A

PROJECT REPORT ON

Pay Toll System

SUBMITTED BY STUDENT

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CertiFicate

This is to certify that the project synopsis work entitled

"Pay Toll System"

Has been successfully completed by

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ACKNOWLEDGEMENT

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ABSTRACT

With the increase in technological developments, smart phone, tablet and iPods have been widely used by all users. Starting from user needs is almost complete with a small object with millions of benefit. With this trend, many people use their smart phone to do electronic transactions. One of the electronic transactions is toll plaza payment. This application emerges as a solution to the manual toll collection method employed at toll plaza .Time and efficiency are major factors of present situation. In order to overcome the major issues of vehicle congestion and time consumption, the QR scanner is used. Here the user reach to toll plaza and scan QR code and pay the toll amount.

Keywords: Toll plaza, QR code, Payment , Android

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CHAPTER IINTRODUCTION

1.1 BACKGROUND

FASTag is an electronic toll collection system, operated by the NHAI. Based on radio frequency identification (RFID) technology, FASTag is affixed on the windscreen of vehicles. In other words, FASTags are prepaid rechargeable tags for toll collection. FASTags do not have any expiry date, hence, they can be used as long as they are not tampered with and are readable at the toll plazas.

Vehicles which have FASTag enabled on them, do not have to stop at toll gates as charges are deducted from the prepaid or bank account when the vehicle is moving. This means that drivers do not have to stop their vehicle to make transactions as the toll collection will be done electronically under the National Electronic Toll Collection (NETC) programme.

In our project we coustmize the previous system to the less time consuming and user friendly process. Application is user friendly, safe for payment. You can pay the toll amount using upi, net banking, credit/debit card. We customize and proposed this system to make the traffic free lens at toll plaza, less time consuming payment process for the users

1.2 ENVIRONMENT

The application will support implementation and refinement of the system that has been developed for users. In this project users will get map navigation in the feature of toll pay in route, so user does not need to open google map navigation separately. Quick scan is also usable feature for the user. It can be use at the emergency or if user know their complete travel route. A demo video is also provided.

1.3 USE OF PROJECT

1. This Android application can maintain the less redundant database.
2. Less timeconsuming
3. Safe secure transition
4. No need to open separate navigation app
5. We can get history of all payment make at toll plaza

1.4 PURPOSE

1. Overcome slow payment process as it done manually
2. Make payment easily with Pay Toll application
3. Keep track of all toll payments in history
4. Some travelers are forgot to bring card/cash.

CHAPTER II LITERATURE REVIEW

2.1 EXISTING SYSTEM

FASTag

FASTag is an electronic toll collection system, operated by the NHAI. Based on radio frequency identification (RFID) technology, FASTag is affixed on the windscreen of vehicles. In other words, FASTags are prepaid rechargeable tags for toll collection. FASTags do not have any expiry date, hence, they can be used as long as they are not tampered with and are readable at the toll plazas.

FASTag system work

Vehicles which have FASTag enabled on them, do not have to stop at toll gates as charges are deducted from the prepaid or bank account when the vehicle is moving. This means that drivers do not have to stop their vehicle to make transactions as the toll collection will be done electronically under the National Electronic Toll Collection (NETC) programme.
2014, FASTags were set up as a key project in the Golden Quadrilateral between Ahmedabad and Mumbai. By 2016, 347 toll plazas national highways started accepting FASTag payments. The following year, NHAI launched a FASTag lane in all 370 toll plazas under its ambit and the government made it mandatory on all new vehicles sold in India after December 2017. On October 19, 2019 FASTag was made mandatory on all National Highways.

2.2 PROPOSED SYSTEM

In our project we customize the previous system to the less time consuming and user friendly process. Application is user friendly, safe for payment. You can pay the toll amount using upi, net banking, credit/debit card. We customize and proposed this system to make the traffic free lens at toll plaza, less time consuming payment process for the users. We also provide demo video (How to use Pay-Toll Application) in our project for those who unable use the application.

Advantages

1. To Controls traffic to a maximum extent
2. To reduce the time consumption
3. Reducing long vehicle lens
4. User friendly
5. Safe and secure

CHAPTER III
SCOPE OF PROJECT

3.1. OBJECTIVE

3.1.1. To Controls traffic to a maximum extent

Reduced vehicular conjunction In there vehicles need not stop longer in toll plazas for paying the toll fees, the toll fee is deduced from the vehicles linked prepaid account when the vehicles are in move. This makes the vehicles move faster in the toll area, no vehicular conjunction.

3.1.2. To reduce the time consumption

Time saving Since there is no vehicular conjunction or traffic due to the proposed system, the vehicles need not wait in long queues to pay the toll fee and there is no traffic . This saves the precious time of many people who drive the vehicles.

3.2. SCOPE OF PROJECT

Designed system gives complete solution for traffic and transport related problems such as Toll gate control , traffic rules violation control. Compare to normal manually system is better and in this we can pay the toll charges at any toll booth by scanning payment the QR Code.

CHAPTER IV CORE TECHNOLOGY

4.1. DESIGNING

4.1.1. XML

4.1.1.1. WHAT IS XML

XML stands for Extensible Markup Language. Much like HTML (or HyperText Markup Language), XML is also a markup language. It was created as a standard way to encode data in internet-based applications. However, unlike HTML, XML is case-sensitive, requires each tag is closed properly, and preserves whitespace. XML tags are not predefined in XML. We must define our own Tags. Xml as itself is well readable both by human and machine. Also, it is scalable and simple to develop. In Android we use XML for designing our layouts because XML is lightweight language so it doesn't make our layout heavy.

What's XMLPull Parser ?
Android provides three types of XML parsers which are DOM,SAX and XMLPullParser. Among all of them android recommend XMLPullParser because it is efficient and easy to use. So we are going to use XMLPullParser for parsing XML.

4.1.1.2. Different uses of XML in Android:

In Android there are several purposes of using XML, each purpose is needs a specific type of xml files. Below we define each and every one.

1. Define the actual UI of an Application:

XML is well used in defining the UI of the application for the different reasons I mentioned earlier but the files that must be used to do that in Android are the Layout XML Files which holds all the elements(views) or the tools that we want to use in our application. Like the TextView's, Button's and other UI elements.

2. Define all the components of the Application:

XML is also used in defining the components the application contains Like Activities and their state (main or not, the theme they use, …), the names of app's packages,receivers, services and the permissions that our application needs. All written in the Manifest xml File (Mainfest.xml) one of the most important files in Android App's.

3. Replace the Hard-coded strings with a single string:

XML helps us as well to define all the strings in a file called Strings xml File(strings.xml) which allows us to access them in our app (Activity or in Layout XML files) to enhance the reusability of the code and avoid Hard-coded programming.

4. Define the different styles and looks for the UI of the application:

In addition to all the previous functionalities, XML also allows you to define our App's custom themes and styles in the Styles xml File(styles.xml).

5. Provide various graphics to the elements or views of the application:

XML also helps in providing various graphics to the elements or views to create a custom UI, that we put in Drawable xml Files.

6. Define the App's colors :

XML offers the privilege of defining custom colors that we wants to use in our apps. We simply define the color's in the Color xml File (colors.xml) and used them in our app from this file.

7. Define the dimensions of the Views:

After defining strings, styles and colors XML allows us also to define Dimensions yet in a different file called Dimension xml File(dimens.xml.

4.1.1.3. MATERIAL DESIGN FOR ANDROID

Material design is a comprehensive guide for visual, motion, and interaction design across platforms and devices. To use material design in your Android apps, follow the guidelines defined in the material design specification and use the new components and styles available in the material design support library. This page provides an overview of the patterns and APIs you should use.

Android provides the following features to help you build material design apps:

1. A material design app theme to style all your UI widgets
2. Widgets for complex views such as lists and cards
3. New APIs for custom shadows and animations

Used following dependencies to design a application:

- implementation 'com.google.android.material:material:1.2.1'
- implementation 'com.android.support:appcompat-v7:26.1.0'
- implementation 'androidx.constraintlayout:constraintlayout:2.0.4'
- implementation 'com.android.support:design:26.1.0'
- implementation 'androidx.recyclerview:recyclerview:1.1.0'
- implementation 'com.github.bumptech.glide:glide:3.5.2'
- implementation 'pl.droidsonroids.gif:android-gif-drawable:1.2.17'

4.1.2. ANDROID STUDIO

Android Studio is the official Integrated Development Environment (IDE) for android application development. Android Studio provides more features that enhance our productivity while building Android apps.

4.1.2.1. FEATURES OF ANDROID STUDIO

- It has a flexible Gradle-based build system.
- It has a fast and feature-rich emulator for app testing.
- Android Studio has a consolidated environment where we can develop for all Android devices.
- Apply changes to the resource code of our running app without restarting the app.
- Android Studio provides extensive testing tools and frameworks.
- It provides build-in supports for Google Cloud Platform and Google Maps Platform. It makes it easy to integrate Google Cloud Messaging and App Engine.

4.1.2.2. ANDROID STUDIO PROJECT STRUCTURE

The Android Studio project contains one or more modules with resource files and source code files. These include different types of modules-

- Android app modules
- Library modules
- Google App Engine modules

4.1.3. GRADLE BUILD SYSTEM

Gradle build used as the foundation of the build system in Android Studio. It uses more Android-specific capabilities provided by the Android plugin for Gradle. This build system runs independently from the command line and integrated tool from the Android Studio menu. We can use build features for the following purpose:

- Configure, customize, and extend the build process.
- We can create multiple APKs from our app, with different features using the same project and modules.
- Reuse resource and code across source sets.

Fig. 4.1.3.1 Android studio 3.6

By default, Android Studio displays our project files in the Android project view, as shown in the above image. This view is formed by modules to provide quick access to our project's key source files.

These build files are visible to the top-level under Gradle Scripts. And the app module contains the following folders:

- **manifests**: It contains the AndroidManifest.xml file.
- **java**: It contains the source code of Java files, including the JUnit test code.
- **res**: It contains all non-code resources, UI strings, XML layouts, and bitmap images.

4.2. DEVELOPMENT

4.2.1. JAVA

4.2.1.1. WHAT IS JAVA?

Java is one of the most popular and widely used programming language and platform. A platform is an environment that helps to develop and run programs written in any programming language.
ava is fast, reliable and secure. From desktop to web applications, scientific supercomputers to gaming consoles, cell phones to the Internet, Java is used in every nook and corner.

Java is easy to learn and its syntax is simple and easy to understand. It is based on C++ (so easier for programmers who know C++). Java has removed many confusing and rarely-used features e.g. explicit pointers, operator overloading etc. Java also takes care of memory management and for that, it provides an automatic garbage collector. This collects the unused objects automatically.

Current versions of Android use the latest Java language and its libraries (but not full graphical user interface (GUI) frameworks), not the Apache Harmony Java implementation, that older versions used. Java 8 source code that works in latest version of Android, can be made to work in older versions of Android.

4.2.2 WHAT IS SQLLite?

SQLite is a opensource SQL database that stores data to a text file on a device. Android comes in with built in SQLite database implementation.

SQLite supports all the relational database features. In order to access this database, you don't need to establish any kind of connections for it like JDBC,ODBC e.t.c
The main package is android.database.sqlite that contains the classes to manage your own databases.

- **SQLITEOPENHELPER CLASS**

The android.database.sqlite.SQLiteOpenHelper class is used for database creation and version management. For performing any database operation, you have to provide the implementation of onCreate() and onUpgrade() methods of SQLiteOpenHelper class.

4.2.2.1 Methods of SQLiteOpenHelper class

Method	Description
public abstract void onCreate(SQLiteDatabase db)	called only once when database is created for the first time.
public abstract void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion)	called when database needs to be upgraded.
public synchronized void close ()	closes the database object.
public void onDowngrade(SQLiteDatabase db, int oldVersion, int newVersion)	called when database needs to be downgraded.

4.2.2.1 SQLiteDatabase class

Method	Description
void execSQL(String sql)	executes the sql query not select query.
long insert(String table, String nullColumnHack, ContentValues values)	inserts a record on the database. The table specifies the table name, nullColumnHack doesn't allow completely null values. If second argument is null, android will store null values if values are empty. The third argument specifies the values to be stored.
int update(String table, ContentValues values, String whereClause, String[] whereArgs)	updates a row.

4.2.3 GOOGLE MAPS PLATFORM

4.2.3.1. Maps SDK For Android

With the Maps SDK for Android, add maps to your Android apps using Google Maps data, map displays, and map gesture responses. You can also provide additional information for map locations and support user interaction by adding markers, polygons, and overlays to your map.

4.2.3.2. The Directions API

The Directions API is a web service that uses an HTTP request to return JSON or XML-formatted directions between locations. You can receive directions for several modes of transportation, such as transit, driving, walking, or cycling.

4.2.3.3. Places API

The following place requests are available:

- Place Search returns a list of places based on a user's location or search string.
- Place Details returns more detailed information about a specific place, including user reviews.
- Place Photos provides access to the millions of place-related photos stored in Google's Place database.
- Place Autocomplete automatically fills in the name and/or address of a place as users type.
- Query Autocomplete provides a query prediction service for text-based geographic searches, returning suggested queries as users type.

Each of the services is accessed as an HTTP request, and returns either an JSON or XML response. All requests to a Places service must use the https:// protocol, and include an API key.

The Places API uses a place ID to uniquely identify a place. For details about the format and usage of this identifier across the Places API and other APIs, see the Place IDs documentation.

4.2.4 Razorpay Payment Gateway

4.2.4.1. Payment Flow

Below is a high-level representation of the Razorpay payment flow.

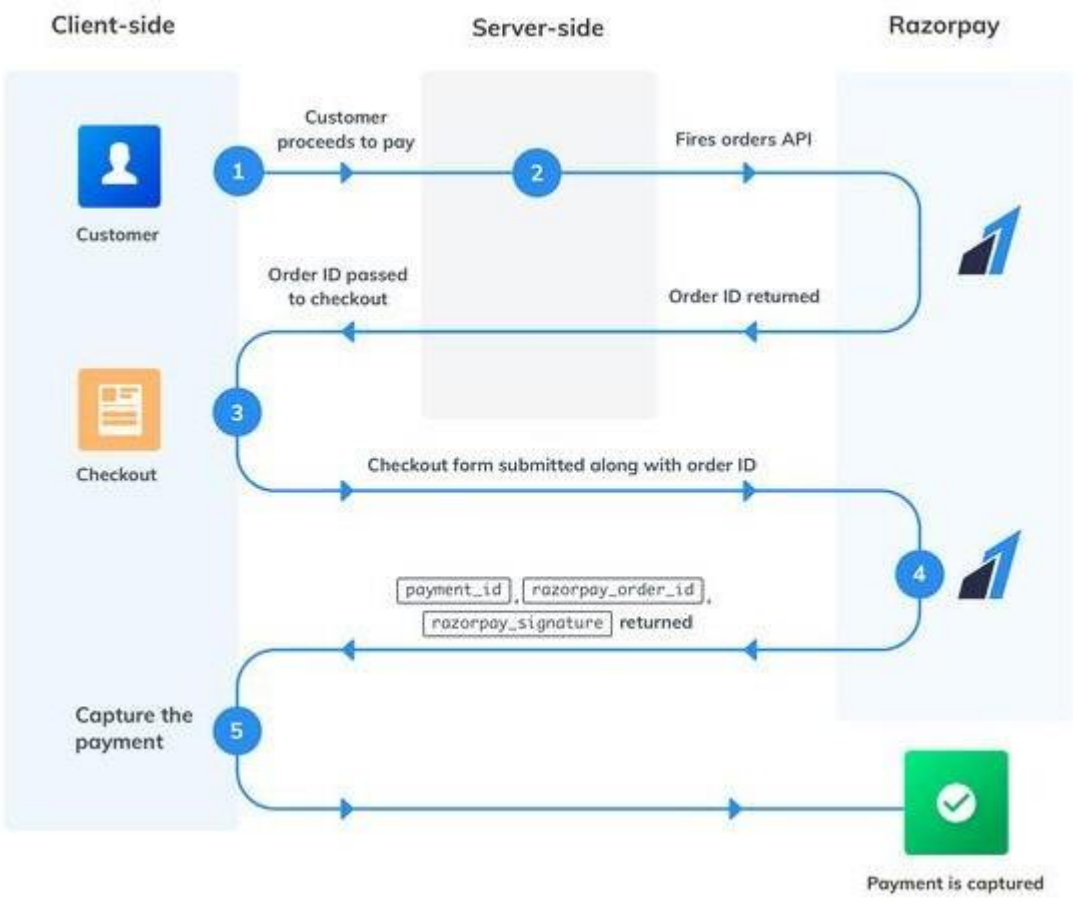


Fig 4.2.4.1 Razorpay Payment Gateway Flow

4.2.4.2. Android SDK Integration - Razorpay Standard

Razorpay Android Standard SDK lets you easily integrate the Razorpay Payment Gateway with your Android application.

4.2.4.3. Prerequisites

Create a Razorpay account.

Generate API Keys from the Razorpay Dashboard. You can use the Test Keys for a sandbox experience. No money will be deducted from your account when making test payments. Please use the Live Keys when going live with the application.

4.2.4.4. Integration Steps

Steps to integrate your Android application with Razorpay Android Standard SDK are given below:

- Install Razorpay Android Standard SDK.
- Initialize Razorpay Android Standard SDK.
- Create an Order in your Server.
- Initiate Payment and Display Checkout Form.
- Handle Success and Error Events.
- Store Fields in Server.
- Verify Payment Signature.

4.2.4.5. Fetch Multiple Payments

Source code
Request:

```
RazorpayClient razorpay = new RazorpayClient([YOUR_KEY_ID],[YOUR_KEY_SECRET]);
try {
 JSONObject paymentRequest = new JSONObject();

  //supported option filters (from, to, count, skip)
 paymentRequest.put("count", 2);
 paymentRequest.put("skip", 1);

 List<Payment> payments = razorpay.Payments.fetchAll(paymentRequest);
} catch (RazorpayException e) {
 // Handle Exception
  System.out.println(e.getMessage());
}
```

4.2.4.6 Response:

"id":"pay_HLdqMvogv05K9Q",
"entity":"payment",
"amount":200,
"currency":"INR",
"status":"authorized",
"order_id":null,
"invoice_id":null,
"international":false,
"method":"upi",
"amount_refunded":0,
"refund_status":null,
"captured":false,
"description":"Toll Charges",
"card_id":null,
"bank":null,
"wallet":null,
"vpa":"7083874227@ybl",
"email":"sharadpatilcr7@gmail.com",
"contact":"+917083874227","notes":[],
"fee":null,"tax":null,
"error_code":null,
"error_description":null,
"error_source":null,
"error_step":null,
"error_reason":null,
"acquirer_data":{"rrn":"116273055050"},
"created_at":1623390331
},
{
"id":"pay_HLdj0V2Whdb4Mq",
"entity":"payment",
"amount":100,
"currency":"INR",
"status":"…}

CHAPTER V
HARDWARE AND SOFTWARE SPECIFICATION

5.1 SOFTWARE CONFIGURATION

OPERATING SYSTEM	: WINDOWS 8 OR HIGHER
LANGUAGES	: Java
DATA SERVER	: sqllite
Payment Getway	: Rozorpay
Google Maps API	: Places API, Direction API, Maps SDK

5.1 HARDWARE CONFIGURATION

Vehicle Owner	: Android Phone
Toll Collector	: QR ode Scanner

CHAPTER VI UML DIAGRAMS

6.1 FLOWCHART

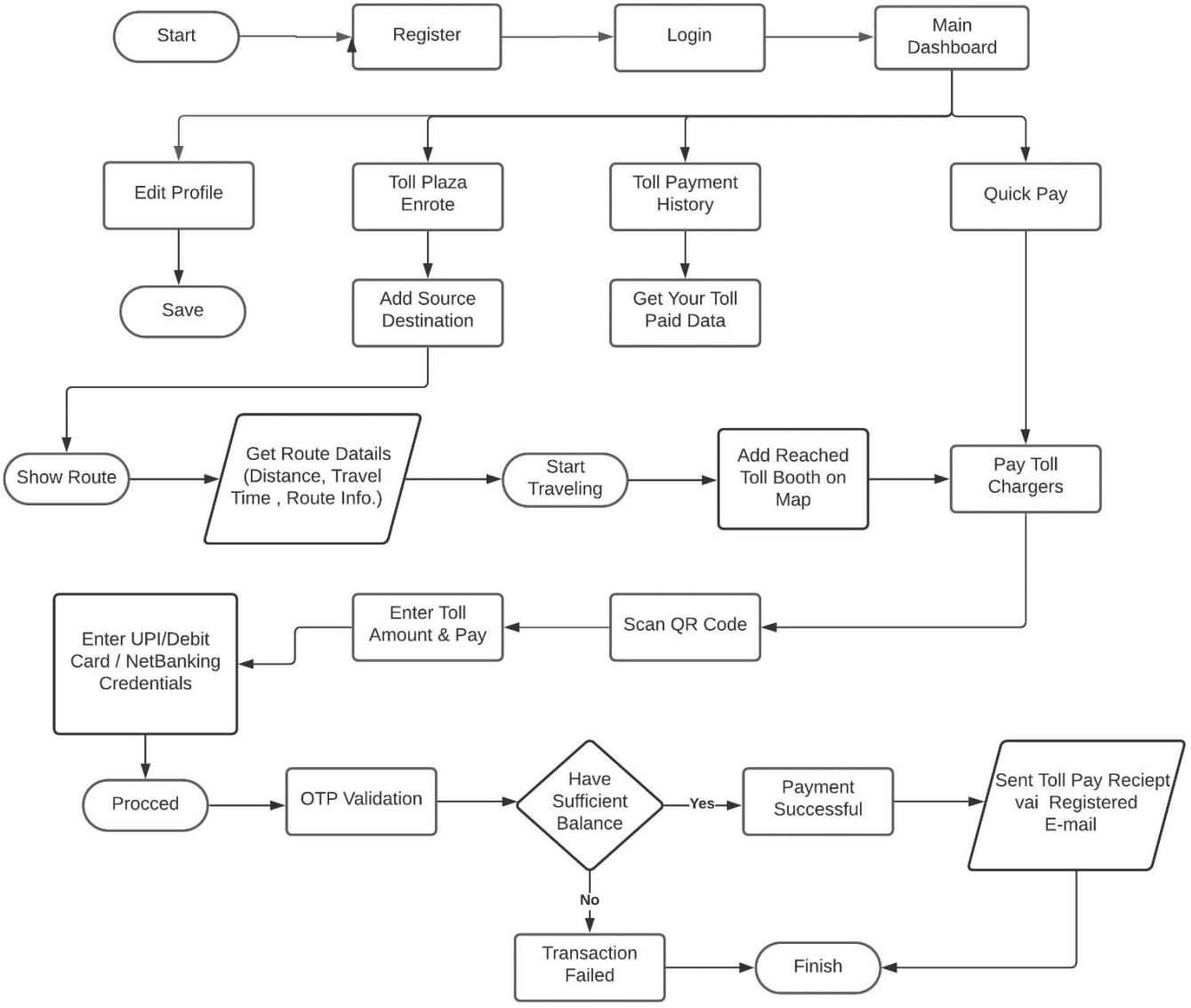


Figure 6.1 Pay Toll Flow Chart

6.3 USE CASE DIAGRAM

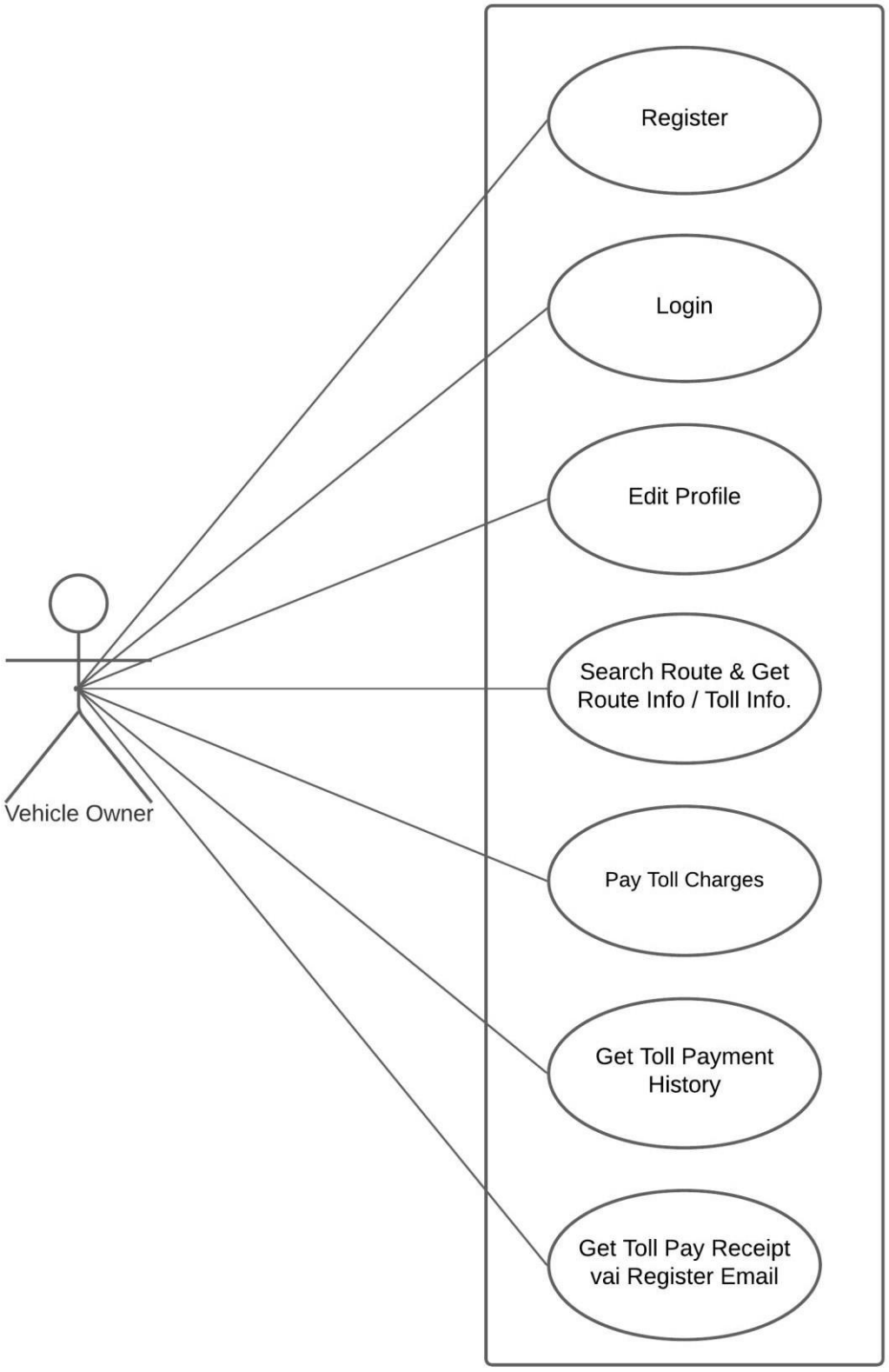


Figure 6.3.1 Pay Toll Use Case Diagram

6.4 Data Flow Diagrams

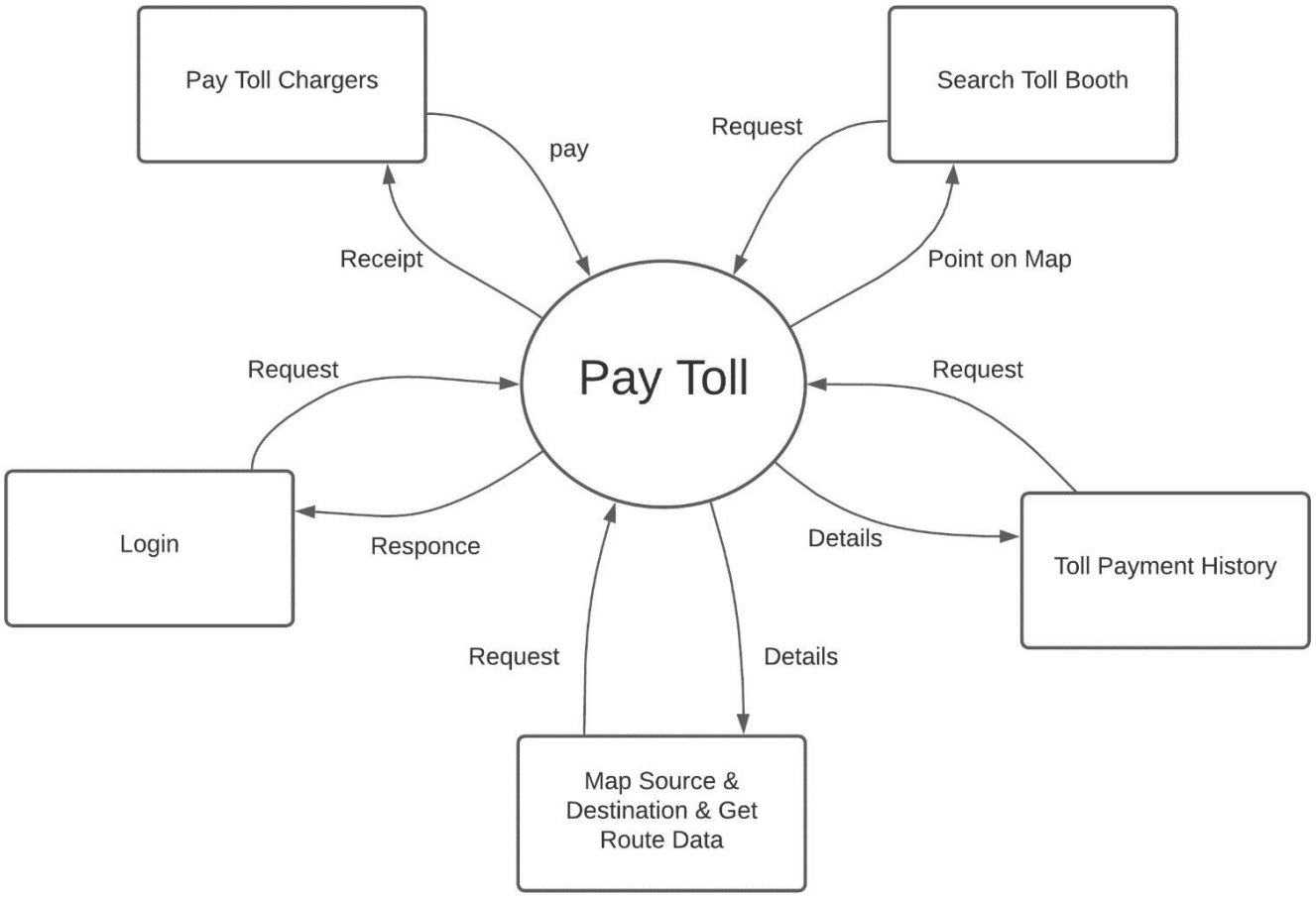
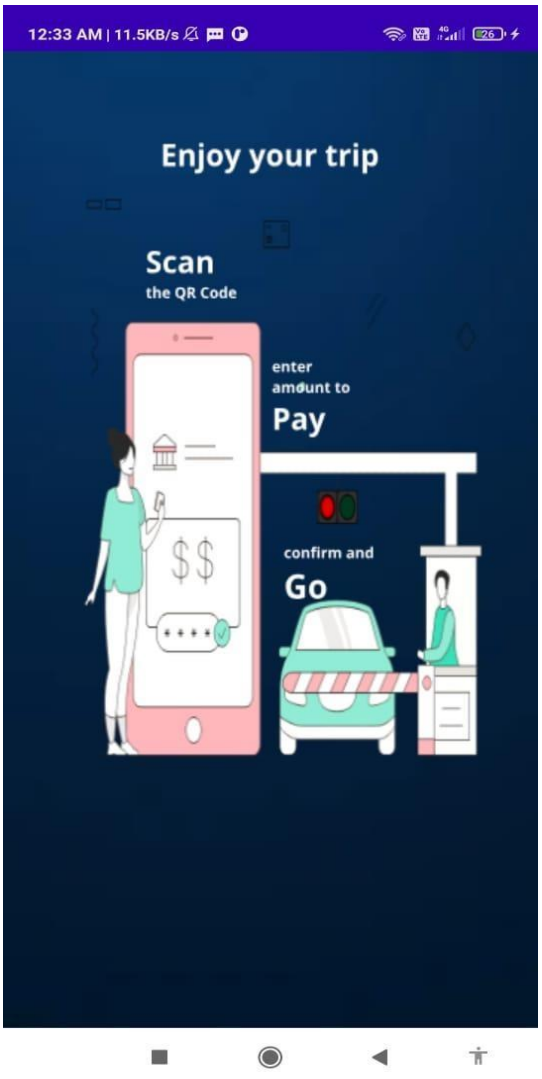


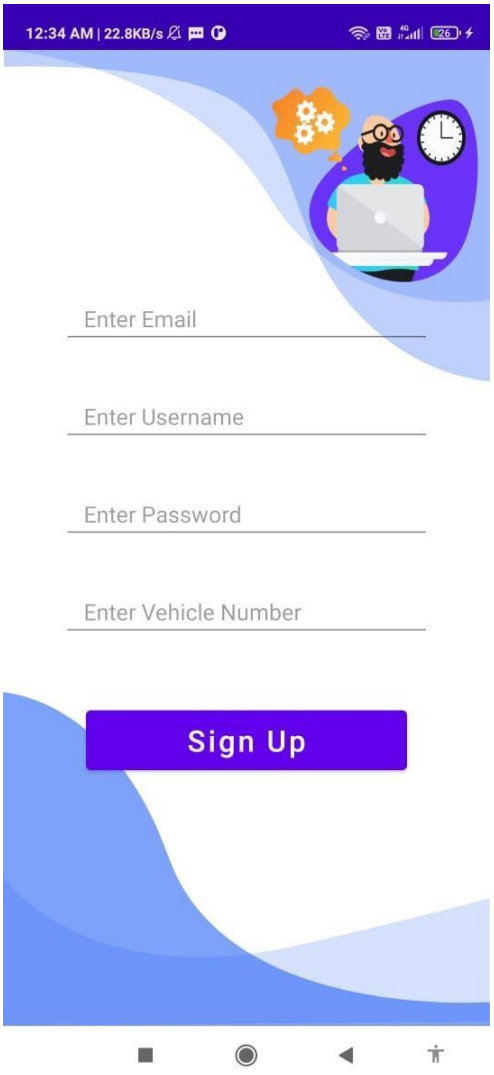
Figure 6.4.1 DFD level 0

CHAPTER VII

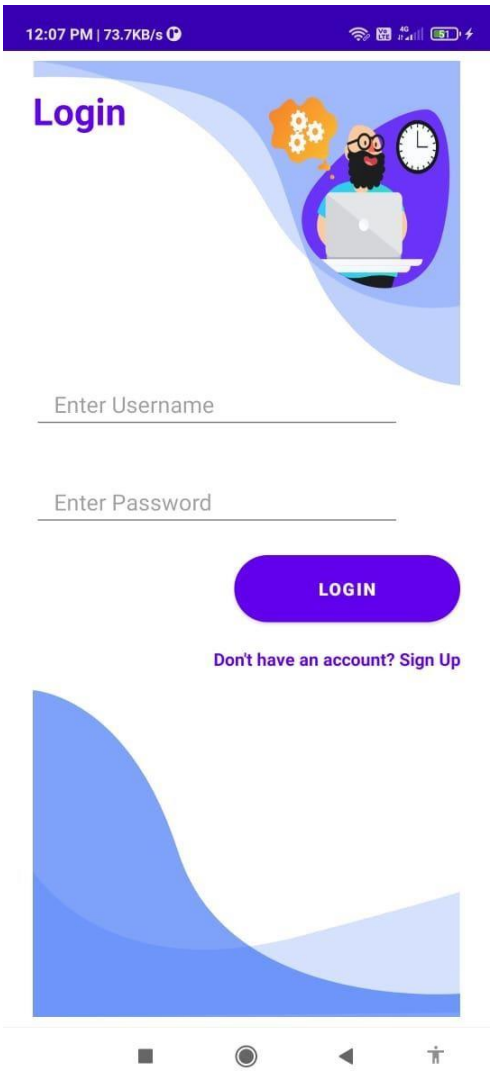
6.2 SNAPSHOTS OF STUDENTFEEDBACK SYSTEM



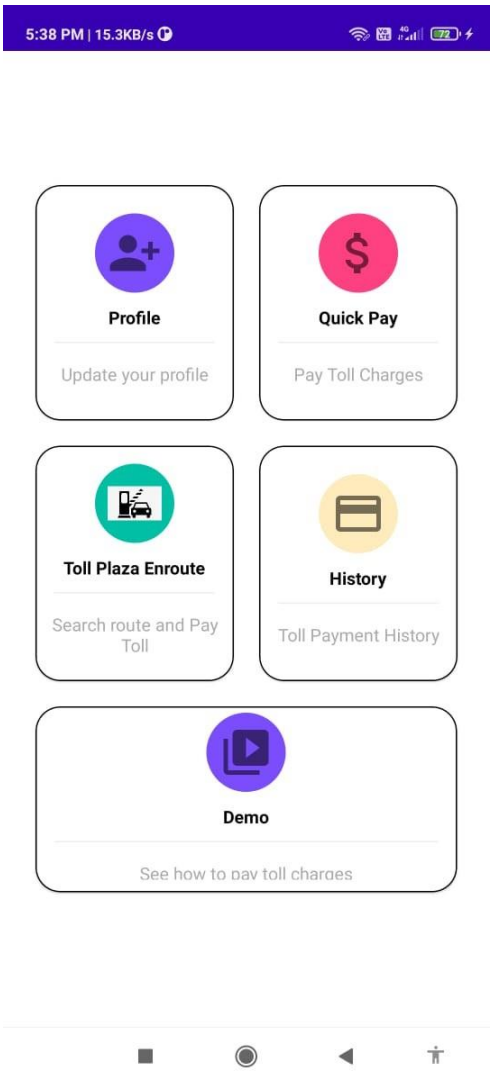
Snapshot 6.2.1 Splash Screen



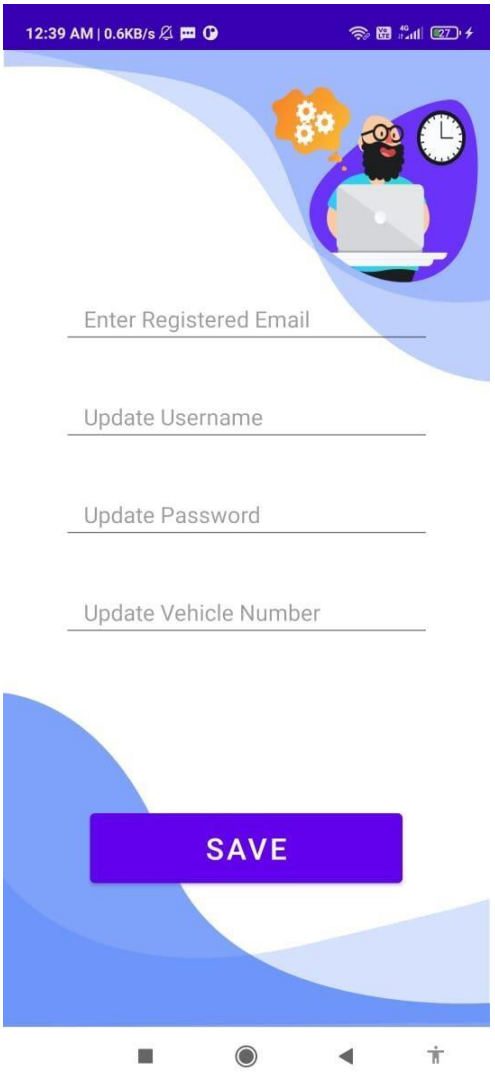
Snapshot 6.2.2 Login Page



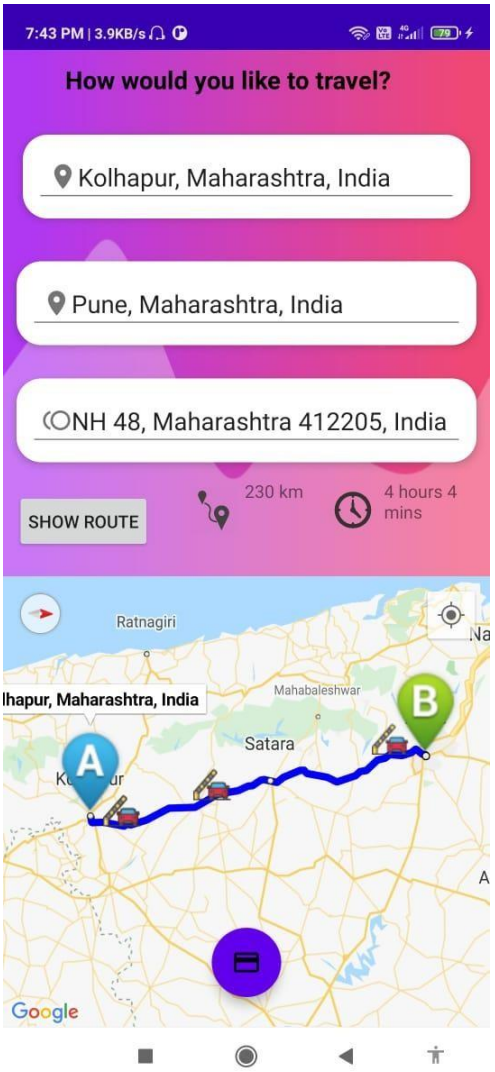
Snapshot 6.2.3 Login Screen



Snapshot 6.2.4 Dashboard

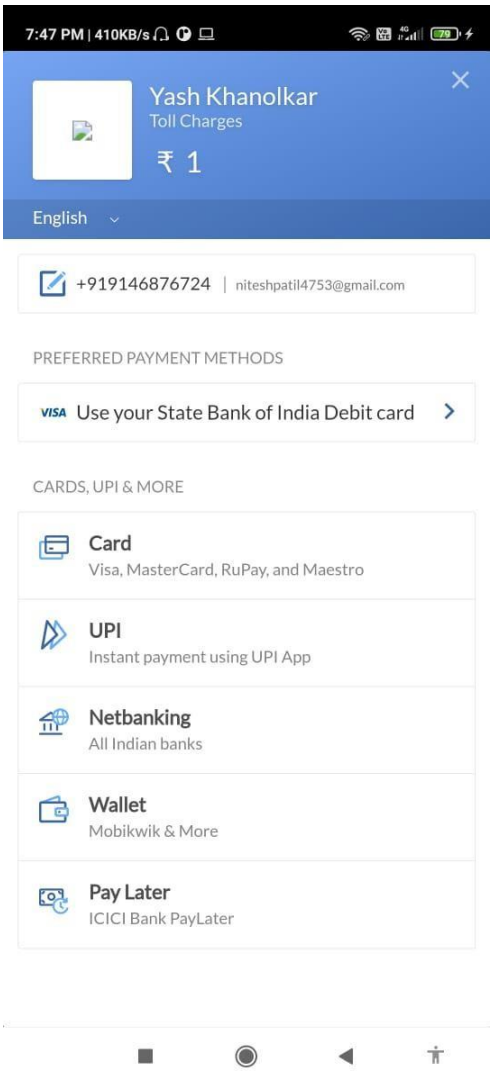


Snapshot 6.2.5 Update Profile

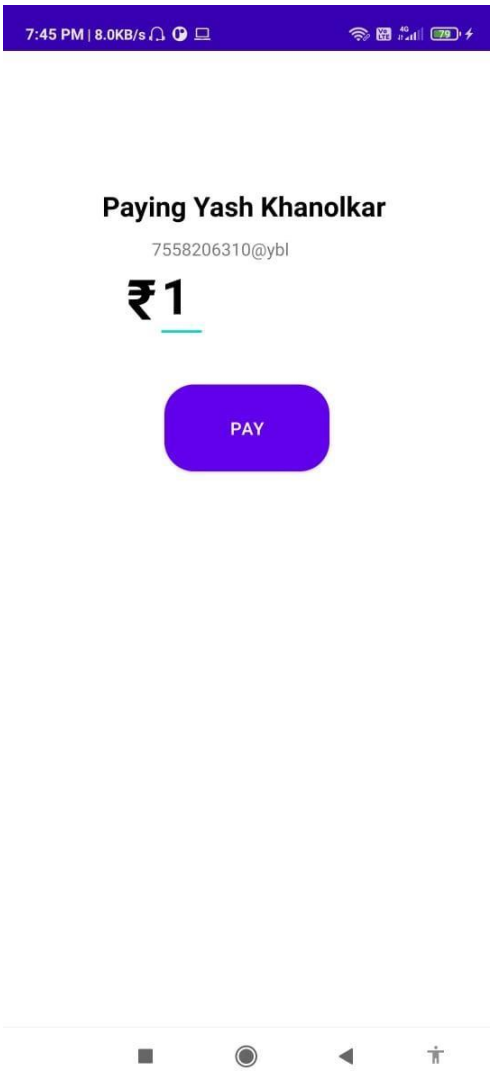


Snapshot 6.2.6 Toll Plaza enroute

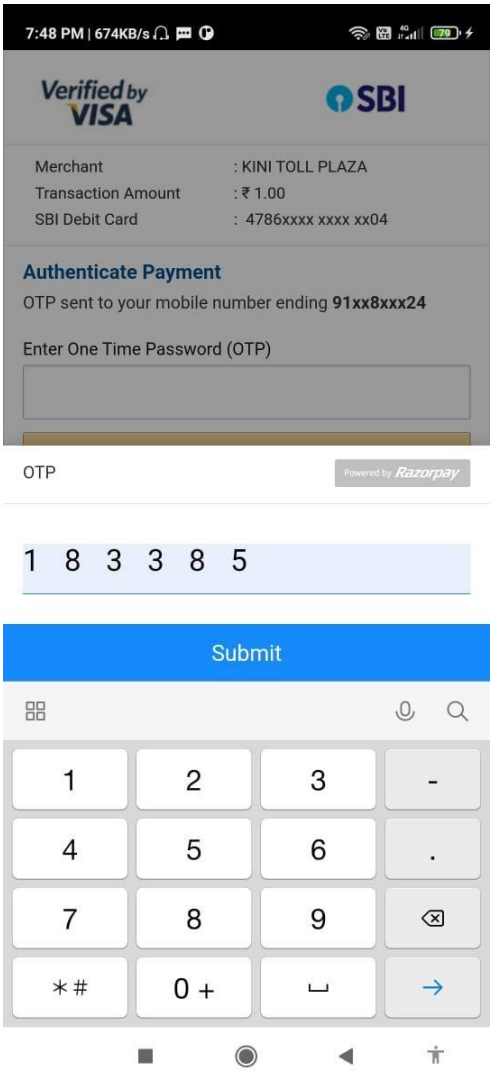
Snapshot 6.2.7 Scan QR code



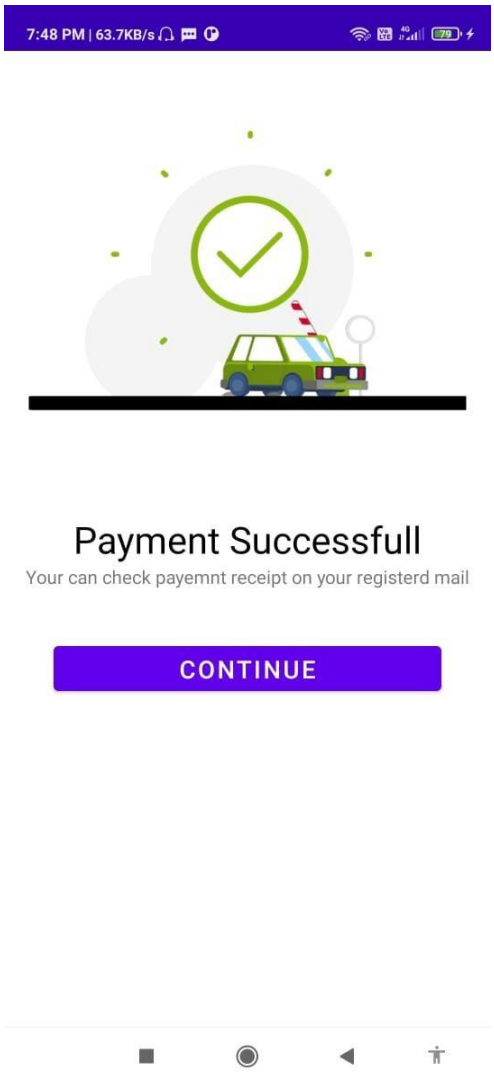
Snapshot 6.2.8 Toll Charges



Snapshot 6.2.9 Enter amount



Snapshot 6.2.10 Enter OTP



Snapshot 6.2.11 Payment

TESTING AND RESULTS OF PROJECT

7.1 TESTING METHODOLOGIES

1. Black box Testing

It is the testing process in which tester can perform testing on an application without having any internal structural knowledge of application. Usually Test Engineers are involved in the black box testing.

2. White box Testing

It is the testing process in which tester can perform testing on an application with having internal structural knowledge. Usually The Developers are involved in white box testing.

7.2 LEVELS OF TESTING

1. Unit Testing

Unit Testing concentrates on the verification of the smallest element of the program i.e. Module. In this testing all control paths are tested to identify errors within the bounds of the module. The important goal of unit testing is to isolate each part of the program and show individual parts are correct. It is very easy to perform and requires less amount of time because the modules are smaller in size. In unit testing it is possible that the outputs produced by one unit become input for another unit hence, if incorrect output produced by one unit is provided as input to the second unit then it also produces wrong output. If this process is not corrected, the entire software may produce unexpected outputs. To avoid this, all the units in the software are tested independently using unit –testing. In unit testing, the units are tested to ensure that they operate correctly. In software engineering the unit testing is not just performed once during software development, but repeated whenever the software is modified.

2. Integration Testing

When unit testing is complete, integration testing begins. In integration testing the tested units are combined together to form system as whole. The aim of this testing is to ensure that all modules are working properly according to user's requirements when they are combined. The integration test takes all tested individual modules, integrate them, test them again and develop the software. It ensures that all modules work together properly and transfer accurate data across their interfaces.

Integration testing contains:-

1. **Non–Incremental integration** : The entire program is tested as a whole and all errors are identified.

2. **Incremental integration** : The program is constructed and tested in small segments, to find out errors.

3. System Testing

System testing is the next level in the testing and tests the system as a whole. Once, all the components are integrated, the application as a whole is tested to see that it meets Quality Standards. This type of testing is performed by a specialized testing team. System testing can be defined as ”a testing conducted on a complete, integrated system to ensure that the system is according to its specified requirement”.

Example for GUI Test cases

Table 7.2.1 GUI Test Case

T.C. No	Description	Expected value	Actual value	Result
1	Checking all the GUI elements for size, position, width, length, and acceptance of characters or numbers. For instance, you must be able to provide inputs to the input fields.	The GUI must contain all the components properly arranged.	Arranged properly.	Pass
2	Checking Toast Messages are displayed correctly.	The Toast message should Displayed Correctly.	The Toast Messages Displayed correct.	Pass
3	Checking that the images are properly aligned.	The images are properly aligned.	The images are properly align.	Pass
4	Check that the images have good clarity	The Images have good Clarity.	Good clarity.	Pass
05	Check the Color of the font and warning messages is aesthetically pleasing.	The Color of the font and warning messages is aesthetically pleasing.	Color of the font & warning messages are displayed correctly	Pass

Positive Test Cases

- The positive flow of the functionality must be considered
- Valid inputs must be used for testing
- Must have the positive perception to verify whether the requirements are justified.

Table 7.2.2 Test case for k system

Sr.No.	Test Case	Excepted Result	Actual Result
1	Sign up	Sign up accepted if Email, Username, Password and Vehicle Number is authenticated	Sign up accepted
2	Login	Login accepted if email and pass-word is authenticated	Login accepted
3	Edit Profile	Edit profile accepted if registered email, Username, Password and Vehicle Number filling done	New profile accepted
4	Toll Pay Transection	Toll Pay Transection complete if user have sufficient balance	Transection accepted
5	Toll payment history	User will get all the transection records (completed, failed, refunded)	Transection record generated

CHAPTER VIII CONCLUSION AND FUTURE ENHANCEMENT

8.1. CONCLUSION

In this system we have proposed Fastag QR Code Scanner. Toll collection stations allow the traffic to flow continuously and vehicle having been avoided stopping and starting again. This in combination with reduced fuel consumption has positive effect on environment i.e. pollution created will be minimum. Implementing the messaging technology is also not so costly. Man power and cash risks are also reduced to minimum. The system also increasessafety and long traffic lanes are avoided. Society and business community also gain from the system as it results in faster transportation. The system is cost-effective, time saving, it also shows the history of all payment in detail and easy to install which benefits the operator as well as user. The system has successfully overcome the shortcomings of the existing system by reducing the man power at the toll booth. It provides easy way of toll collection and maintenance of the data.

8.2. FUTURE ENHANCEMENT

- Vehicle owner will get navigation view on map from source to destination
- Vehicle owner will get notification before reached to toll booth to pay toll charges online

APPENDICES

Sr. No.	Title of paper	Name of Author	Journal Name	Status
1.	Title	stud1 stud2 stud3 stud4	ManTech Publication	Published
2.	paper name	stud1 stud2 stud3 stud4	International Research Journal of Engineering and Technol-ogy (IRJET)	Published

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