Analysis and Design of a Web-Based Transport Automation System With Vehicle Tracking for Jahangirnagar University

A project report submitted to Department of Computer Science and Engineering, Jahangirnagar University in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science and Engineering.

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Declaration

The research work entitled " **Analysis and Design of a web-based Transport Automation System with vehicle tracking for Jahangirnagar University** "has been carried out in the Department of Computer Science and Engineering, Jahangirnagar University is original and conforms the regulations of this University.

I understand the University's policy on plagiarism and declare that no part of this project has been copied from other sources or been previously submitted elsewhere for the award of any degree or diploma.

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Abstract

Information technology has made our life easier and comfortable day by day. In every aspect of life information technology contributes somehow.Similarly our university transport system can be digitalized to make our university life easier and hassle free.

In this project we design a web-based system that will replace efficiently a bunch of pen-paper work of the Jahangirnagar University's transport system authority. Every member's(e.g - students,teachers,staffs,drivers,conductors) information, vehicle's detail information(e.g - capacity, chesis number, maker, engine number etc) will be kept in the central database. The most attracting and useful feature of this proposed system is the GPS tracking facility of the vehicles of the university.

We use HTML5,CSS,AngularJS for front end development of the system and arduino uno,buck,SIM 800,breadboard,GSM device etc for the GPS tracking device.

User can easily get the location of the desired bus using a smart phone without wasting time. For tracking, user must need to be a registered member of the Jahangirnagar University. User can also see the everyday schedule over internet by asking no one.

Acknowledgement

First of all we would like to thank our honorable supervisor Dr. MD. Ezharul Islam, Associate Professor , Department of Computer Science and Engineering, Jahangirnagar University for his guidance, valuable suggestion, encouragement,cordial cooperation and sharing knowledge throughout this project work. Without his guidance we wasn't able to do our research work. We also want to thank our honorable teachers for their valuable guideline. We also want to remember our parents for their support. Finally, we express our heartiest gratefulness to the God for everything.

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Chapter 1

1 Introduction

1.1 Preface

Today we are living in a digital era. Almost everybody has a smartphone or a computer with internet connection. Considering this we can develop a transport system in which important informations about teachers, students, staffs and vehicles can be documented in a database system. We can manipulate this informations for further use. Any registered member of the university can see this informations. They can also track a desired vehicle which is currently in movement. An authorized member can track the whole path of a vehicle that covered from the source to destination. A valid user can know about the route that a vehicle will cover.[1]

1.2 Motivation

Jahangirnagar University is one of the most largest university in Bangladesh. According to the Wikipedia there are almost 20,000 people working here including teachers, students, staffs. So we badly need a well organized transport system where everyone can get informations without presenting there over internet. Considering this we get the motivation for developing a digital transport system. We will be really very happy if we can implement our proposed system. Many students of the university have posted on social media like facebook for such kind of system. [2]

1.3 Outline of Proposed System

Our proposed transport system has some objectives which are represented here :

- All necessary informations of the users and vehicles will be organized in a central database.
- Staffs can easily document the informations of the system
- Users can easily excess the informations
- Users can track the desired vehicle
- Well documented tracking histories can used for further use

1.4 Thesis outline

The rest of the thesis is organized as followed: we have already discussed about the introduction. We will discuss about GPS tracking mechanism,related works, existing system analysis, requirement analysis, proposed system, database design and analysis, GPS tracking mechanism, user interface design and implementation, future scope of development.

Chapter 2

2 GPS Tracking Device

2.1 GPS

GPS means **Global Positioning System** which is used to determine the location of an object. Normally a moving object carries a GPS device for identifying that object. A GPS device provides the latitude and longitude coordinates of a moving object that can be stored in that device or it can transfer the coordinates to a central database via internet using GPRS,SMS,Radio,Satellite Modem embedded in that unit. There are many data tracking software is available for smartphones with GPS capability.

GPS system has a very interesting working method. We know that GPS system is totally free of cost to use .The working mechanism is the main reason behind this.

It uses Global Navigation Satellite System (GNSS) network. This network incorporates a range of satellites that use microwave signals that are transmitted to GPS devices to give information on location, vehicle speed, time and direction. So, a GPS tracking system can potentially give both real-time and historic navigation data on any kind of journey.

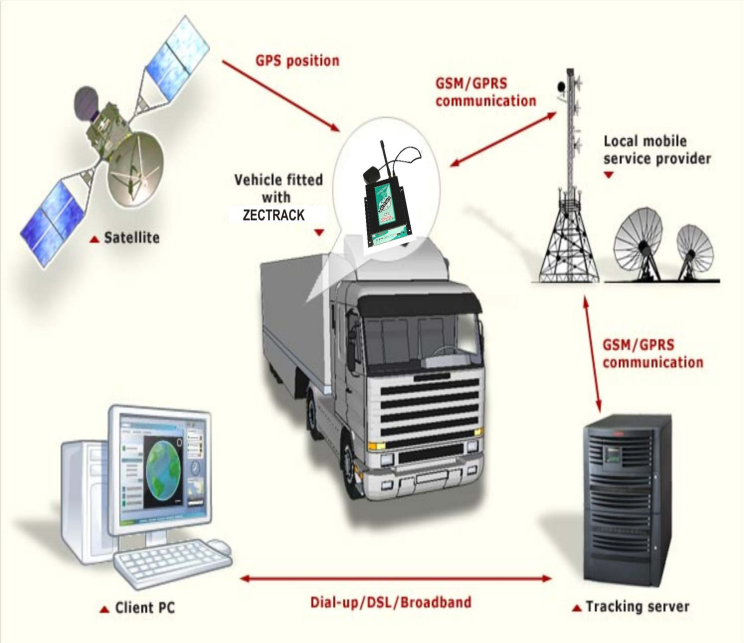

Figure 1: GPS tracking mechanism

2.2 GPRS

GPRS(**General Packet Radio Service**) is packet oriented mobile data service on the 2G and 3G cellular communication system's global system for mobile communications (GSM).GPRS usage is typically charged based on volume of data transferred, which is usually billed per minute of connection time.GPRS is a best-effort service, implying variable throughput and latency that depend on the number of other users sharing the service concurrently.[3]

2.3 Buck

Buck (step-down converter) is a DC-to-DC power converter which steps down voltage (while stepping up current) from its input (supply) to its output (load).

2.4 Microcontroller

Microcontroller is used for building digital devices and interactive objects that can sense and control objects in the physical world.In our device we use Arduino uno and it is used for the coordination of GPS and GSM module with code processing.

2.5 GSM

Global system for mobile communications (GSM) which sends message to server additional with the cellular network.

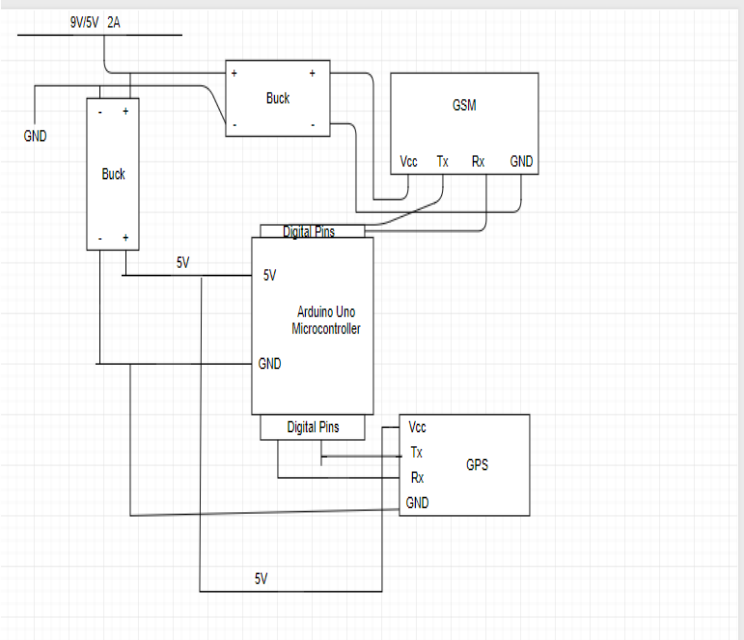

Figure 2: Schema diagram of our GPS device

Chapter 3

3 Related Works

In this chapter we will discuss about some related works of our project.

In[4] Neamat et. al.,2009 divided the Svep Design Center AB into two major parts which were connected through a database. One part having a cell phone application were the user can transmit their current position and the other part was a web application where the position data is presented on a map outlining the route of the user. Difficulties with the project including designing a database being able to handle great amount of data while being optimized with speed and performance. Also the application for the cell phone needed to be very user friendly, use minimal resources and have a low data traffic to keep the costs down. An iterative project model was used when implementing. First a database was created, then the main structure of the cell phone and web applications were coded and finally extra functionality was developed and added. When the main functionality had been implemented the system was tested. A route of approximately 49 kilometres with a duration of 50 minutes was tracked while driving. GPS data was sent periodically with an interval of 30 seconds. The tracking had consumed 8% of the cell phone battery. 77 coordinates where sent to the database corresponding to 29kb of data. The total cost was 0.77 Swedish kronor. To sum it up the goal was achieved and a stable base of a GPS system with social networking features was developed which can be marketed and built on commercially.

In[5]N. Chadil et. al.,2008 they proposed a GPS tracking system called Goo-Tracking that is composed of commodity hardware, open source software and an easy-to-manage user interface via a Web server with Google Map or via Google Earth software. The system includes a GPS/GPRS module to location acquisition and message transmission, MMC to temporary store location information, and an 8-bit AVR microcontroller. Our system prototype is shown and tested on a trip from Bangkok to Chonburi. It has shown great stability and also robust message transfer protocol that most of locations are accurately acquired and transmitted to the server in real-time.

In[6] S. Sidek et. al.,2015 identified the critical flaw in the implementation of the GPS monitoring system and propose a way to improve the existing monitoring system. Result from the interview session on top management of three express bus companies has found that the real-time record-keeping, which is a corrective measure, have been carried out instead of real-time monitoring, a preventive measure. Therefore, the existing model of speed management needs to be remodeled to alert the bus driver and the passengers who really concern about their own safety. A device and its main features which exploit the real-time monitoring ability of GPS are proposed for effective and systematic implementation of this new model.

In [7] H. A. Abdallah Dafallah,2014 presents an accurate and reliable real time tracking system using GPS (global positioning system) and GSM (global system for mobile communication) services, which was designed and implemented successfully in university of Khartoum labs. The system permits localization of a portable tracked unit and transmitting the position to the tracking centre. The GPS tracking system consists of portable tracked device attached to a person, vehicle or any asset, and the tracking center where the portable device's location should be monitored. The mobile tracked device receives its coordinates from the GPS and sends these coordinates as SMS via GSM modem to the tracking centre, which is simply a personal computer with many interface programs to display the location on Google maps using free version of Google Maps APIs (application programming interfaces). The testing shows that The system meets its objective of being low-cost, accurate, real time and adaptive for various applications.

Chapter 4

4 Existing Analog System Analysis

4.1 Actors of the System

Transport system of Jahangirnagar University is operated by different categorized employee. Currently almost the whole system is maintained in analog way. Because of this analog way it costs valuable time. Specific categorized employee performs that specific task. **Different types of actor and their contributions are given below:**

1. **System Admin:** Some of the university teachers are assigned to these posts.They take part in all kind of decision making situation. They recruit staff and conductor.Purchasing new bus, repairing faulty vehicle, assigning budget for the vehicle and maintenance, giving security to the vehicle, approving requisition of new buses etc. are their functional works.

2. **Time Keeper:** Actually he plays the major part of the system. He does all the field work.He makes bus schedule, assign conductor and driver to bus.He has different routines for regular day, vacation days (only class off) , vacation days (class and office off) for student buses , community buses and teacher buses.

3. **Helping Desk:** Provides all the information about transport system to user.He does some official work. He can communicate with the driver and conductor.

4. **Driver and Conductor :**They are assigned to the bus. Driver drives and helper helps the driver and collect money.They are not fixed in a particular bus. They are assigned by the time keeper.

4.2 Drawbacks of The System

1. Every information of the system is stored in paper file.

2. Analog system so it cannot provide comfortable service.

3. If anyone need some information like bus schedule then he/she need to call the time keeper or helpline.It wastes time and sometimes contact number is not available.

4. They cannot immediately say where the bus is now

5. Administrative personnel cannot track the movement of bus

4.3 Scopes of Development

We can convert the analog system to a digital one. Every information will be kept in the central database. We can also retrieve information for further use without wasting time. Anyone will get the bus schedule online. We can track our vehicles by adding GPS tracking device. Administrative personnel can keep the track of the movement of the buses.

Chapter 5

5 Requirement Analysis

[8] For developing a system first of all we need to find out all the requirements. Then we should design the system.Without proper requirement identification we cannot develop the system. We should consider all functional and non-functional requirements. We should find out all the features that we need to fulfill.

5.1 Functional Requirements

[9]

1. **ID: FR1**

   TITLE: Accessing the website
   DESCRIPTION: A user should be able to access the website by entering the address of the website or only entering the IP address of the website.
   RATIONAL: In order for a user to access the site.
   DEPENDENCY: None

2. **ID: FR2**
   TITLE: User Registration.
   DESCRIPTION: A user is registered in the system, so that he can perform different operations.
   RATIONAL: In order for a user to register into the site.
   DEPENDENCY: FR1.

3. **ID: FR3**
   TITLE: User LogIn in the system.
   DESCRIPTION: Given that a user has registered, then the user should be able to log in to the system. The log-in information will be stored on the pc and in the future the user should be logged in automatically.
   RATIONAL: In order for a user to register into the site.
   DEPENDENCY: FR1, FR2.

4. **ID: FR4**
   TITLE: Retrieve Password.
   DESCRIPTION: Given that a user has registered, then the user should be able to retrieve his/her password by email.
   RATIONAL: In order for a user to retrieve his/her password.
   DEPENDENCY: FR1.

5. **ID: FR5**
   TITLE: Add route
   DESCRIPTION: Given that a user has registered as an admin, then the user should be able to add route where vehicles can move.
   RATIONAL: In order for a user to track vehicles in google map.
   DEPENDENCY: FR1, FR2, FR3.

6. **ID: FR6**
   TITLE: Add vehicle details
   DESCRIPTION: A user registered as admin can add information about vehicles.
   RATIONAL: In order for a user to see the available vehicles list.
   DEPENDENCY: FR1, FR2, FR3.

7. **ID: FR7**
   TITLE: Vehicle scheduling
   DESCRIPTION: A registered staff can create a vehicle scheduling.
   RATIONAL: In order for a user to see the daily vehicle schedule.
   DEPENDENCY: FR1, FR2, FR3.

8. **ID: FR8**
   TITLE: Update information
   DESCRIPTION: A registered admin can update informations of user,vehicle,route,schedulin
   info, dept info,office info etc
   RATIONAL: In order to update the database with situation.
   DEPENDENCY: FR1, FR2, FR3.

9. **ID: FR9**
   TITLE: Delete information
   DESCRIPTION: A registered admin can delete informations of user,vehicle,route,scheduling

info, dept info,office info etc.
RATIONAL: In order to update the database with situation.
DEPENDENCY: FR1, FR2, FR3.

10. **ID: FR10**
    TITLE: Add information
    DESCRIPTION: A registered admin can add user, route,vehicle,making schedule,hall info,dept info, office info etc.
    RATIONAL: In order to update the database with situation.
    DEPENDENCY: FR1, FR2, FR3.

11. **ID: FR10**
    TITLE: Vehicle tracking
    DESCRIPTION: A registered user can track the desired vehicle.
    RATIONAL: In order to get the location of a vehicle.
    DEPENDENCY: FR1, FR2, FR3.

12. **ID: FR10**
    TITLE: History log
    DESCRIPTION: A registered admin can get location information of the current vehicles.
    RATIONAL: In order to track the movement details of a vehicle.
    DEPENDENCY: FR1, FR2, FR3.

13. **ID: FR11**
    TITLE: Favourite list
    DESCRIPTION: A registered user can get frequently used route. RATIONAL: In order to faster tracking.
    DEPENDENCY: FR1, FR2, FR3.

5.2 Non-functional Requirements

1. Security Requirements
   Access will be controlled with usernames and passwords.Only administrator users will have administrative functions.
   Password must be 4-16 characters long.

2. Maintainability and upgrade ability requirements
   Maintainability is our ability to make changes to the information over time. We need strong maintainability in order to render better service. Upgrade ability is our ability to cost-effectively deploy new versions of the product to the users with minimal downtime or disruption.

3. Supportability and operability requirements
   Supportability is our ability to provide cost effective technical support. Our goal is to limit our support costs. The product's automatic upgrade feature will help us easily deploy defect fixes to end-users. The user guide and product website will include a troubleshooting guide and checklist of information to have at hand before contacting technical support.

   Operability is our ability to host and operate the software as an ASP (Application Service Provider). The product features should help us achieve our goal of 99.9% uptime (at most 43 minutes downtime each month).

5.3 Environmental Requirements

1. Laptop with modern web browser
2. Smartphone with modern web browser

Chapter 6

6 System Design

6.1 Use case diagram

From the Wikipedia definition we know that use case diagram is a graphical representation which is used to describe the relationship between the actors and the systems. [10] It is a methodology used in system analysis to clarify, identify and organize system requirements. A use Case diagram consists of 4 components:

1. Actor
2. Use Case
3. Communication Link
4. System Boundary

In our project, we have designed use case diagram for Transport Management System, Login, Update, Scheduling and Tacking which is given below:

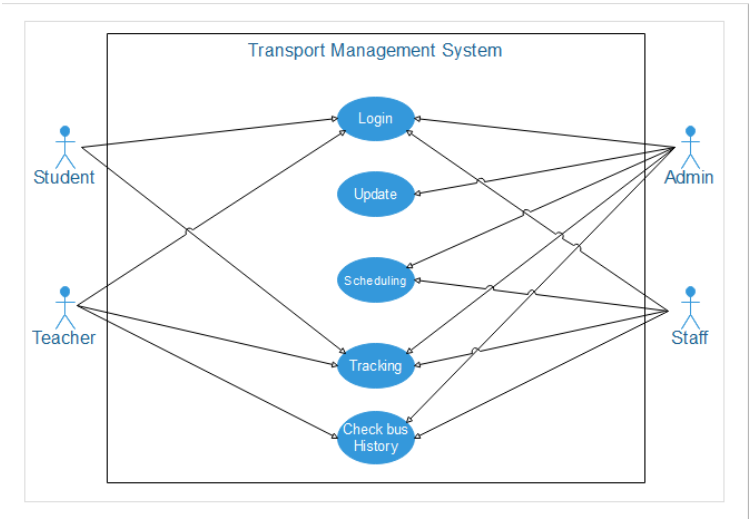

Figure 3: Use Case Diagram of an Overview of Transport Automation System and GPS Tracking System

Discussion:

Use Case Name: An overview of Transport Automation System and GPS Tracking System.

Actor:

1. Student.
2. Teacher.
3. Admin.
4. Staff.

Description:

1. Login.
2. Update.
3. Scheduling.
4. Tracking.

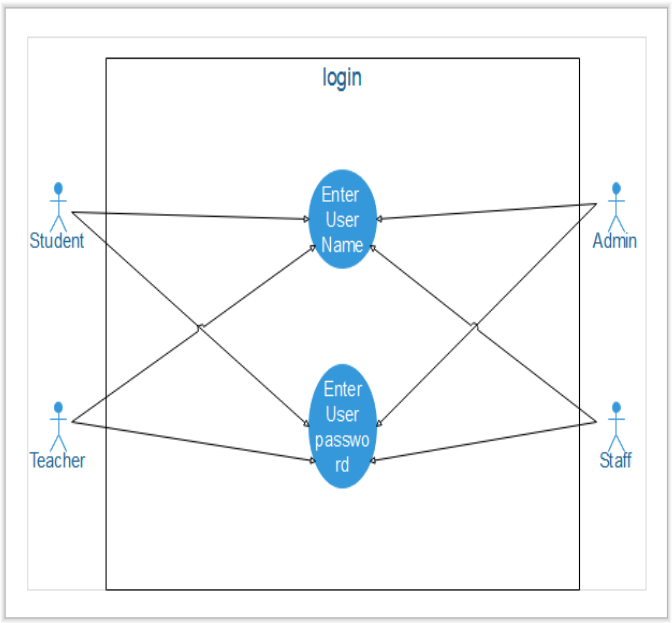

Figure 4: Use Case Diagram for Login

5. Check History.

Discussion:

Use Case Name: Login.

Actor:

1. Student.
2. Teacher.
3. Admin.
4. Staff.

Description:

1. Enter user Name.
2. Enter user password.

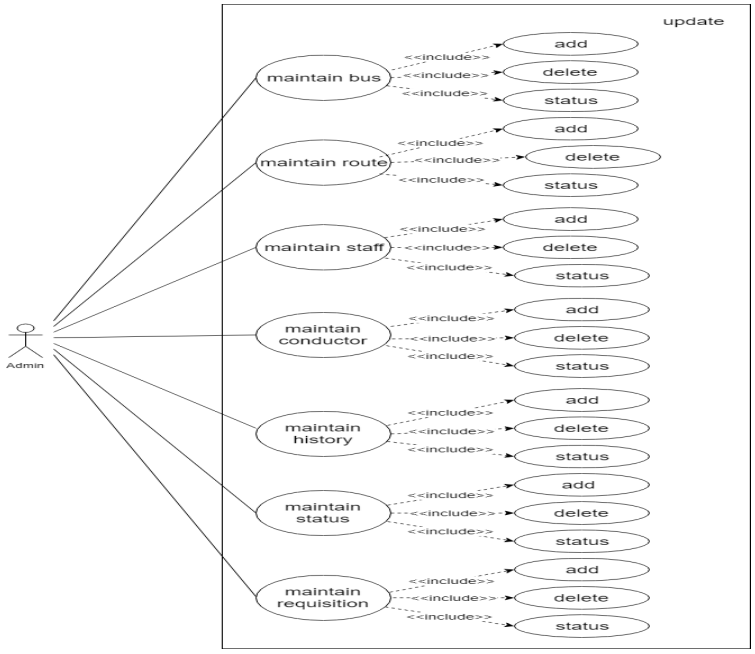

Figure 5: Use Case diagram for Update

Discussion:

Use Case Name: Update.

Actor:

1. Admin.

Description:

1. Maintain Bus.
2. Maintain Route.
3. Maintain Staff.
4. Maintain Conductor.
5. Maintain History.
6. Maintain Status.
7. Maintain Requisition.

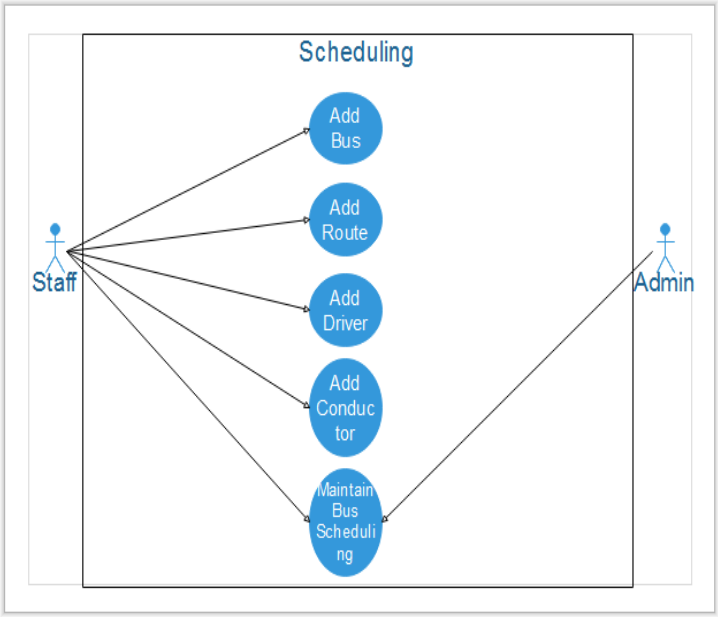

Figure 6: Use Case Diagram for Scheduling

Discussion:

Use Case Name: Scheduling.

Actor:

1. Admin.
2. Staff.

Description:

1. Add Bus.
2. Add Route.
3. Add Staff.
4. Add Conductor.
5. Maintain Bus Scheduling.

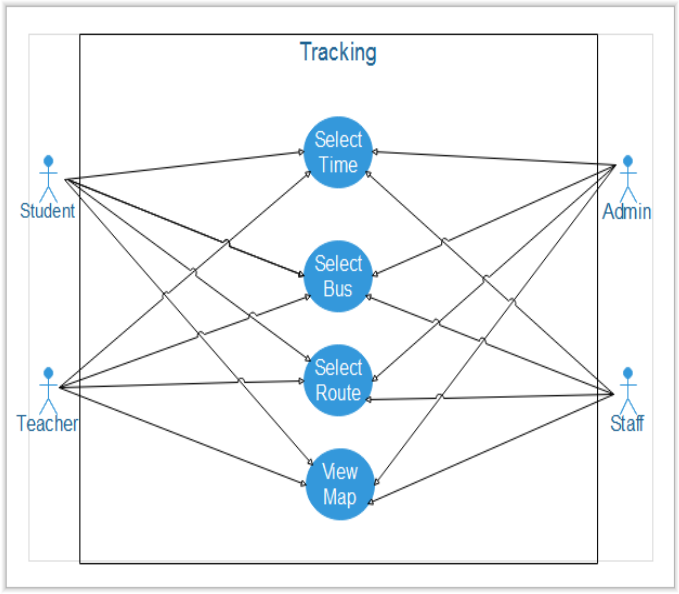

Figure 7: Use Case Diagram for Tracking

Discussion:

Use Case Name: Tracking.

Actor:

1. Admin.
2. Staff.
3. Student.
4. Teacher.

Description:

1. Select Bus.
2. Select Route.
3. Select Time.
4. View Map.

6.2 Data Flow Diagram

Data Flow Diagram shows the flow of Data through the system and is also used used for modelling the requirements. It is a graphical representation of flow of data in an information system. It is capable of describing incoming data flow, outgoing data flow and stored data. The DFD does not mention anything about how data flows through the system.

Two types of DFD are given below:

1. **Logical DFD:** This type of DFD concentrates on the system process and flow of data in the system.
2. **Physical DFD:**This type of DFD shows how the data is actually implemented in the system. It is more specific and close to the implementation.

Symbols used in DFD: Different types of symbol are use used to draw the DFD, which are given below:

1. **External Entity:** An external entity can represent a human, subsystem or system. It is a source of data or destination for data.

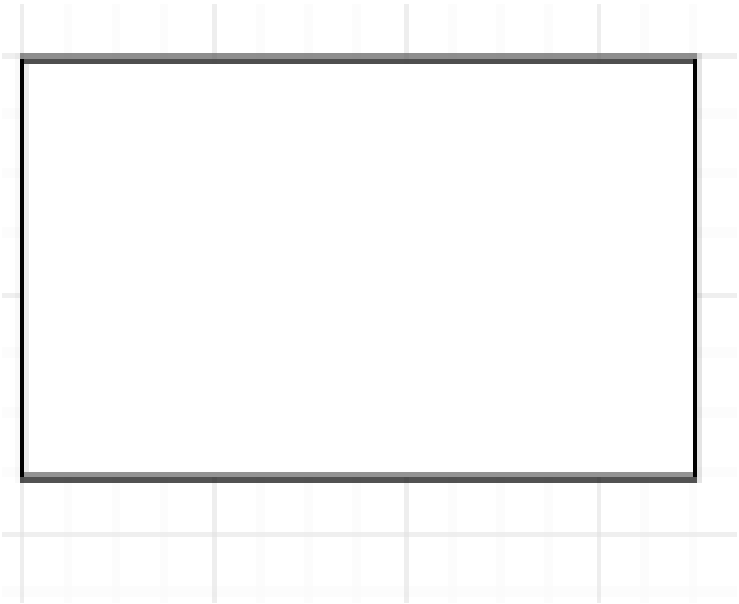

Figure 8: External Entity

2. **Process:** A process or task performed by user. Process is a business activity or function where the manipulation or transformation of data takes places.

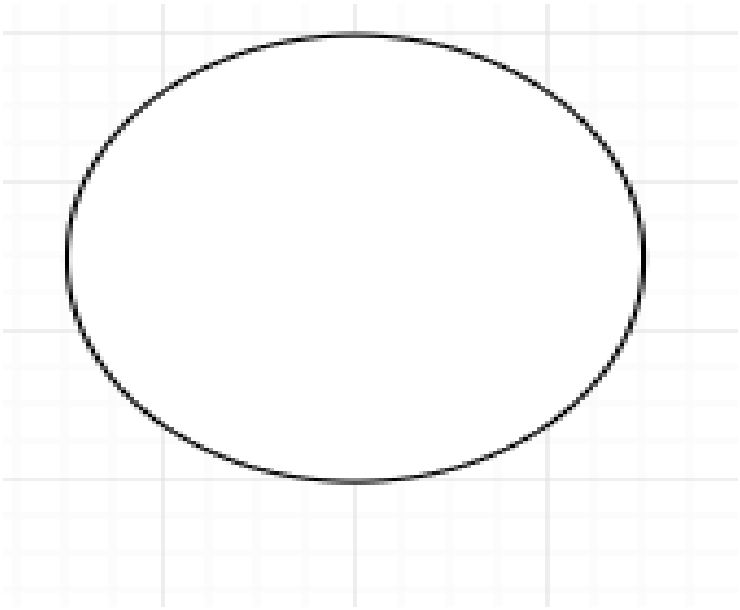

Figure 9: Process

3. **Data store:** Data store is a place where data is held between processes. Data store are sometimes referred as file.

Figure 10: Data Store

4. **Data Flow:** Data flow shows the flow of data into or out of a process or data store. Its direction is represented by an arrow that shows at the end of the flow connector.

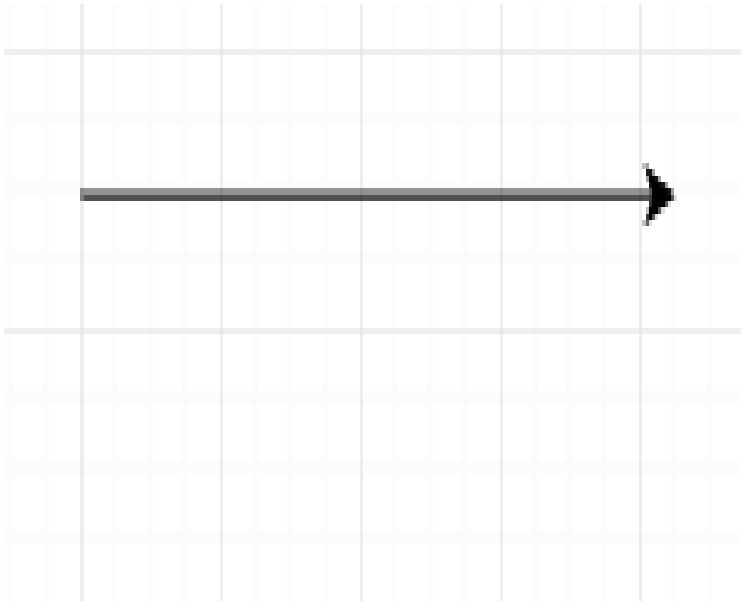

Figure 11: Data Flow

Level of DFD:

1. **Level 0:**It is also known as context level diagram.It gives the basic overview of the whole system or process.It identifies input,output and external entities.In a context diagram there could be only one process and all the external entities must be identified.Data store can be never present in context level diagram.

2. **Level 1:**It gives the more detailed view of a system or process rather than context level diagram. It breaks the main processes into subprocesses and identifies the major processes and data flows between them.It also identifies data flow which is used by the major processes.Data can not be only input data flow or output data flow in level 1 DFD.

3. **Level 2:** Level 1 precesses is expanded into more detail in level 2 diagram.Each process in level 1 is decomposed to show the whole process.

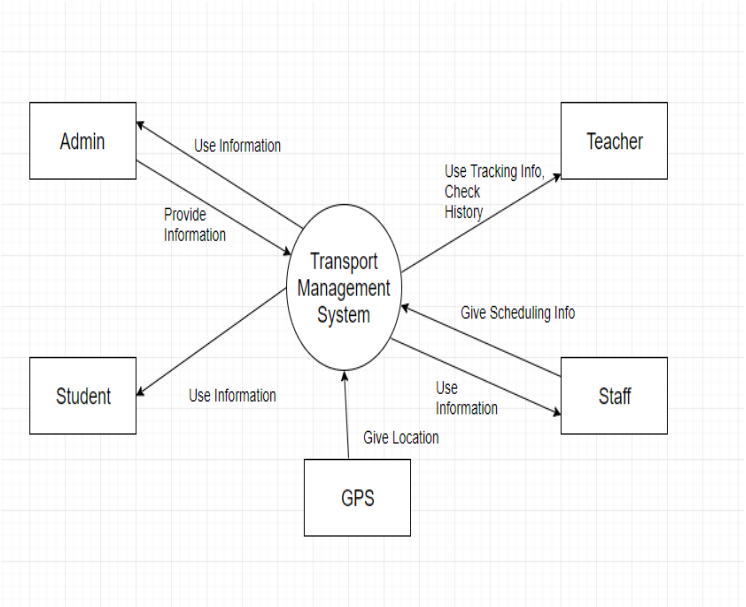

Figure 12: Level 0 DFD

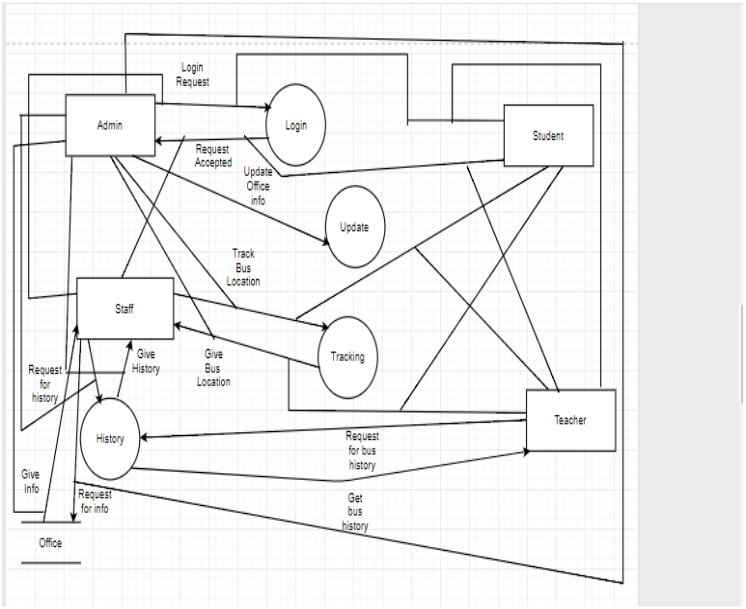

Figure 13: Level 1 DFD

6.3 Model-View-Controller(MVC)

The Model-View-Controller (MVC) is an architectural pattern that separates an application into three logical components: Model, View and Controller. Each of these components is built to handle specific development aspect of an application. MVC is one of the frequent used industry-standard web development framework to create scalable and extensible projects.

6.4 MVC components

1. Model:
   The Model component corresponds to all the data related logic that the user works with. This can represent either the data that is being transferred between the view and controller components or any other business logic related data. For example, the a user object will retrieve the user information from the database. Manipulate it and update its data back to the database.

2. View:
   The view component is used for all the UI logic of the application. For example,the user view would include all the UI components such as text boxes, drop down etc. That the final user interacts with.

3. Controller:
   Controllers act as an interface between Model and View components to process all the business logic and incoming requests, manipulate data using the Model component and interact with the Views to render the final output. For example, the user controller would handle all the interactions and inputs from the user View and update the database using the user Model. The same controller would be used to view the user data.

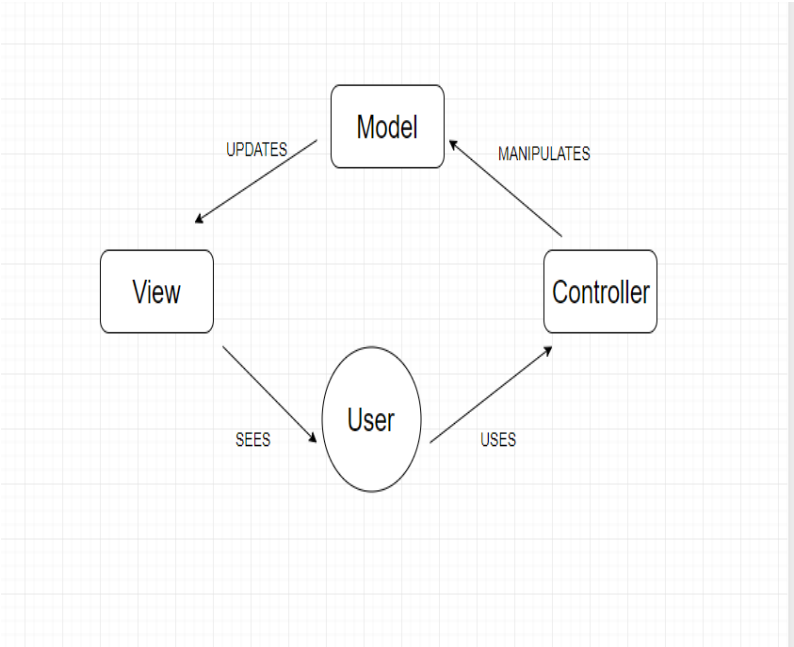

Figure 14: Model-View-Controller(MVC)

Chapter 7

7 Database Design

7.1 Definition

From the definition of Wikipedia we know that, Database Management System (DBMS) is a computer software relationship that interacts with end users, other applications, other applications, and the database itself to capture and analyze data. DBMS consists of a collection of interrelated data and a set of programs to access those data. The collection of data referred as database. The primary goal of DBMS is to provide an environment that is efficient to use in storing the database information. Database design is one

of the crucial parts of our project.A properly designed database will provide us up-to-date and accurate information.It will help us to achieve our goals efficiently.[11]

7.2 Relational Database

Relational database is based on relational data model. SQL(Structured Query Language) is used for querying and maintaining the relational database. In our project we used relational database.There are multiple tables and each table has multiple columns.Each record in the table contains the same set of columns.A table must contains a primary key and can also have foreign key and unique key.

7.3 Database Design tables

1. **User type:** User type table consists of user type id and type name,This table also contains CRUD (create,delete,update and read) function and status of the use type.
   Primary key: User Type Id.

2. User: This table contains all tha information about a user.It consists of user id ,user type id,user meta id,password.It also contains CRUD (create,delete,update and read) function and status about the user.
   Primary Key: User Id.

3. **Student:** Student table contains all the information about his/her.It consists of student id, student name, hall id, session, registration number, department id, email, phone, media id. CRUD(create,delete,update

and read) function and status of the studentRole: A person can access to the system as student,teacher,staff or admin and the role table contains role id, role name, CRUD (create,delete,update and read) function and status of the role.Role id is the primary key of this table.
Primary Key: Student Id.

4. **Role:** This table describes the role of a user who can access to the system.It consists of role id,role name,CRUD(create,delete,update and read) function and also status of the role.
Primary Key: Role Id.

5. **Teacher or Staff info:** It contains all the information of a teacher or staff.This table provides teacher or staff id, teacher or staff name, office type id, designation id, email, phone, media id, CRUD (create,delete,update and read) function and status of the teacher or staff.
Primary Key: Teacher or Staff Id.

6. **Driver or conductor info:** This table provides all the information about a driver or conductor.It contains driver or conductor id, driver or conductor name, phone number, license number, designation number, media id,CRUD (create,delete,update and read) function and status of the driver or conductor.
Primary Key: Driver or Conductor Id.

7. **Hall info:** Hall info table contains the information about student hall id and hall name. It also consists of CRUD(create,delete,update and read) function and status of the hall info.
Primary Key: Student Hall Id.

8. **Department info:** This table contains all the information of student's department id and department name. This table also contains CRUD(create,delete,update and read) function and status of the department info.
Primary key: Department Id .

9. **Other office info:** It provides the information about other office id and other office name. It also provides the CRUD (create,delete,update and read) function and status of the other office info. Primary key: Other office id.

10. **Medium:** Medium provides all type of pictures/photos of the system.This table cosists of media id,route map id, relative path, CRUD

(create,delete,update and read) function and status about the medium.
Primary key: Media Id.

11. **Office type:** Office type table contains all the information about office type id and office name. It also consists of CRUD(create,delete,update and read) function and status of the office type.
Primary Key: Office type Id.

12. **Designation:** This table consists of designation id, designation mane, CRUD (create,delete,update and read) function and status about the designation.
Primary key: Designation Id.

13. **Vehicle category:** Vehicle category table contains category id, category name, CRUD(create,delete,update and read) function and status about the vehicle category.
Primary Key: Category Id.

14. **Schedule type:** Schedule type table contains all the information about scheduling.It consists of schedule type id, schedule type name,CRUD (create,delete,update and read) function and status about the vehicle schedule type.
Primary Key: Schedule type id.

15. **Vehicle type:** Vehicle type table consists of vehicle type id, type name, AC or NON AC, base price, per kilo rate, halt age price per kilo,CRUD(create,delete,update and read) function and status about the vehicle type .
Primary Key: Vehicle type id.

16. **Vehicle:** Vehicle table consists of vehicle id, vehicle number, type id, device id, capacity, fitness deadline, maker, media id, make year, vehicle status, chesis number, engine number,CRUD(create,delete,update and read) function and status about the vehicle.
Primary Key: Vehicle Id.

17. **Schedule:** Schedule table consists of schedule id, schedule type id, time, type id, category id,CRUD(create,delete,update and read) function and status about the schedule.
Primary Key: Schedule Id.

18. **Device:** This table contains all the information about the device which is needed to track the bus location.It consists of device id, device name,

IMEI number, sim number,CRUD(create,delete,update and read) function and status about the device.
Primary Key: Device Id.

19. **Track:** This table gives the tracking information which consists of track id, device id, time, latitude, longitude,CRUD(create,delete,update and read) function and also status about the track.
Primary Key: Track Id.

20. **User favorite:** Use favorite table consists of favorite id, user id, route id,CRUD(create,delete,update and read) function and also status about the user favorite. Primary Key: Favorite Id.

21. **Trip:** Trip table consists of trip id, date, schedule id, vehicle id, driver or conductor id, end time, trip code,CRUD(create,delete,update and read) function and also status about the trip.
Primary Key: Trip Id.

22. **Route:** Route table provides the information about route map id,route name, route id, subtitle, comments, from to, up down,CRUD (create,delete,update and read) function and status about the route.
Primary Key: Route map Id.

23. **Requisition:** Requisition table provides the information about requisition id, user id, requisition start, requisition end, vehicle id, driver or conductor id, actual start, actual end, remark or purpose, travel distance, requisition code,CRUD(create,delete,update and read) function and also status of the requisition.
Primary Key: Requisition Id.

Database design of our proposed system:

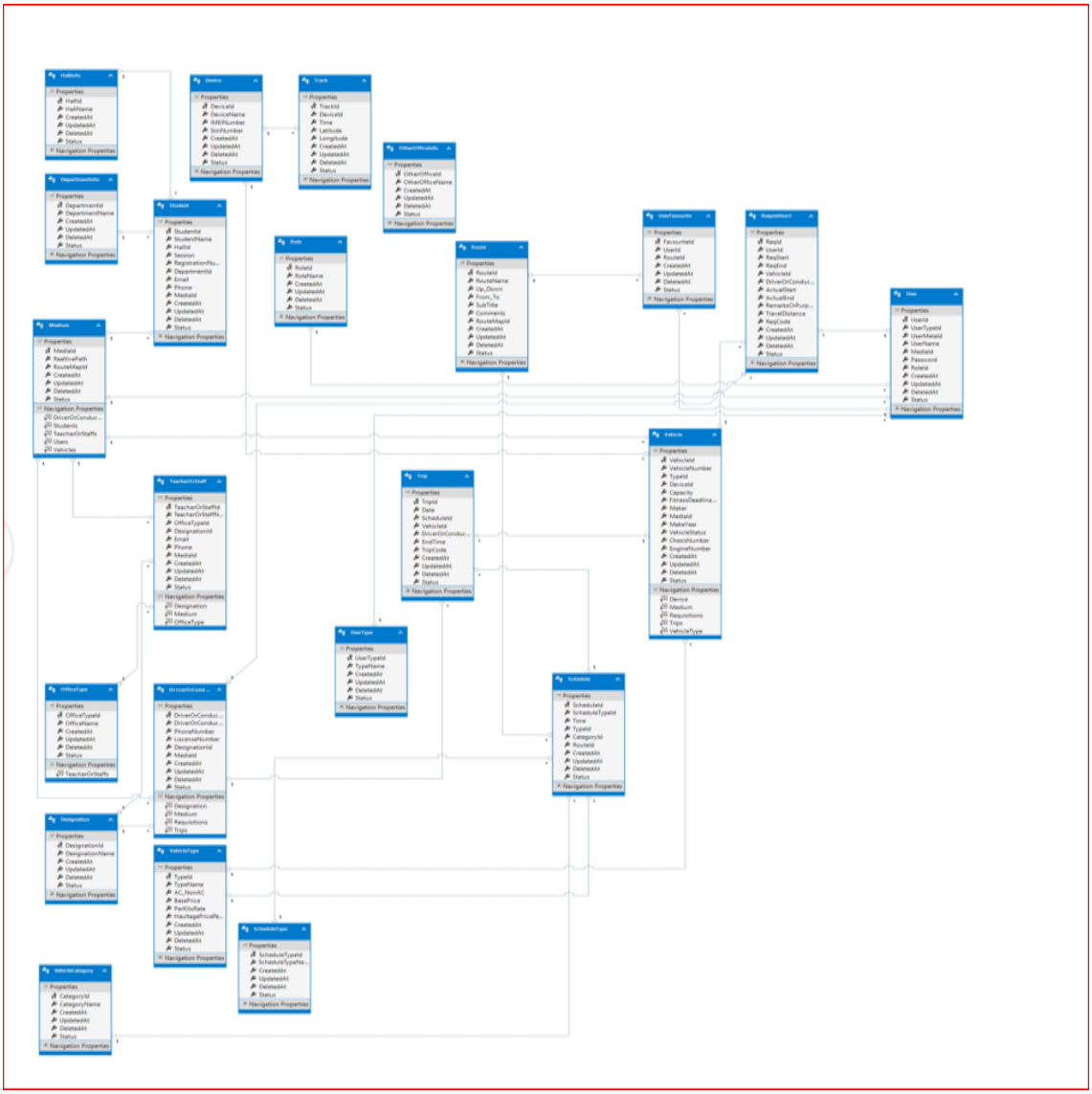

Figure 15: Database design

Chapter 8

8 User Interface

8.1 Design

A user interface is the means by which a person controls a software application or hardware device.Users interact with the system by using interfaces. Interface hides the complex and ugly details of the system. Interface consists of a set of commands by which a user can easily communicate with the program.Interfaces should be simple and user friendly.By using UI we can easily make a program as per our project.

Before designing UI we consider Shneiderman's "Eight Golden Rules of Interface Design"

1. Strive for consistency:
   By utilizing familiar icons, colors, menu hierarchy, call-to-actions, and user flows when designing similar situations and sequence of actions.

2. Enable frequent users to use shortcuts:
   If users are familiar with the item, make it easy for them to accomplish their objective.

3. Offer informative feedback:
   The user should know what is happening. For every action there should be appropriate, human-readable feedback within a reasonable amount of time.

4. Design dialogue to yield closure:
   Do not keep users guessing. Tell them what their action has led them to

5. Offer simple error handling:
   If an error is made, allow the user to recover them.

6. Permit easy reversal of actions:
   Make it easy to undo errors and easy to stop the actions once started

7. Support internal locus of control:
   Allow your users to be the initiators of actions. Give users the sense that they are in full control of events occurring in the digital space

8. Reduce short-term memory load:
   Make it so the user can quickly scan the controls and know how to use the item rather than remembering

8.2 Implementation

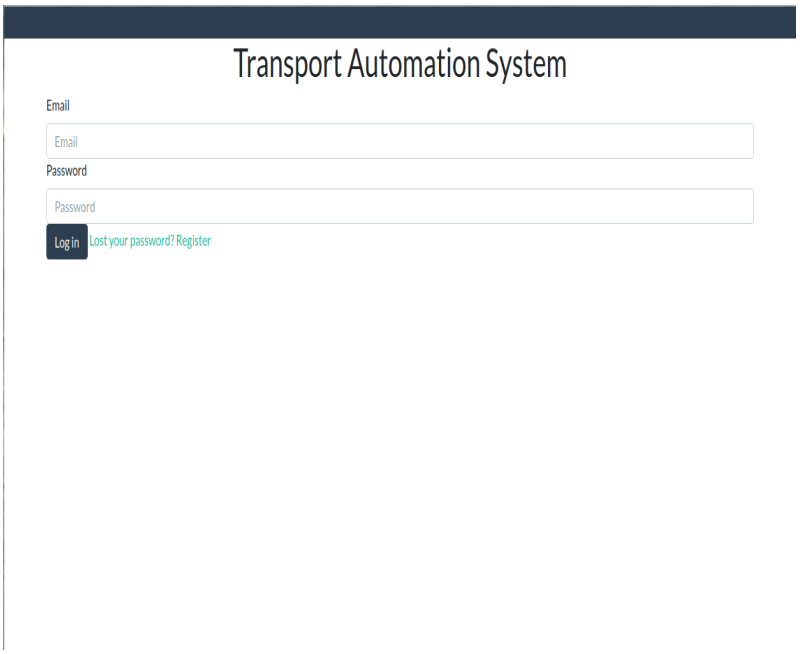

Figure 16: Login web page

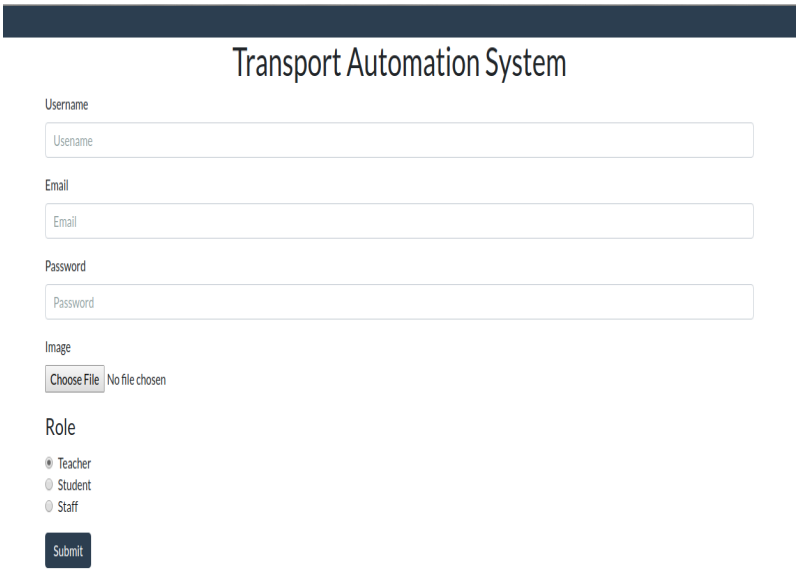

Figure 17: Register web page

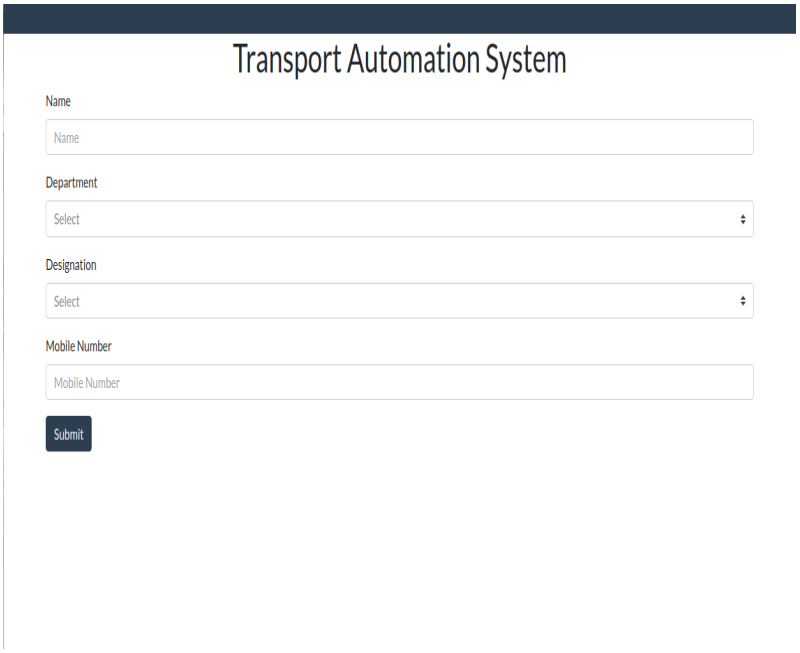

Figure 18: Teacher registration form

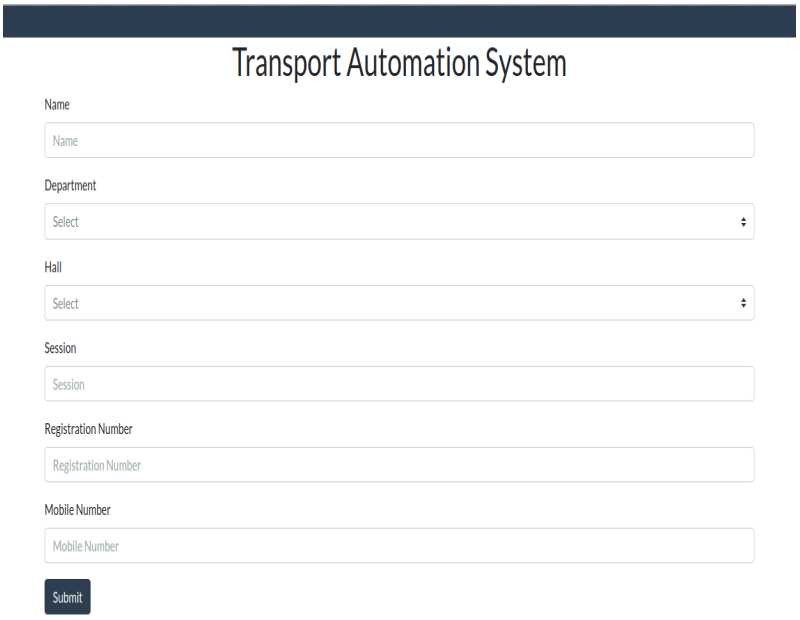

Figure 19: Student registration form

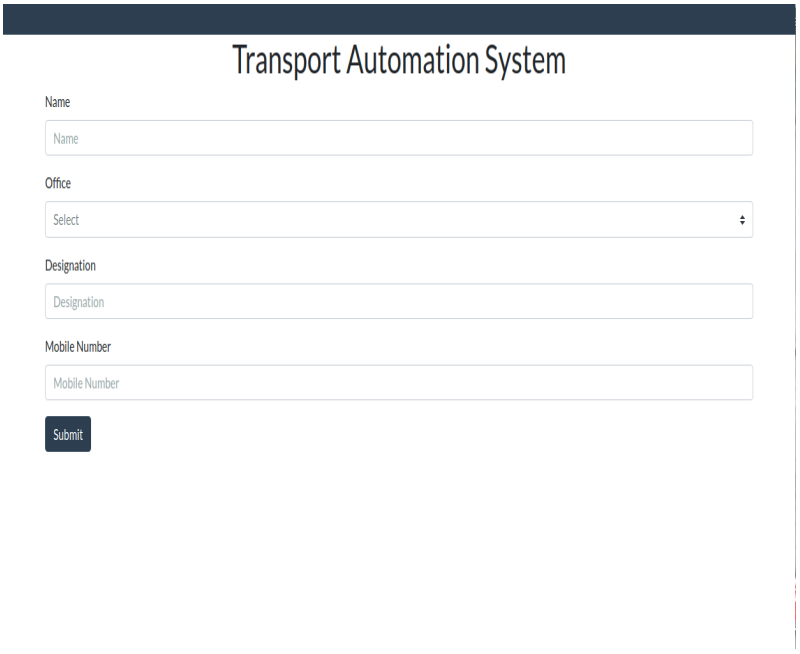

Figure 20: Staff registration form

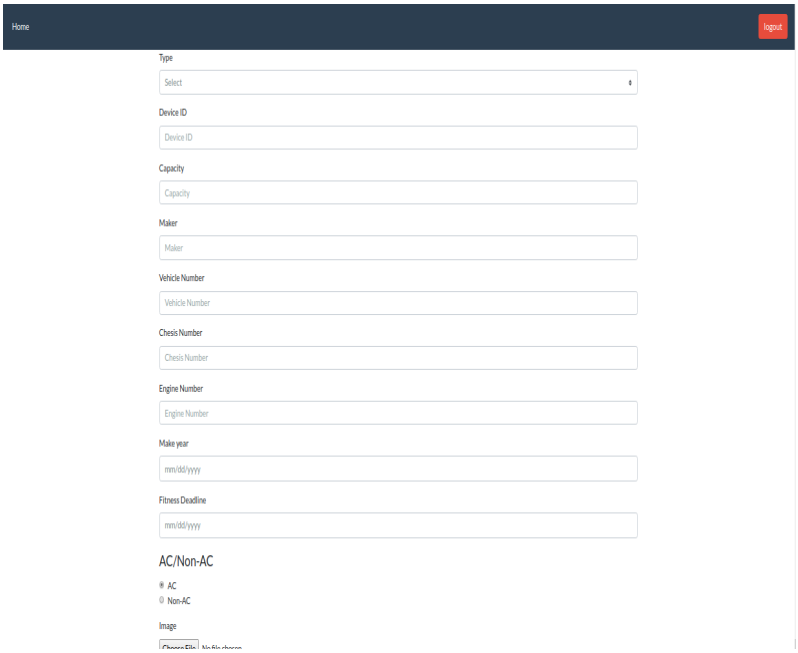

Figure 21: Vehicle registration form

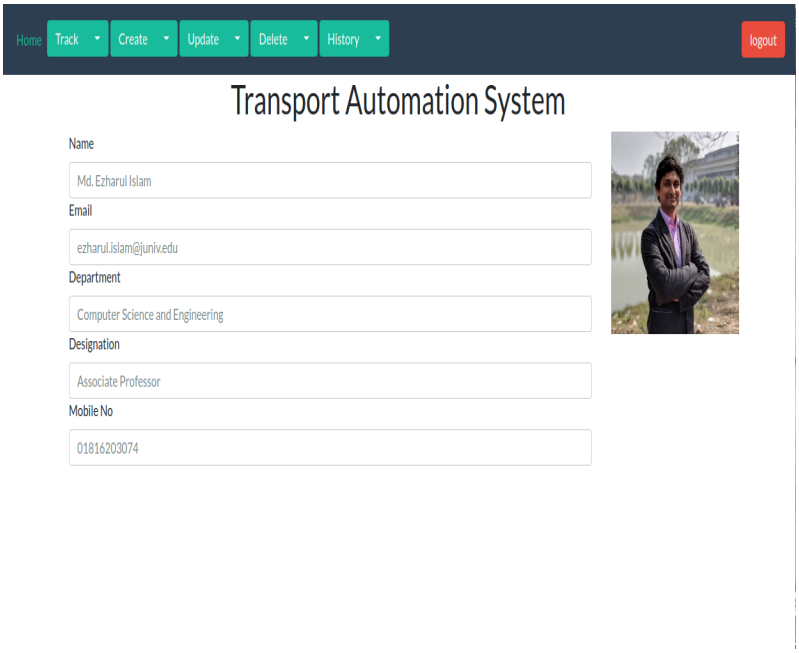

Figure 22: Admin profile page

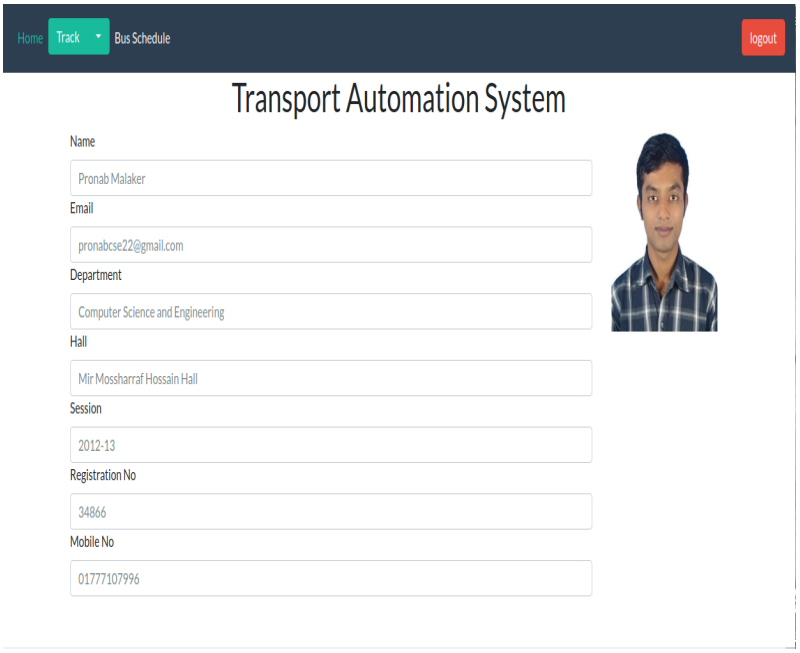

Figure 23: Student profile page

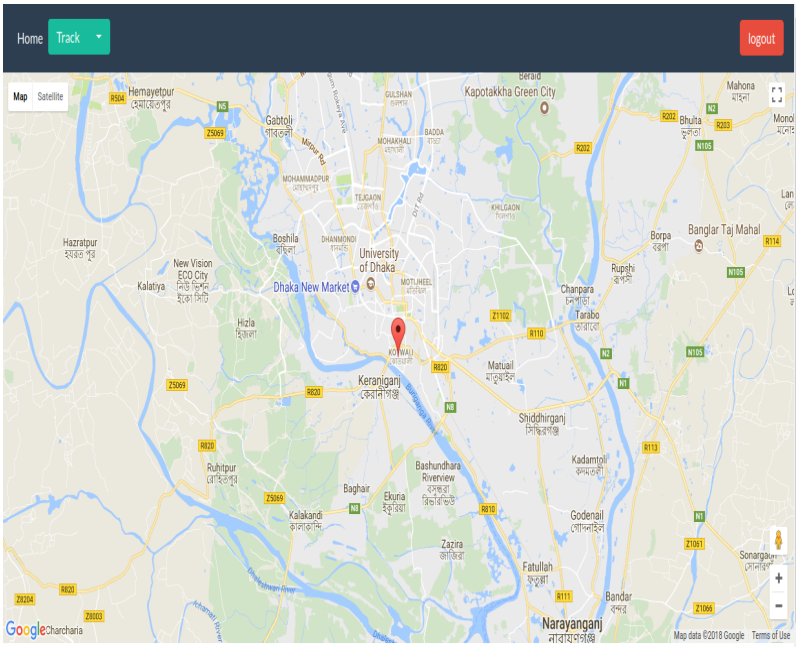

Figure 24: Vehicle location in google map

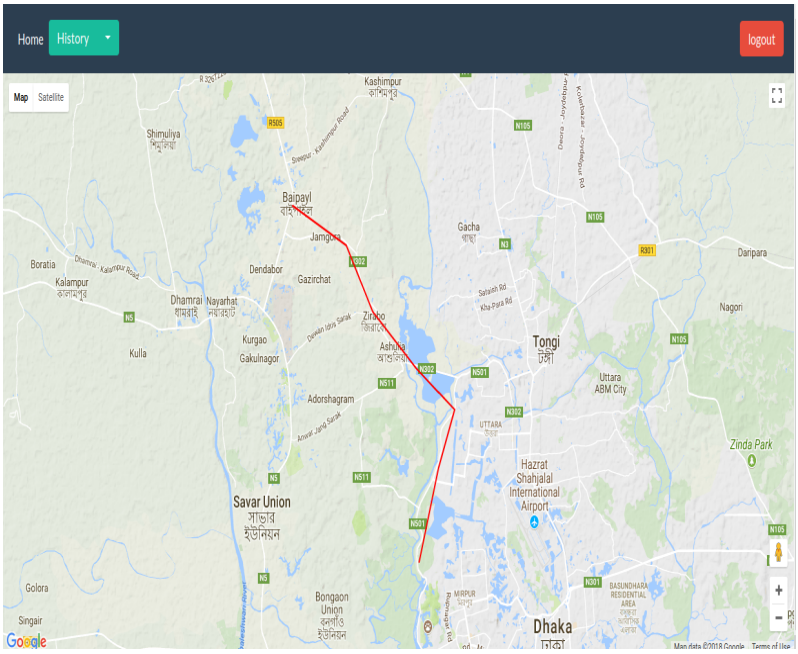

Figure 25: Vehicle history in google map

Chapter 9

9 Conclusion and Future Work

We have a central database, GPS tracking device,user friendly interfaces. Using existing web service we can upload data and retrieve data from the database. We can use data of the database for some analytical purpose e.g tracking history.
In future we can add some new features in GPS tracking device like automated alerts,integration with other services,engine diagnostics.We can also develop our own web services.

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