Route Turns and Hurdle Guidance

Software Requirements Specification

Version 1.0

Prepared By

Muhammad Farjad Ali Raza

Muhammad Raheel

Jawad Shaoor

Revision History

Date	Description	Author	Comments
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Document Approval

The following Software Requirements Specification has been accepted and approved by the following:

Signature	Name	Title	Date
	Mr. Arshad Ali Khan	Lecturer. (Supervisor)	

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1. Introduction

The detection of road surface anomalies (potholes, speed bumps) and their correct localization contribute to the improvement of driver's safety and to the optimization of road maintenance operations. Road quality assessment has been identified as a critical issue related to the possibility of making the transportation system more safe, efficient and comfortable. This is the one of the reasons that hurdle detection plays an important role in safety and comfort for all road users. The reduction in average vehicular speed significantly improves the safety of people in the neighboring areas. Even though there is evidence that speed-breakers reduce speed related accidents, they have also been known to cause accidents and injuries. This application is based on mapping and navigation that detects and provides information about the road anomalies e.g. turns, speed breakers etc. and will help in prevention of road accident.

1.1 Purpose

The purpose of this application is to detect and provide information about road abnormalities (i.e., speed bumps, sharp turns) on android platform. This method makes use of a sensor mounted in a car & a GPS receiver to obtain location information of the road. After having the vehicle trip through several locations, data is retrieved from the sensors & transfer this data on server so every client can utilize this data during travelling. This app will be a source of guidance for new drivers which are non-familiar to new location and helps in prior notify the user about speed breaker and a sharp curve.

1.2 Scope

The system is based on android application that has been developed to collect data on road quality with the final aim of giving real-time information to road users, allow them to have a map & GPS (receiver to obtain location information of the road) with complete guidance of turns and hurdles. The system is bound to collect evaluation data using several different types of vehicles (i.e., car, motorcycle, bus, cycle-rickshaw, and auto rickshaw) driven by different people on various different roads. In this way each event can be located and it is possible to create a dataset of road anomalies by means of a central server to which data collected by users can be reported and registered. MQTT is the essential component of our system for the storage of all the sensor data, which has a capability to store collected data offline. Stakeholders are keen to develop a road detection system based on the use of Android mobile devices, driving a test vehicle and a utilitarian car for the validation process.

1.3 Definitions, Acronyms, and Abbreviations

PHP - A server scripting language used by ROUTE TURNS AND HURDLE GUIDANCE APP.
My SQL - The database that will be used for this project.
Android studio- A platform for developing and android app.

2. General Description

There are significant technical difficulties in developing an app, this will be a risk because team has not much experience with the relevant tools and technologies although we will learn, and we will certainly make some mistake and sub optimal choices. We will address this risk by scoping the project such that we have enough time to train and to review the design and implementation.

2.1 Product Perspective

The **Route turns and hurdle guidance app** is a new self-contained app intended for use on the android platform. While "**Route turns and hurdle guidance**" mobile application is the main focus of the project, there is also a server side component which will be responsible for database which controls the GPS and all route information.

2.2 Product Functions

- System Provide Splash Activity.
- Systems include notification about new releases.
- It gives facility of avoidance from hurdles and information about turns on the route.
- Allows user to search route.
- Allows user to show map view.
- The system will provide result instantly to save user's time.
- The system will display information stored in the database.

2.3 User Classes and Characteristics

Home Users – these users need our product for their home and easily access on internet for accessing the application

Office Users- These users have laptops, usually remote-connect into the network.

Drivers- They often have only smart phone to use application.

2.4 General Constraints

- Must have multiple data sources for accuracy in dataset.
- Application should be run on any version of android.
- Application must be able to update itself for new data.
- Application must detect speed breakers & potholes.
- System must be entirely and well trained.
- Dataset must be categorized according to location.

2.5 Assumptions and Dependencies

- Our system is dependent on the quality of dataset.
- Assuming that our sensor & GPS will work efficiently.

3. Specific Requirements

Specific requirements are

1) Functionality

This subsection contains the requirements for the **Route turns and hurdle guidance app**. These requirements are organized by the features discussed in the vision document. Features from vision document are then refined into use case diagrams and to sequence diagram to best capture the functional requirements of the system. All these functional requirements can be traced using traceability matrix.

1.1 Configured to user demand.

a) The system shall display all the routes which are solved by system.

b) The system shall allow user to select the Route.

c) The system shall display all the available Routes.

d) The system shall notify the user about any conflict in the current configuration.

e) The system shall allow user to update the configuration to resolve conflict in the current configuration.
f) The system shall allow user to confirm the completion of current configuration.

1.2 Provide comprehensive service details.

a) The system shall provide detail information about routes.
b) User requests the system for route indication.

1.3 Detail product categorization.

a) System shows the splash activity.
b) Then system shows the Map activity
c) User has to provide search query of routes.

1.4 Provide personalized profile.

a) The system shall display both the guided map and unguided map.
b) The system shall display details information about the searched route.
c) The system shall display the most accurate route.

1.5 Provide user support

a) The system shall allow user to enter the service information for the support.
b) The system shall allow user to enter contact number for support personnel to call.

1.6 Hurdle and turn Notification

a) The system shall send a notification for upcoming hurdle and turn

1.7 Detailed Description for user

a) The system shall display detailed Info about route.

1.8 Allow change of Route.

a) The system shall display the route that is eligible to change.

1.9 Map activity

a) The system shall provide map to select the location of user.

3.1 External Interface Requirements

3.1.1 User Interfaces

- A first-time user of the mobile application should see the log-in page when user opens the application.
- A visual GUI is used to display the menu and sub menus.
- Buttons are displayed on menus and sub menus for selecting options.
- Backgrounds are used make our interface more attractive.
- User interface is designed in a user friendly manner.

3.1.2 Hardware Interfaces

Since the Application is based on Android, so it supports any Android System, meeting the following criteria:

- At least 1GB ram and 100MB memory storage to install and load the application.
- Touch screen input for selecting options from menus and capture the image.
- A WIFI connection to download and install the application.

3.1.3 Software Interfaces

The application runs on Android Operating System and it is implemented on API, which supports Java scripting language. This development tool is preferred because it is a best application developing engine. It is portable and cross platform which means that the same code, developed via API, can be ported on many platforms with minimal modifications.

3.1.4 Communications Interfaces

The **Route turns and hurdle guidance app** system shall use MQTT protocol for communication between server & database. Internet will be required for android application to locate the user through GPS.

3.2 Functional Requirements

User Class 1 - User

3.2.1 Functional Requirement 1

TITLE: **Download mobile application**

A user should be able to download the mobile application through either an application store or similar service on the mobile phone. The application should be free to download.

3.2.2 Functional Requirement 2

TITLE: Download and notify users of new releases

When a new/updated version or release of the software is released, the user should check for these manually. The download of the new release should be done through the mobile phone in the same way as downloading the mobile application.

3.2.3 Functional Requirement 3

TITLE: Mobile application - Search

Given that a user downloaded the mobile application, then the first page that is shown should be the search page. The user should be able to search for a route, according to several search options. The search options are categories of the hurdles and turns. There should also be a free text search option.

3.2.4 Functional Requirement 4

TITLE: Mobile application - Search result in a map view

- Search locations of user can be viewed on a map. On the map, the relevant and closest user location according to the user's position is shown.
- A specific pin will represent a specific user location. On each pin there should be an information link.
- The map view should include a button that, when selected, should display different filtering options in a filtering menu.

3.2.5 Functional Requirement 5

TITLE: Mobile application - Search by destination

A user should be able to input a maximum and a minimum distance, according to his/her position. By default the minimum distance is set to 0 km and the maximum to 10 km. The user should be able

to input a higher or lower maximum distance and a higher minimum distance than set by default. The result is displayed in a map view by default.

3.2.6 Functional Requirement 6

TITLE: Mobile application - No match found

If no match is found the user should be informed but kept on the search page in order to get the possibility to conduct a new search right away.

3.3 Use Cases

User Use Case

Table-3.3.1 User Use case

Use case ID:	UC-3.3.1
Use case name:	User
Actors:	User
Description:	How user can use the app.
Priority:	High
Precaution:	None
Post conditions:	The user will Search route
Essential path:	1: App must be running 2: User must click on Search button 3: App must be connected with Internet
Alternative Scenario:	None

3.3.2 Use Case #2

Table-3.3.2 User Use case

Use case ID:	UC-3.3.2
Use case name:	User
Actors:	User
Description:	How user can use the app.
Priority:	High
Precaution:	None
Post conditions:	The user will Search result in map view
Essential path:	1: App must be running 2: User must click on Search button 3: App must be connected with Internet
Alternative Scenario:	None

3.3.3 Use Case #3

Table-3.3.3 User Use case

Use case ID:	UC-3.3.3
Use case name:	User
Actors:	User
Description:	How user can use the app.
Priority:	High
Precaution:	None
Post conditions:	The user will Notified before hurdle and turn
Essential path:	1: App must be running 2: User must click on Start 3: App must be connected with Internet
Alternative Scenario:	None

3.4 Non-Functional Requirements

3.4.1 Performance

The product shall be based on android and has to run from the android mobile phone. The product shall take initial load time depending on internet connection strength which also depends on the media from which the product is run. The performance shall depend upon hardware components of the user.

3.4.2 Reliability

- ***Back-end internal computers.***
  The system shall provide storage of all databases on redundant computers with automatic switchover.
  The system shall provide for replication of database to off-site storage locations.
- ***Internet Service provider***
  The system shall provide a contractual agreement with an internet service provider for T3 access with 99.99% availability
  The system shall provide a contractual agreement with an internet service provider who can provide 99.99% availability through their network facilities onto the internet.

3.4.3 Availability

METER: Measurements obtained from 1000 hours of usage during testing.
MUST: More than 98% of the time.
PLAN: More than 99% of the time.
WISH: 100% of the time.

3.4.4 Security

- ***Data Transfer***
  The system shall use secure sockets in all transactions that include any confidential user information
  The system shall automatically log out all customers after a period of inactivity.
  The system shall confirm all transactions with the user's application.
  The system shall not leave cookies in the user app containing the user password.
  The system shall not leave any cookies in the user computer containing any of the user's confidential information.

- ***Data Storage***
  The user app shall never display user's password. It shall always be echoed with special characters representing typed characters.
  The system's back end servers shall never display a user password. The user's password may be rest but never shown.
  The system's back end servers shall only be accessible to authenticated administrators.
  The system's back end databases shall be encrypted.

3.4.5 Maintainability

The application should be easy to extend. The code should be written in a way that it favors implementation of new functions.

3.4.6 Portability

The application should be portable with Android.

3.5 Inverse Requirements

Explain what the system shall not do. Inverse requirements describe the constraints on the allowable behaviors. Many people find it convenient to describe their needs in this manner These requirements indicate the indecisive nature of customers about certain aspects of a new software product Example: The system shall not use red color in the user interface, whenever it is asking for inputs from the end-user

3.6 Design Constraints

- ***Hard Drive Space***
  SCALE: The application's need of hard drive space.
  MUST: No more than 20 MB.
  PLAN: No more than 15 MB.
  WISH: No more than 10 MB.
  DEFINED: Megabyte
- ***Application Memory Use***
  METER: Observations done from the performance log during testing.
  MUST: No more than 20 MB.
  PLAN: No more than 16 MB.
  WISH: No more than 10 MB.

3.7 Logical Database Requirements

My SQL database shall be used to store the information about user and workers.

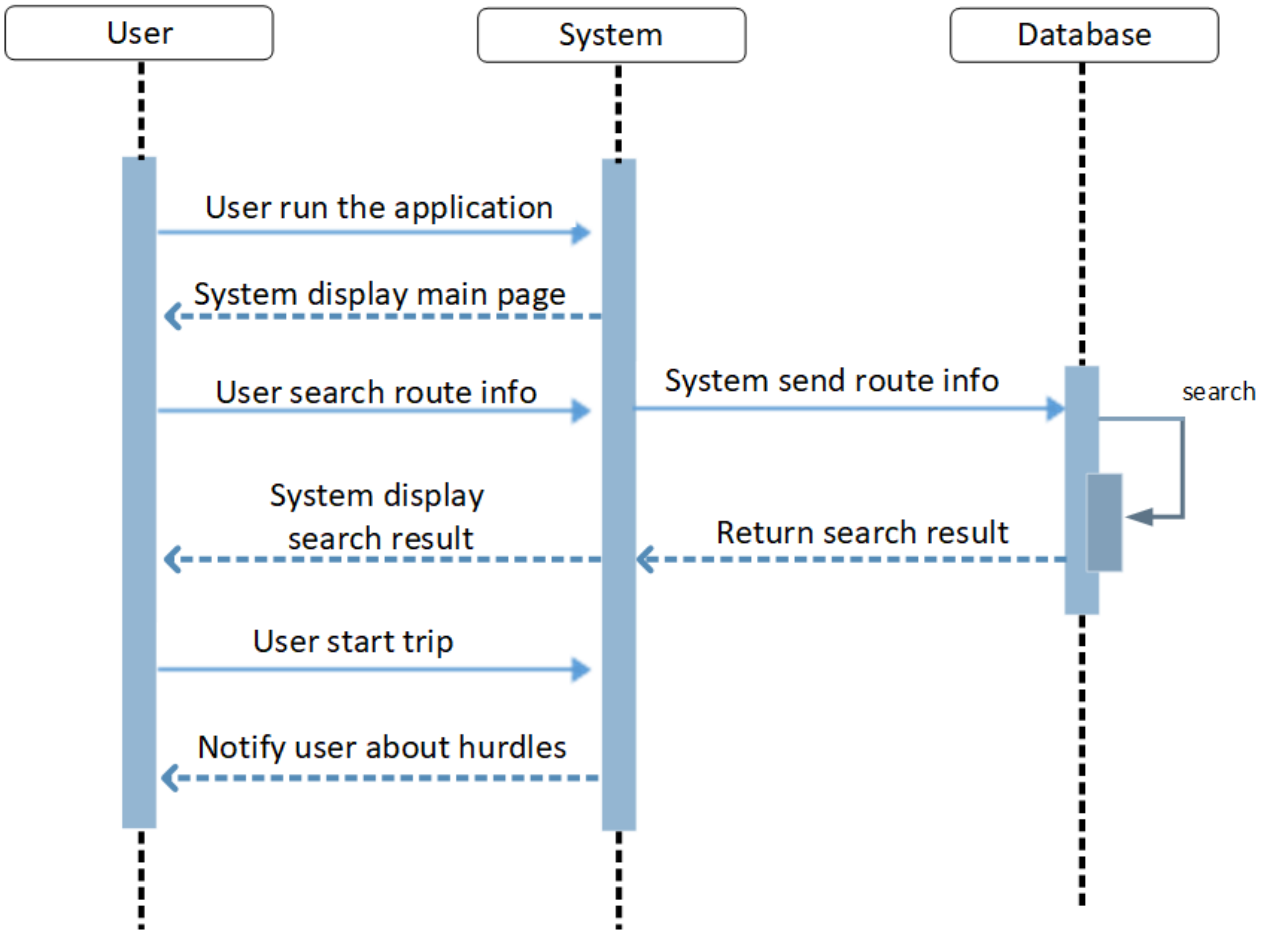
3.8 Other Requirements

Legal , Copy right and other notices.

Route Turns and Hurdle Guidance app should display the disclaimers, copyright, word mark, and trademark.

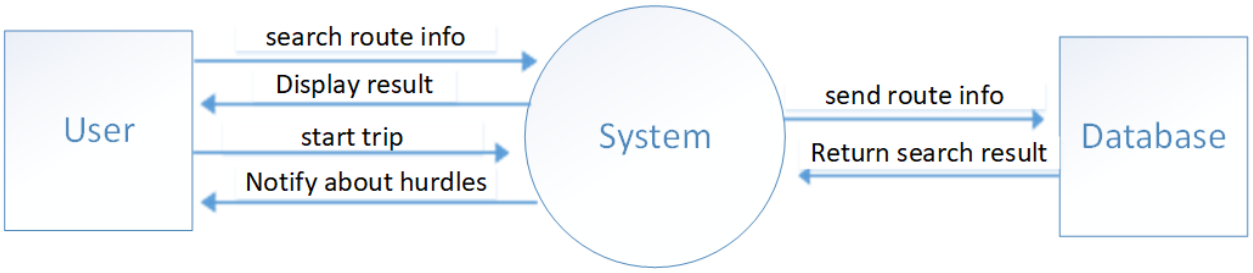
4. Analysis Models

4.1 Sequence Diagram

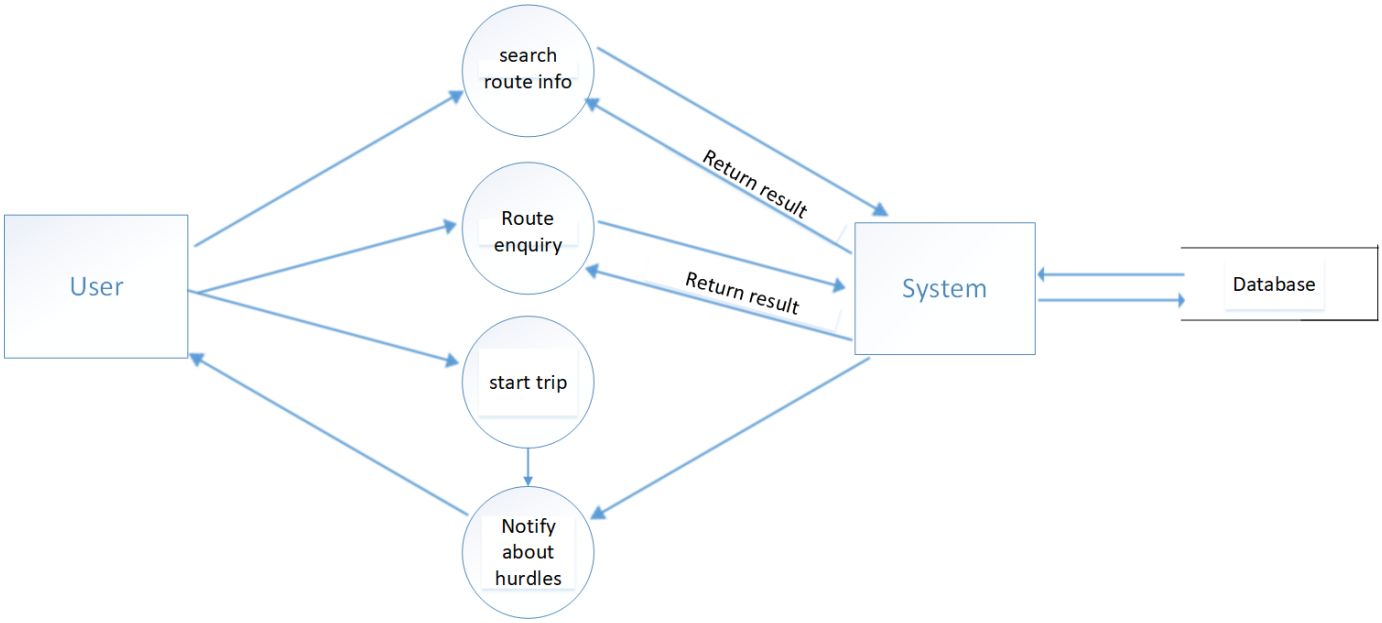


4.2 Data Flow Diagrams (DFD)

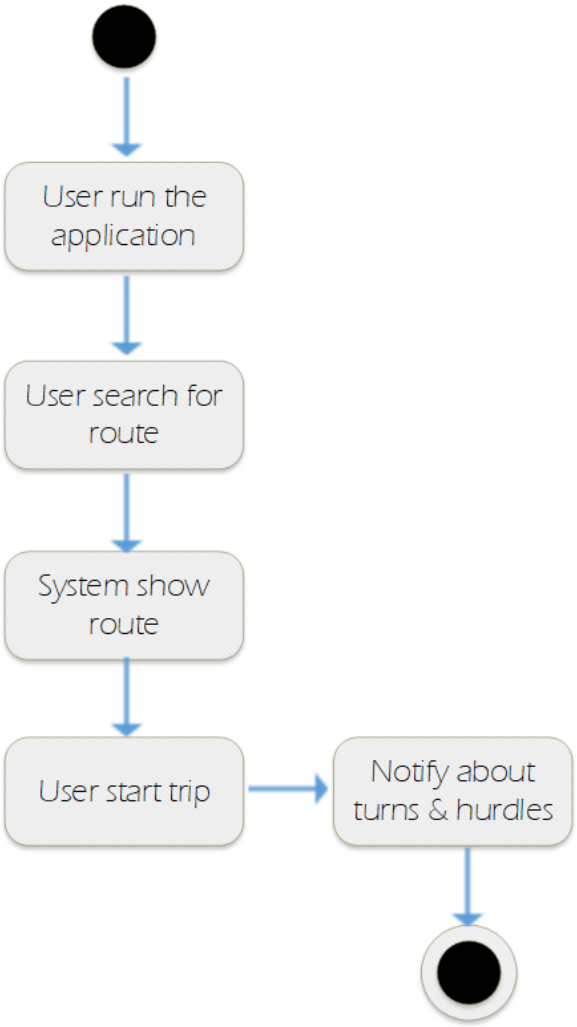
Level 0



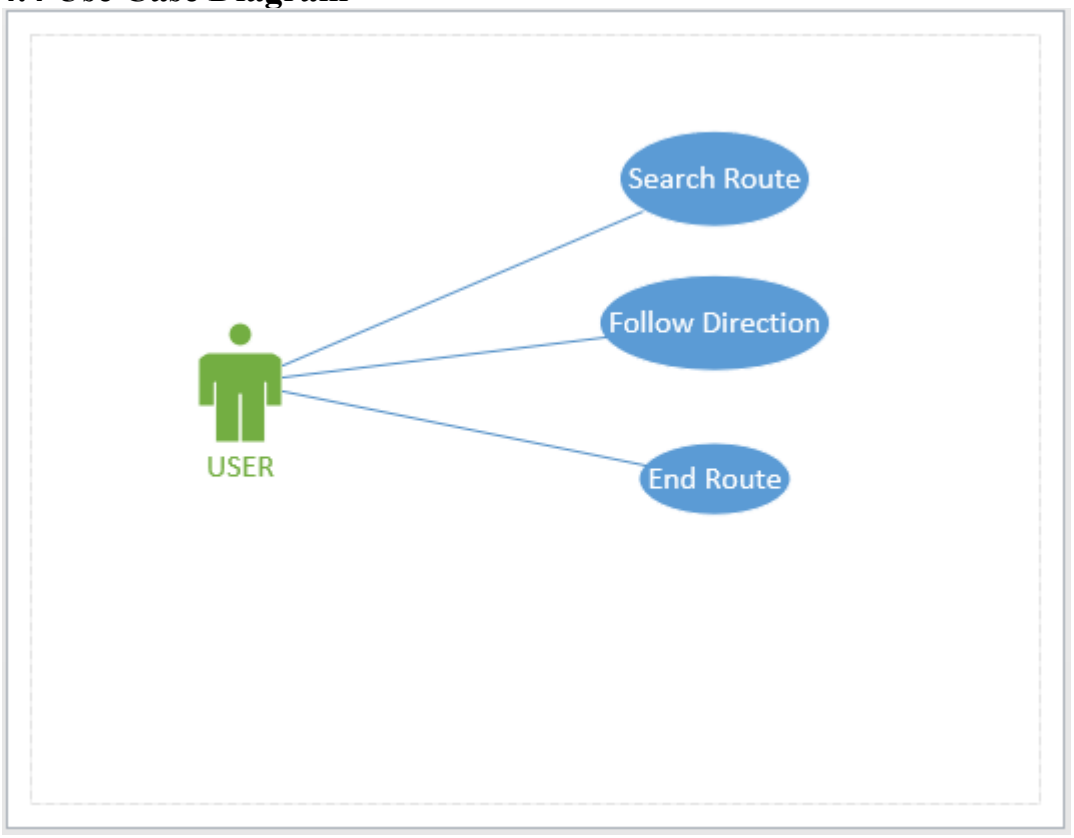
Level 1

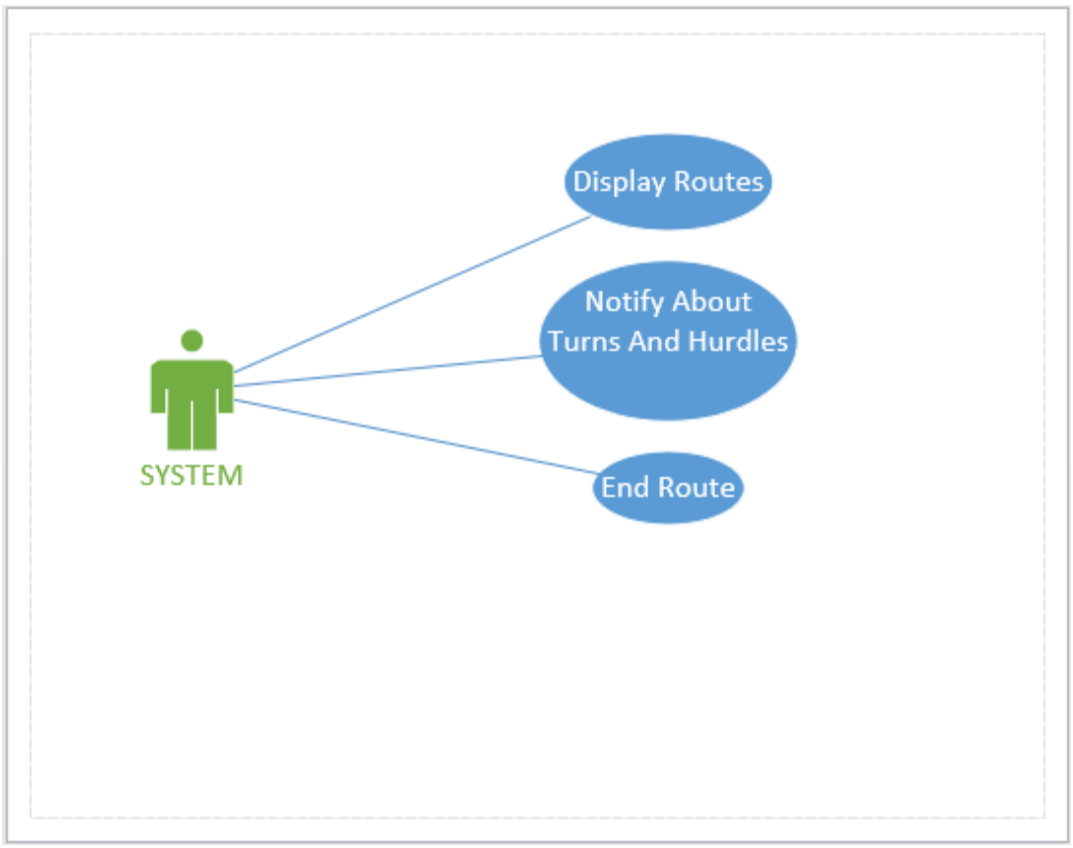


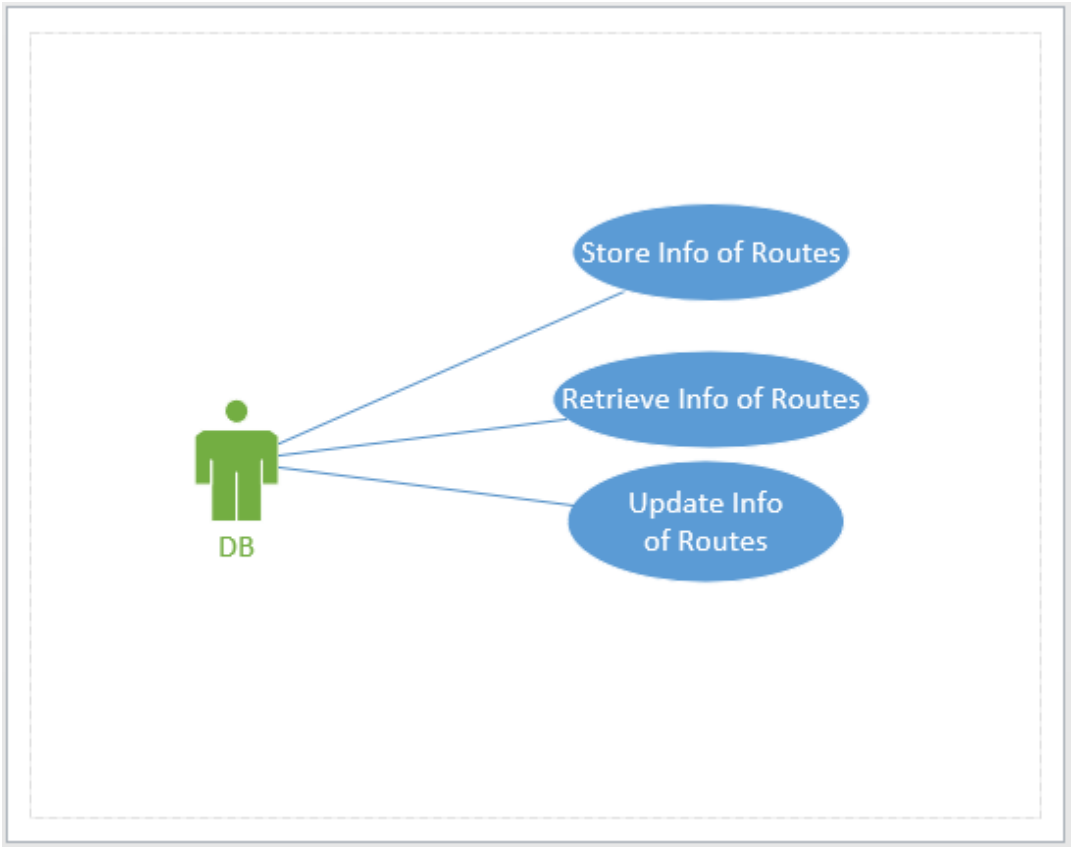
4.3 Activity Diagrams (STD)



4.4 Use Case Diagram




Display Routes
Notify About Turns And Hurdles
End Route
SYSTEM


Store Info of Routes
Retrieve Info of Routes
Update Info of Routes
DB

5. Change Management Process

SRS requirements could be changed by changing the scope of the project. By complete study and the admin will be allowed to update the SRS.

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[14]. Mobile Application Development: Web vs. Native

A. Appendices

Appendix – A

Android studio	Android Studio is an integrated development environment (IDE) from Google that provides developers with tools needed to build applications for the Android OS platform.
GUI	Graphic User Interface
MySQL Lite	The database within the app
Windows	Operating system
Scripting	A scripting language or script language is a programming language that supports the writing of scripts, programs written for a special runtime environment that can interpret and automate the execution of tasks which could alternatively be executed one-by-one by a human operator.
Graphics	Graphics are visual presentations of app.
SRS	SRS Software Requirement Specification
UX	User experience for using a product.
User	User is the one who use the app to check for routes and hurdles.
System	A system is a set of interacting or interdependent components forming an integrated whole or a set of elements and relationships which are different from relationships of the set.