commuters in the bus is fetched from the server and displayed in the application.

Functionality 3:

- Description: Highlighting the bus stops on the route of the bus in the maps.
- Input: Bus No.
- Processing: When the bus no. Is entered.The details of the bus is fetched from the database & the bus stops are highlighted accordingly in the maps to analyse the next stop where the bus will halt and show the density of commuters in the bus.Here the data of bus stops and location of the bus are stored in the database. This data is then fetched by the application and displays them in a fused manner.
- Output: While tracking the bus on maps.We can analyse the next bus stop in the map and plan the commute accordingly

5.2 Evaluation of developed system

1. The module is able to receive GPS data by GPS receiver.
2. The module is able to send GPS data.
3. The module will continuously send updated GPS location data to server when location is changed.
4. The bus icon is able to plot on the custom map correctly.
5. The bus icon will automatically update with interval every second.
6. The module is able to update bus status.
7. The module is able to update the count of people in bus correctly or not.
8. If someone inserts the wrong bus number in the bus then it shows the message.
9. If someone insert the wrong format in the bus number field then it show the error message.
10. It doesn't store more data, so that the system is cheaper & we can save money on Implementation efficiently.
11. Since it is an android application,the application is user friendly and easy to use..
12. The Application size is small.
13. System will produce result in less time.
14. System is portable.
15. Cost of system is comparatively Less.
16. It gives suggestion to user to take alternative transport route if the bus is full or not.
17. It gives the notification to user if the bus is near to the location.

Chapter 6: Testing

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black box testing, and as such, should require no knowledge of the inner design of the code or logic.The testing is important and is the final phase. All the process that has been done is just a trail or by assumption. All the required hardware and software is prepared for the testing so that errors or some modifications may be required for further proceeding.The software, which has been developed, has to be tested to prove its validity. Testing is considered to be the least creative phase of the whole cycle of system design, yet it is one of the most important from the efficiency point of view. In the real sense it the phase, which helps to bring out the other phases. Testing is done to make sure that the product does exactly what is supposed to do. Testing is the final verification and validation activity within the organization itself. In the testing stage, try to achieve the following goals; to affirm the quality of the product, to find and eliminate any residual errors from previous stages, to validate the software as a solution to the original problem, to demonstrate the presence of all specified functionality in the product, to estimate the operational reliability of the system. During testing the major activities are concentrated on the examination and modification of the source code. Testing is vital to the success of the system. System testing makes a logical assumption that if all parts of the system are correct. The preparation of testing should start as soon as the design of the system starts. To carry out the testing in an efficient manner certain amount of strategic planning has to be done. Any testing strategy must incorporate testing planning, test case design, test execution and the resultant collection and evaluation. The goal will be successfully achieved.
There are four steps:

- Unit Testing
- Integration Testing
- Validation Testing
- Output Testing

In this testing, the smaller part of the project is tested first that is modules and the sub functions present in the project. It seems to be working satisfactorily without any errors and that shows the unit testing is successful.

6.1 Unit Testing

Test Case 1 : Bus Positioning Module - Unit Testing

NO	Test Objective	Test Step	Expected Result	Result
1	To ensure that the module able to receive GPS data by GPS receiver.	1) Turn on GPS feature. 2) Run the bus positioning module installed. 3) Observe the GPS data receive from satellite.	The GPS location data should display on the screen.	Pass
2	To ensure that the module able to send GPS data received to serve	1) Run the module installed in smartphone. 2) Observe the data table in database located in server computer.	The database should receive GPS data from bus position module.	Pass
3	To ensure that the module will continuously send updated GPS location data to server when location is changed.	1) Run the module installed in smartphone. 2) Move the smart phone to other location. 3) Observe the data table in database. 4) Repeat step 2 and 3 few times.	The database should continuously receive updated GPS location data.	Pass

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Test case 2 : Real Time Bus Position Mapping Module - Unit Testing

No	Test Objective	Test steps	Expected result	result
1	To ensure that the bus icon able to plot on the custom map correctly.	1) Manually insert a bus stop GPS value into database. 2) Change the module code to retrieve the insert GPS data in step 1. 3) Run module on System 4) Observe the bus icon.	The bus icon should plot on the Current position	Pass
2	To ensure that the bus icon will automatically update with interval every second	1) Take a bus trip and bring along the smart phone which installed with bus positioning module. 2) Run the bus positioning module which installed in smart phone when the bus starts moving. 3) Run the module on System. 4) Observe the bus icon movement (Updating).	The bus icon should update position with interval 1 second	Pass

Test Case 3 : Bus Status Update Module - Unit Testing

No	Test Objective	Test Step	Expected Result	Result
1	To ensure that the module able to update bus status.	1) Run the module which installed in smartphone. 2) Observe the bus status changing on the server and android	The bus status should update accordingly.	Pass

Test Case 4 : Bus status of bus density

No.	Test Objective	Test Step	Expected Result	Result
1	To ensure that the module able to update the count of people in bus correctly or not	1) Run the module which installed in smartphone. 2)To Check bus Proximately Sensor for count the people is working is properly or not	Module Should able to approximate count the people in the bus properly	Pass

6.2 MODULES INTEGRATION TESTING

Test Case 5: Modules Integration Testing

No	Test Objective	Test Steps	Expected Result	Result
1	To ensure that all modules is able to communicate with server	1) Run all modules 2) Observe bus icon position on map.	All modules should able to communicate with server and the bus information should display smoothly and correctly	Pass

Chapter 7 : Result Analysis

7.1 Parameters Considered

we are explaining the involvement of critical parameters for giving the performance in GPS based vehicle tracking systems which is analyzed and verified through existing work during recent past years. Here, the used technologies like positioning techniques and user interaction is grasped and smoothen by the service providers so that the main objective of clients can be achieved.

- **Location based service**

LBS is having greater impact in the implementation of GPS based vehicle tracking system by providing mobile information through mobile positioning in a desired scenario. LBS work as a shared point between Geographic information system, internet, communication network and national information and communication technologies. The components of LBS are communication links, service providers, data and content provider and device of positioning.

- **Environmental Context**

GPS based vehicle tracking systems dealt with environmental variables like Sensing of signals emitted by object based on moments which are optical in nature, detecting reflection of signals

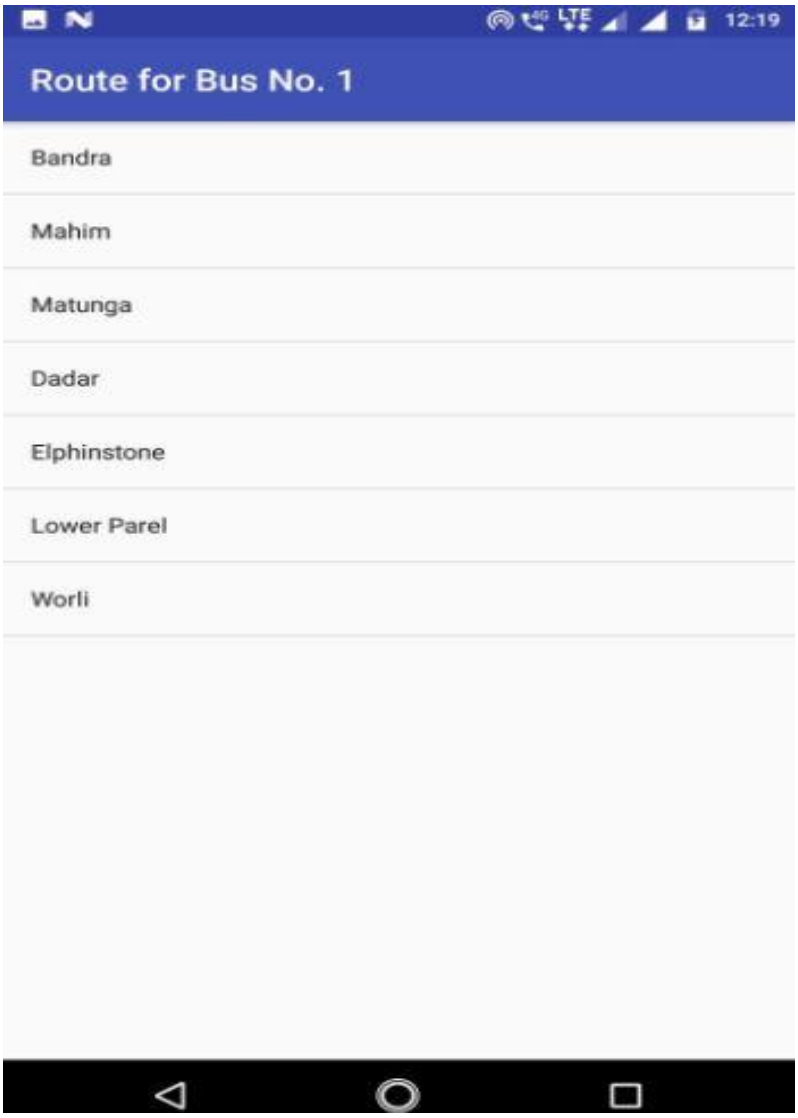
- **Technological Context**

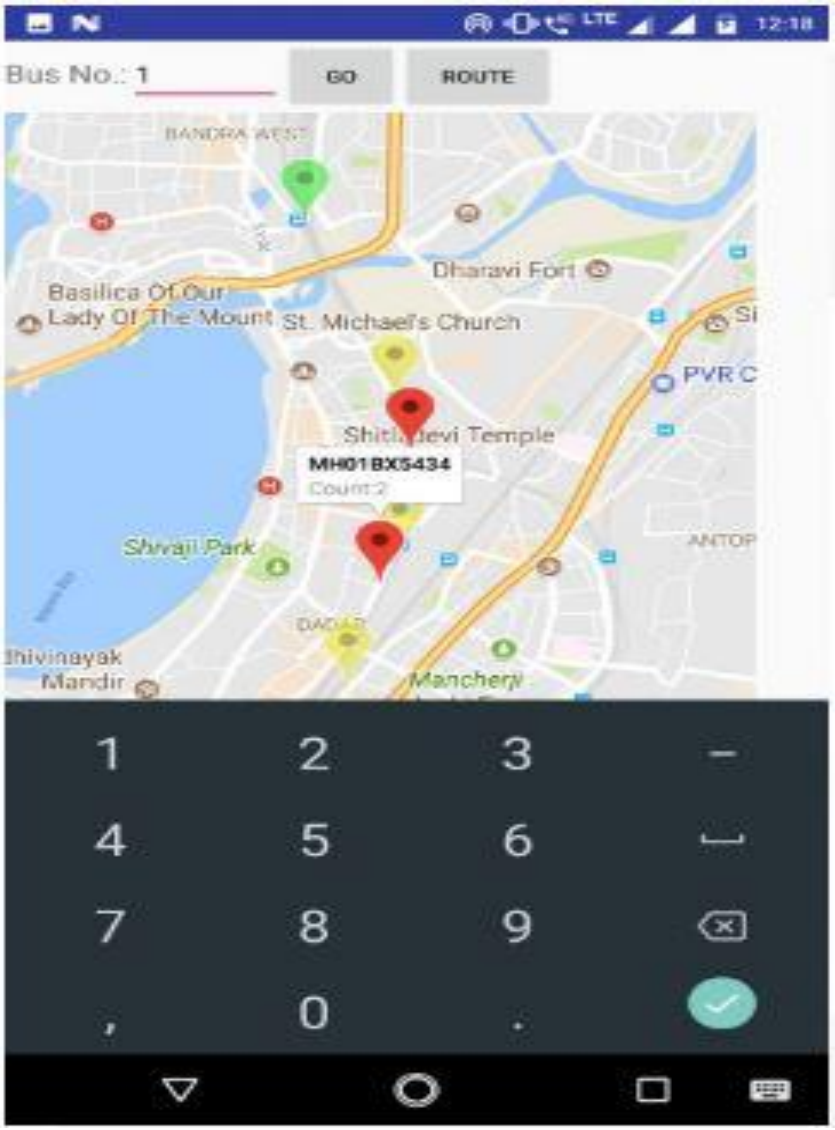
GPS based vehicle tracking systems hold the technology according implementation like High GPS (Based on more than four satellites [9]), Low GPS (Based on less than three satellites), and No GPS (No satellite). The technological implementation also dedicated to Effective to Public Transport System, Tracking & Monitoring, and Increase in productivity, Reduction in travel time, Reduction in accidents.

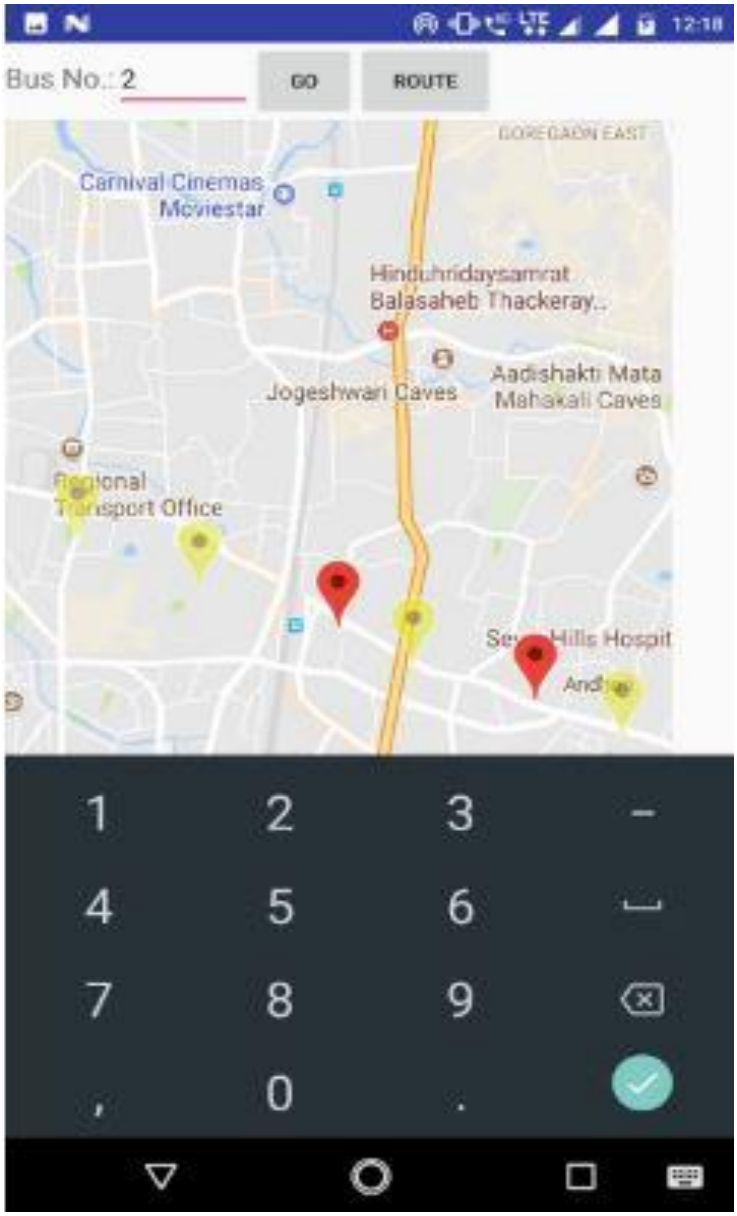
- **User Context**

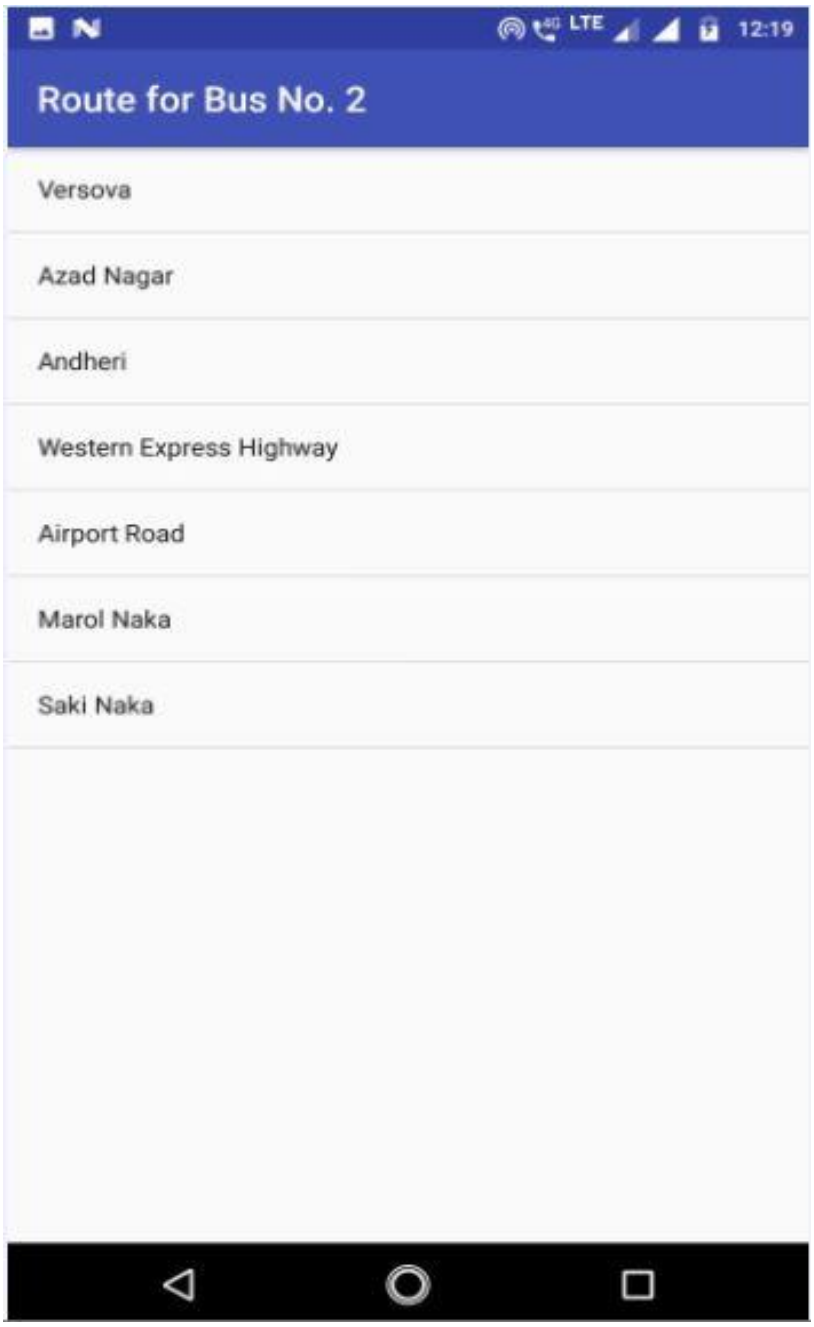
The best utilization of GPS based vehicle tracking system is dependent on nature of the user. Performance is boiled by technical expertise of the user. GPS based vehicle tracking system is handled efficiently by fully professional user. All the features of system analyzed and compiled by this kind of users. The other kind of user are naive user without any technical knowledge who requires a UI to analyse the location which is easy to understand.

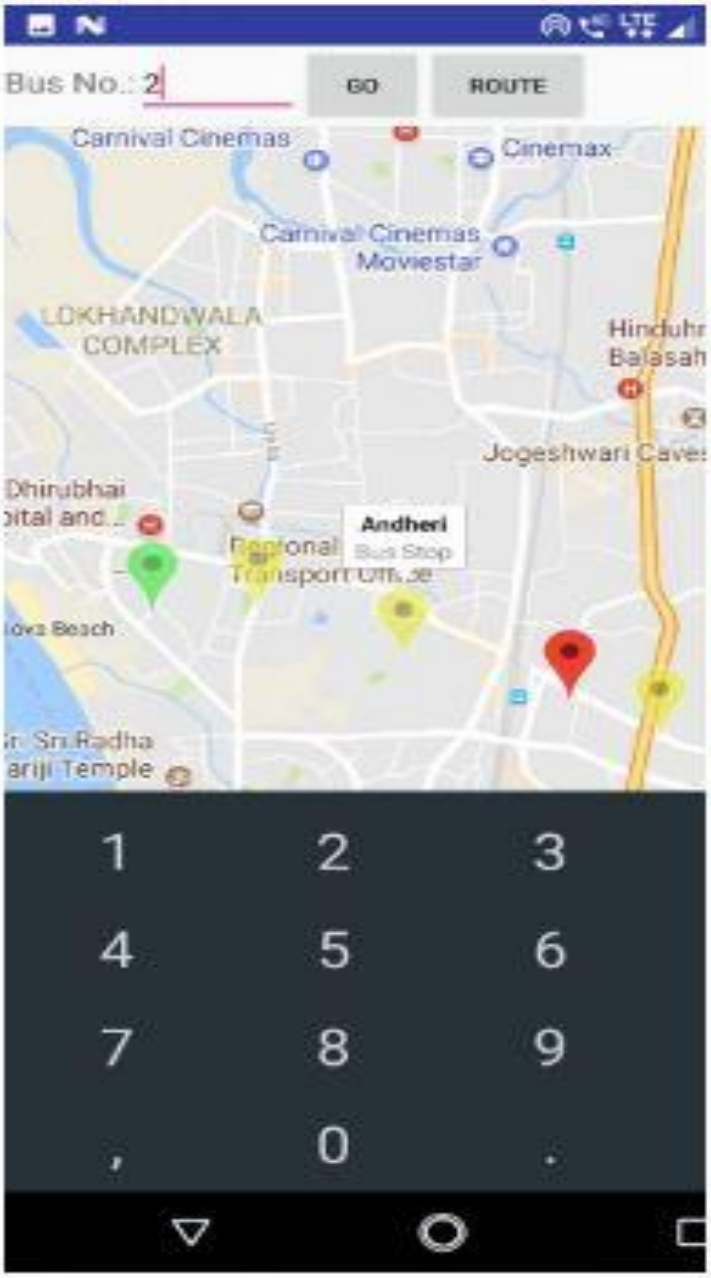
7.2 Screenshots of User Interface (UI)




Bus No.: 1
GO
ROUTE
Dharavi Fort
Basilica Of Our Lady Of The Mount
St. Michael's Church
PVR C
MH01BX5434
Count:2
Shivaji Park
Mandir
1 2 3 -
4 5 6
7 8 9
, 0 .


Bus No.: 2
GO
ROUTE
GOREGAON EAST
Carnival Cinemas
Moviestar
Hindu hridaysamrat
Balasaheb Thackeray..
Jogeshwari Caves
Aadishakti Mata
Mahakali Caves
Regional
Transport Office
Hills Hospit
And
1
2
3
4
5
6
7
8
9
0


12:19
Route for Bus No. 2
Versova
Azad Nagar
Andheri
Western Express Highway
Airport Road
Marol Naka
Saki Naka


Bus No.: 2
GO
ROUTE
Carnival Cinemas
Cinemax
Carnival Cinemas
Moviestar
LOKHANDWALA
COMPLEX
Andheri
Bus Stop
1
2
3
4
5
6
7
8
9
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0
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Chapter 8 : Conclusion

8.1 Limitation

i) The proximity module gives estimate count not the exact count because here some people get into the bus via front door. Which can create proxy of people exiting instead of exiting. Thus making the count a close estimate rather than being an exact one.

ii)The Location provided by our application is the key feature for the users to track the location. This feature can only be consistently provided if and only if there is an active , stable internet connection. The internet connection can sometimes be affected by the bad weather, power failure, Loose connection in the module ,etc [Battery operated device can be affected by battery failure

iii)The accuracy of GPS tracking system goes down to 10-50 metres. This inaccuracy is sometimes created due to the tracking device not being able to communicate with the satellites. The GPS signal is not accurate due to various obstacles such as buildings, Trees, Clouds, & sometimes by extreme atmospheric conditions such as Geomagnetic storms.

8.2 Conclusion

i)Application is made in order to save time as we are using public transport system which is unpredictable & is affected by the nature and various other conditions;

- Heavy rainfall leads to Flooding of streets, which affect the public transportation and its schedule
- Lot of potholes also add-up to the disturbance in schedule
- Protests leading to road blockage
- Unexpected fault in the Transport vehicle can add to the irregularities.

ii)The same application with some data changes can be used for Monorail, Metro Trains, etc to track the live location of the vehicle and update the commuters about its status.

iii)The density of the commuters in the bus is updated in the database, so that the commuters can decide whether to take alternate route to their destination or proceed with the current route.

iv)Our System is a cheaper alternative to the one available in the market and also provide some extra functionality through the app to the users.

v)Thus, our system helps in streamlining the current system used, and takes advantages of all the modules to provide better output[service to the users].

The proposed system is successfully designed, implemented and tested and the following conclusions are made. Our system reduces the waiting time of remote users for bus. The system the tracks the bus at any location at any time. All the current information is stored to the server and it is retrieved to remote users via android application. This system is more user friendly for users to get information visually shown on Google Map. User can freely get this android based application for real time tracking of bus which provide interactive interface environment. So by using this application, remote user can just wait or they may reschedule their journey according to the availability of bus. So our system provides high practical value in the modern fast era. The system has high practical value and is cost efficient

8.3 Future Scope

This project is having a wide scope. A web based application which can be further modified using cloud. Use of video camera to this system would take this system to the next level in the field of security.

It will help to monitor the crimes that happen now a days which is witnessed by common people every day. This would prove a major breakthrough in reducing the crime rates. Also, with use of motion sensors the speed of the bus can be calculated.

The cameras installed in the bus can replace the functionality of the proximity sensor installed at the entrance of the bus. Proximity sensor gives an estimate count rather than the exact count. Thus the density can be analysed by the camera in bus with the help of image recognition and analysing the no. of people in the bus.The wifi-used in the bus provides connectivity only to the arduino board for the functionality of our system. We can also provide high-speed internet access to the users in the bus. As internet is a medium which will turn out to be a necessity in the near future

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