INTELLIGENT COMPLEMENTARY RIDE-SHARING SYSTEM
(Document Validation and Profile Rating Maintenance)

Project ID: CDAP 19-055

Software Requirements Specification

**B.Sc. Special (Honors) Degree in Information Technology
Specializing in Software Engineering**

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Declaration

I hereby declare that this is my own work and this document does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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1. Introduction

1.1 Purpose

This document presents a detailed description about how the important documents of users (National Identity Card and Driving License) gets validated and how the profiles of the users maintain their ratings in the proposed system "Intelligent Complementary Ride-Sharing System". SRS mainly focuses on understanding the software aspects of the system; this document highlights the scope of the system and this can be used as a proper reference to understand the system components by both stakeholders and the software development team.

1.2 Scope

"Document validation and Profile rating maintenance" is one of the main components in the proposed system. This consists of two sub components as,

- Validation of user documents at the stage of user registration

    The necessity of document validation is to minimize to fake registrations to the system.

    Here we mainly focus on two documents,

    - o National Identity Card of the user.
    - o License card of the user.

- Rating of the user done at the end of each trip

    The purpose of rating maintenance is to make the system more reliable to the users.

    At the end of each trip, driver will get the chance to rate or review on the passengers, and vice versa

Our product is fully software-based application, which is more specifically a mobile application and will be used as a platform for ride sharing by different professionals on daily basis.

1.3 Definitions and Abbreviations

NIC	National Identity Card
SRS	Software Requirements Specification
ICRSS	Intelligent Complementary Ride Sharing System
DVPRM	Document Validation and Profile Rating Maintenance
API	Application Programming Interface

1.4 Overview

The expectation of this document is to provide a complete description about the software aspect of the research component "Document validation and Profile rating maintenance" of ICRSS. All the functional and non-functional details will be described in detail throughout this document.

A full description of the component is given in the first section, next an overall description is explained with several user interfaces, use cases and a descriptive comparison between features of the existing and proposed system. Finally, the reliability, maintainability and security of the system are discussed.

2. Overall Descriptions

The main objective of ICRSS is to reduce the traffic congestion in urban areas by providing a mobile application platform for the users as an effective medium of ride sharing. When it comes to the convenience, security and reliability of the software application, "Document validation and Profile Rating maintenance" plays a vital role.

The whole overview of the component "Document validation and Profile Rating maintenance" is discussed descriptively within this section. Main goals, the way of achieving those and the effect of them to the stakeholders are described under this section. All the required interfaces, the connectivity between modules, communication among components and the system implementation are also explained.

2.1 Product Perspective

During the phase of preliminary market research, it was identified that there are similar systems within the country, yet most of them were not able to address the need of the user through those system. With the survey we have done during this phase, we have identified that the key factor many people agree with ride sharing is to "reduce the traffic congestion". With that identification, we proceeded in developing a system which would lead to a proper user satisfaction from a ride sharing platform. There are several novel features we have introduced to our system. Among them, the features related to document validation and profile rating maintenance are discussed below as a comparison between proposed and existing solutions.

Conclusion of this analysis presents an idea how we have addressed the user requirements using the system.

Features	UDIO	Carpooling.lk	RideShare.lk	Proposed Solution
Validating the user by NIC and license by processing the images of them *This feature will reduce the fake registrations, and this will eliminate manual validations in the system*	✗	✗	✗	✔
Analyze the reviews given by users based on their severity and categorizing them *The system allows users to write their own reviews at the end of trip, those sentiments gets analyzed using machine learning algorithm and a proper rating will be given to that sentiment*	✗	✗	✗	✔
Allowing the passengers to rate the driver, vehicle and co-passengers separately at the end of trip. *Our solution maintains separate ratings for user's behavior and vehicle. At the end of the journey, users can rate the driver, vehicle and the co-passengers separately*	✗	✗	✗	✔

Table 2.1.1 - Feature Comparison Table

2.1.1 System Interfaces

ICRSS is a mobile application and is designed to run on Android platforms. The implementation is done using android studio. This application will retrieve information from the web server as we have decided to have a cloud database. There are several system interfaces used in the implementation of the module. Main purpose is to retrieve and manipulate the data that are circulated in our system.

2.1.2 User Interfaces

The main user interfaces for document validation are shown below.
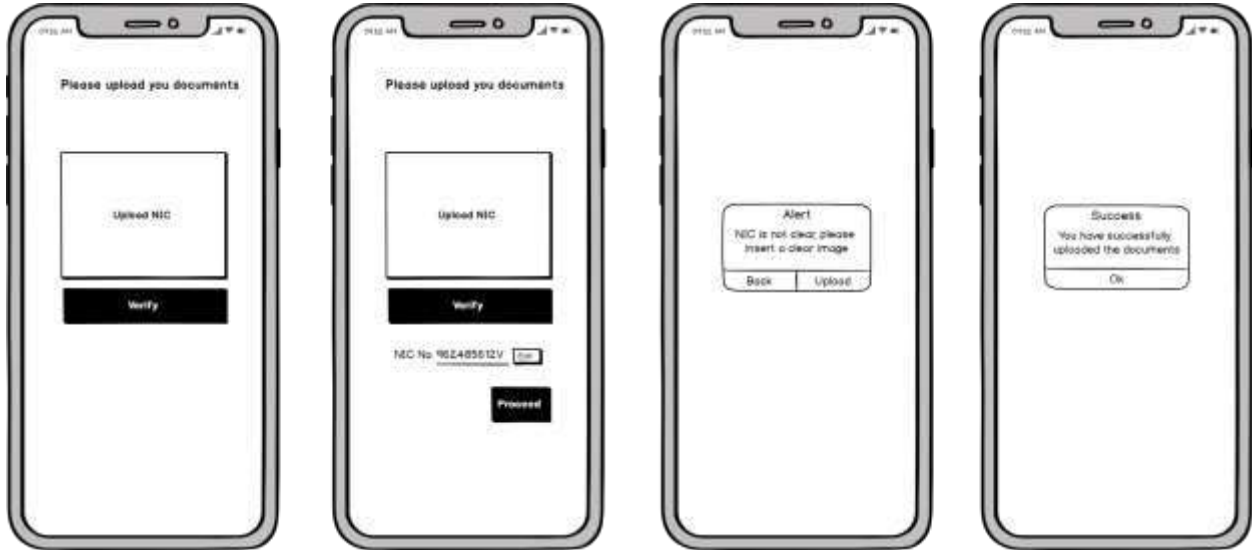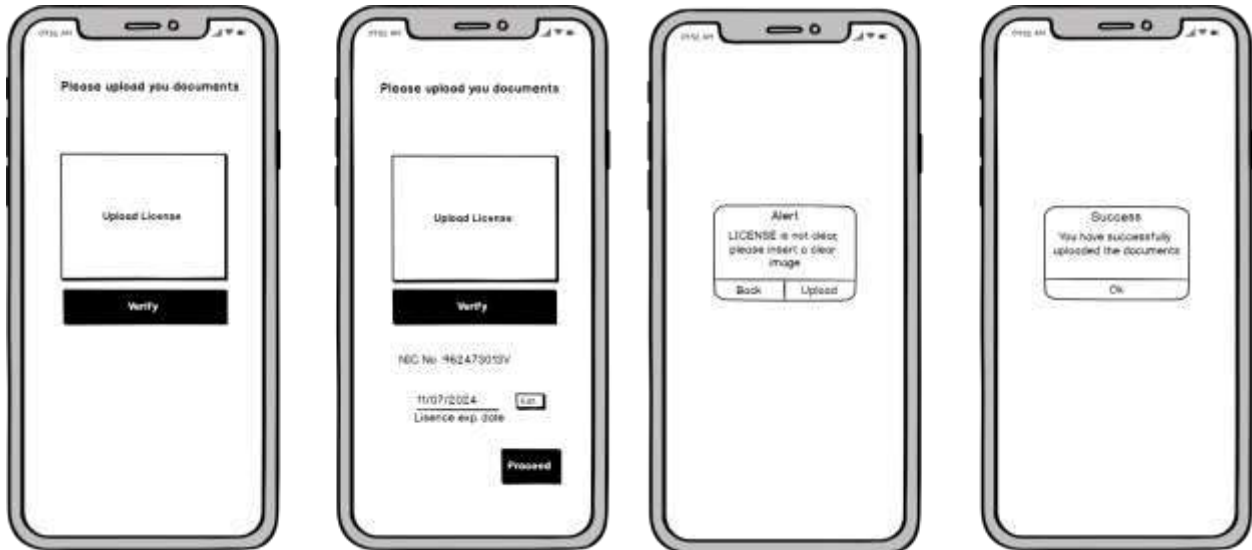

Image 2.1.1 NIC upload

Image 2.1.2 License upload

Following are the mobile interfaces designed for rating maintenance

    a.   Driver Interfaces

Image 2.1.3 Five-star rating interface by driver
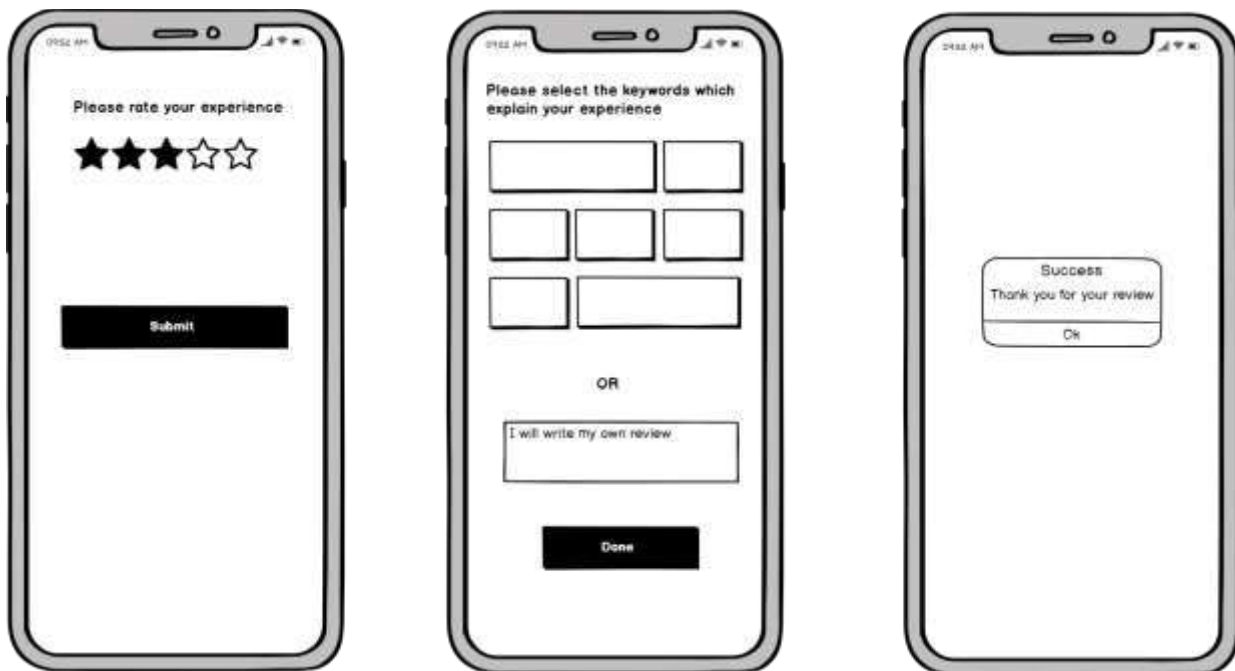
Image 2.1.4 Low rating interface by driver

b. Passenger Interfaces

Image 2.1.5 Five-star rating interface by Passenger

Image 2.1.6 Low rating interface by Passenger

2.1.3 Hardware Interfaces

As the solution is a mobile application, this will be using a little amount of hardware. The user will be needing a smartphone with internet connectivity and also will need to allow the camera to capture images using the mobile phone

2.1.4 Software Interfaces

The main software interfaces used in DVPRM component are,

Android Studio - For development of mobile application

Genymotion Emulator - Emulating purposes

MySQL - As the database in the server

Python - To implement the backend algorithms

Express js - For development of web api

2.1.5 Communication Interfaces

Internet connection provided by modem will be used for the communication between mobile application and the web server.

2.1.6 Memory Constraints

The android mobile application is required,

- Android version should be 6.0 or higher
- 2 GB RAM(Minimum) and 4GB RAM is Recommended
- 100 MB Memory space

2.1.7 Operations

The user operations can be categorized by the main four components in the system. All the operations that are specific to the "Document Validation and Profile Rating maintenance" are listed below.

1. User should upload an image of valid NIC
2. User should upload an image of valid driving license for the validation
3. Driver should rate / review the passengers at the end of the journey
4. Passengers should rate / review the Driver, Vehicle and Co-Passengers at the end of journey.
5. If a user blocks another user, it will be stored in the database.

2.1.8 Site Adaptation Requirements

English will be used as the language in the application interfaces.

For the use of this application, mobile should have enabled the access to the internet, and must have access to the camera.

As the application is for ride sharing among professionals, all the users should have a valid NIC and driving license.

As the initial implementation is done in android, the product will be compatible only with the android users.
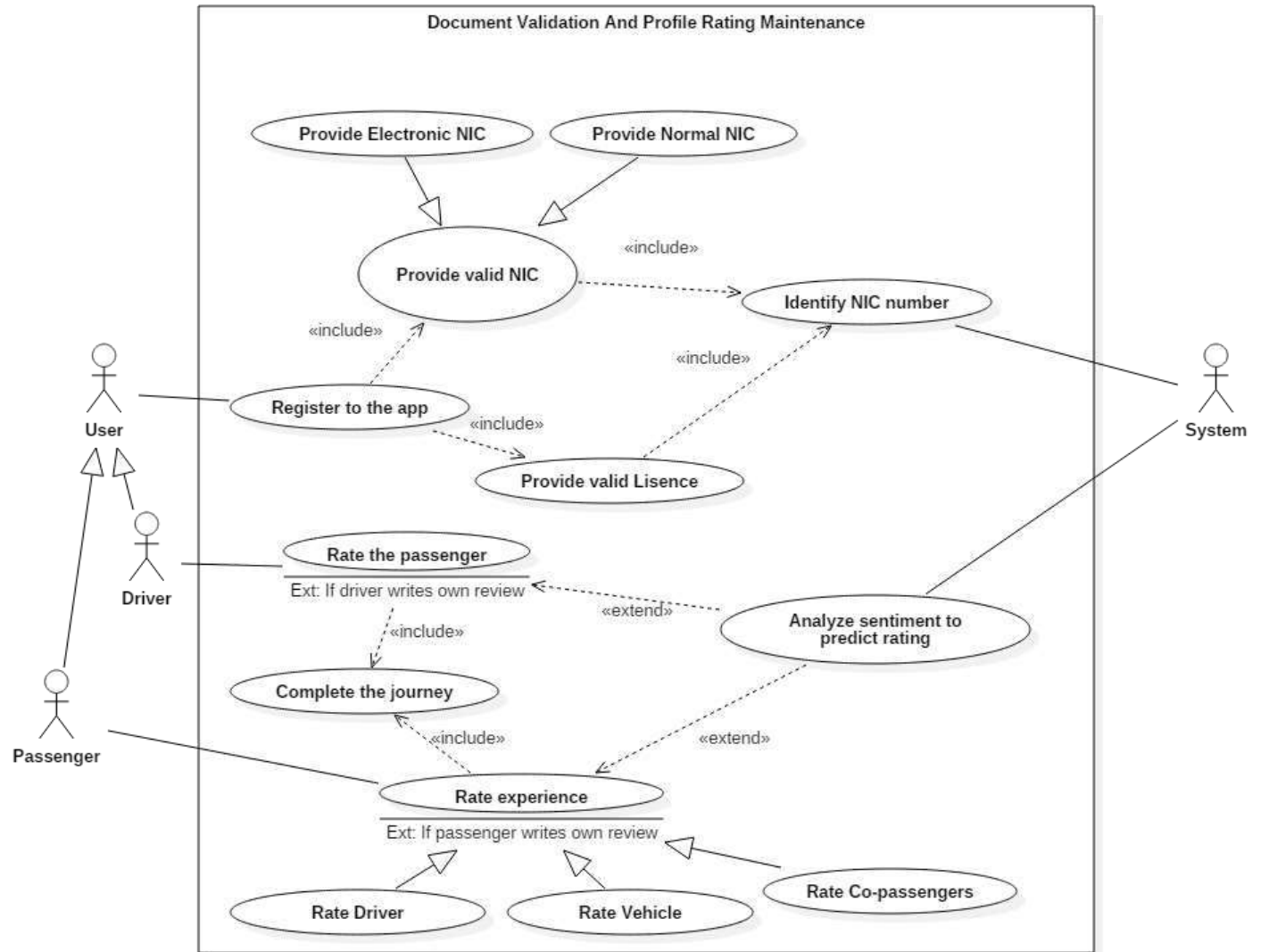
2.2 Product Functions

Image 2.2 Use Case Diagram

Use Case ID	DVPRM001
Use Case Name	Register to the app
Actors	User
Preconditions	There is internet connection to the mobile
Post conditions	User should be directed to a page to insert another user information
Main Success Scenario	1. The use case starts when the user selects sign up in the app 2. Direct an activity to insert image of NIC card 3. Show the extracted NIC number from NIC card in a text box 4. User clicks "next" 5. Direct an activity to insert image of License card 6. Use case ends when the license gets validated and new activity starts
Extensions	2a. If the image does not recognize a human face in it, will ask the user to insert another image 2b. If NIC number is not recognized, will ask user to add clear image 3a. If the user edits the identified NIC number in textbox, user input will be saved in temporary database. 5a. If the image does not contain human face, will ask user to upload another image. 5b. If NIC number is not identified by the image of License, will ask the user to upload new image 5c. If NIC number extracted does not match more than 75% to the NIC number in temporary storage, will ask the user to upload new image

Table 2.2.1 - Use Case 01

Use Case ID	DVPRM002
Use Case Name	Rate the passenger
Actors	Driver
Preconditions	1. Driver has already completed trip 2. There is internet connection
Main Success Scenario	1. Use case starts when a passenger gets down after completing his /her trip 2. Direct an activity for driver to rate the experience 3. Driver adds the ratings 4. The use case is closed when the activity is over
Extensions	3a. If driver skips rating, activity is closed 3b. If driver gives rating below 5, he will be given a set of keywords to clarify the dissatisfaction, and if keywords are not sufficient, will be asked to write their own review on experience.

Table 2.2.2 - Use Case 02

Use Case ID	DVPRM003
Use Case Name	Rate overall experience
Actors	Passenger
Preconditions	Passenger has completed the trip and got down There is internet connection
Main Success Scenario	1. Use case starts when passenger finish the trip 2. Passenger rates the overall experience 3. Passenger rates experience less than 5

	4. System asks which made the rating low as "Driver"," Vehicle"," Co-passengers"
	5. System provides set of keywords to be selected regarding experience based on above selection.
	6. Use case ends when the rating activity finishes
Extensions	2a. If passenger skips rating experience, all "driver", "vehicle" and "co-passengers" get default rating.
	3a. If passenger rates experience as 5, he can write a complement to the driver
	4a. If the selection is "Co-passengers", list of passengers of the session will be displayed to be selected
	5a. If passenger wants to write a review, a text box will be appeared instead of the keywords

Table 2.2.3 - Use Case 03

2.3 User Characteristics

As this is a product which is developed in order to reduce traffic occurred due to office staff, the focus group is office staff. They can either drive the vehicle or go on the vehicle as a passenger. Any other person with a smart phone too can use this system, but they too will have to have a valid NIC, license. Yet they too will have to provide their profession and other details as the system does its clustering by analyzing all them.

2.4 Constraints

- A smart phone is required with enough battery life, and internet connectivity.
- Smart phone should have a camera to capture quality images as low quality / blurred images may not result in expected outcome after image processing. (8MP + preferred)
- Images uploaded by the user should be cropped accordingly to remove unnecessary backgrounds
- The mobile phone should be android mobile phone (API 23 + preferred)

2.5 Assumptions and Dependencies

- The smart phone is switch on throughout the journey as well as have the enough power of battery.
- Internet connectivity is always enabled in the smartphone within the journey.
- The user has a valid NIC and license.
- The users do not insert false reviews after the journey.
- The users will not insert vague ratings on others.

2.6 Apportioning of Requirements

The main requirement of DVPRM component in this system is to ensure the convenience and security of the ride sharing platform. First, to use this system users have to be valid citizens of the country. This will be ensured by identifying the images of NIC and license of the users with an image processing algorithm. Another focus of this component is to ensure the usability and enhance the experience of the system. For that, the system has decided on asking the users to rate their experience at the end of the journey. They will also get the chance to write their own reviews regarding their experience and the system will analyses the sentiment using a machine learning algorithm to give a proper rating accordingly.

3. Specific requirements

3.1 External interfaces

3.1.1 User Interfaces

Name of Item	Description of Purpose	Source of input or destination of output	Valid range accuracy and tolerance	Timing	Relationship to other input and output
Upload NIC button	Opens an activity to capture the image of NIC	Camera	N/A	N/A	Redirect to the previous page
Verify button	Uploads the image to the server and retrieve the NIC number in the image	Touch screen	N/A	N/A	Show a dialog box with a proper message

Table 3.1.1 - Upload NIC

Name of Item	Description of Purpose	Source of input or destination of output	Valid range accuracy and tolerance	Timing	Relationship to other input and output
Upload License button	Opens an activity to capture image of License	Camera	N/A	N/A	Redirect to the previous page
Verify button	Uploads the image to the server and retrieve the NIC number and license expiration date in the license image	Touch screen	N/A	N/A	Show a dialog box with proper message

Table 3.1.2 - Upload License

Name of Item	Description of Purpose	Source of input or destination of output	Valid range accuracy and tolerance	Timing	Relationship to other input and output
Star rating	The stars selected by the user will be used in calculating the rating	Touch screen	N/A	N/A	Redirect to the next page
Submit button	Uploads rating to the web server	Touch screen	N/A	N/A	Show a dialog box with a proper message

Table 3.1.3 - Five-star rating interface by the driver /passenger

Name of Item	Description of Purpose	Source of input or destination of output	Valid range accuracy and tolerance	Timing	Relationship to other input and output
Star rating	The stars selected by the user will be used in calculating the rating	Touch screen	N/A	N/A	Redirect to the next page
Keywords	Keywords selected by user will be updated in the database	Touch screen	N/A	N/A	Show a dialog box with a proper message
Review textbox	Sentiment given by the user will be updated and processed in the server	Keypad	N/A	N/A	Show a dialog box with a proper message

Table 3.1.4 - Low rating interface by the driver

Name of Item	Description of Purpose	Source of input or destination of output	Valid range accuracy and tolerance	Timing	Relationship to other input and output
Star rating	The stars selected by the user will be used in calculating the rating	Touch screen	N/A	N/A	Redirect to the next page
Vehicle / Driver/ Fellow Passenger button	The user can select those buttons to specify which made them dissatisfied	Touch screen	N/A	N/A	Redirect to the next page
Keywords	Keywords selected by user will be updated in the database	Touch screen	N/A	N/A	Redirect to the next page
Review textbox	Sentiment given by the user will be updated and processed in the server	Keypad	N/A	N/A	Redirect to the next page
Submit button	Submit the review	Touch screen	N/A	N/A	Show a dialog box with a proper message

Table 3.1.5 - Low rating interface by the passenger

3.1.2 Hardware Interfaces

1. Computer or laptop
   a. CPU: 1.6GHz Dual Core or higher
   b. Storage: 500GB or higher
   c. RAM: 4GB or higher
   d. OS: Windows/Linux/Mac OS
2. Server
   a. CPU: 2.6GHz Intel Core i7 (6th Gen or Higher)
   b. RAM: 16GB DDR3 or higher
   c. Storage: 1TB HDD
   d. OS: Linux (Preferably Ubuntu 16.04)

3.1.3 Software Interfaces

Web API's are developed to connect with the web server, python scripts and functions like image uploading.

OpenCV (version 3.4.4 or higher) and Tesseract (version 3.05.02 or higher) are used in image processing and text identification respectively.

3.1.4. Communication Interfaces

Internet should be enabled in the mobile application for communication and for the proceedings. It is preferred at least 3G connection for the best communication in the application.
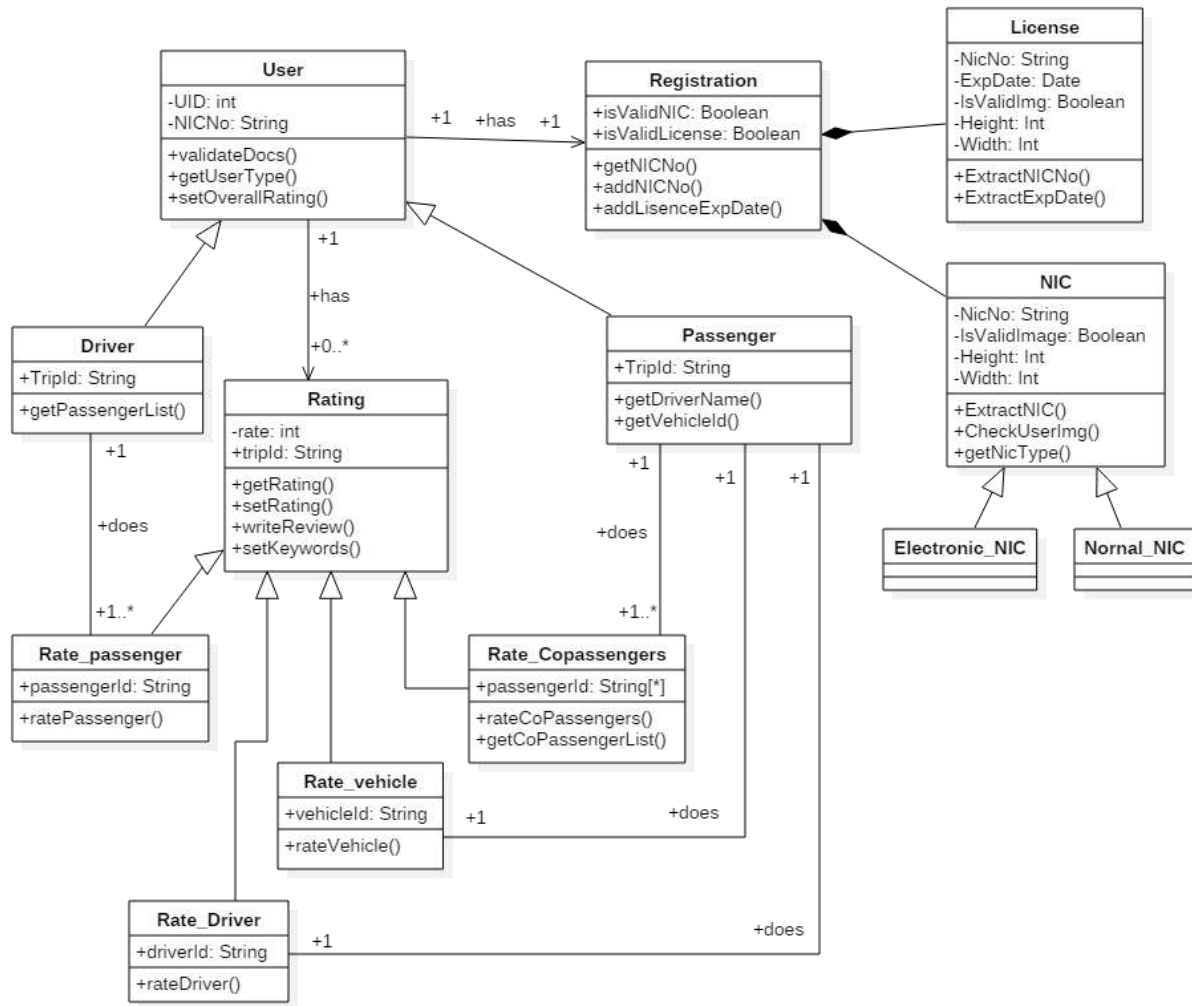
3.2 Classes/Objects

Image 3.2 Class diagram of DVPRM

3.3 Performance requirements

The performance of the proposed system will mainly depend on the stability of the internet connection. Mobile phone battery life, mobile RAM, quality of the images captured will affect the performance of the system.

3.4 Design constraints

After conducting an initial survey on more than 150 office staff in Sri Lanka, we identified that ride sharing is a better solution to the traffic occurred due to office working hours. As the application is focusing on the busy people, the interfaces must be very simple and easy to use. Initial focus is on android users as they are the majority. Performance, reliability and security must be achieved in the application.

3.5 Software system attributes

3.5.1 Reliability

Our system provides a reliable final output as a product. When we consider the component DVPRM, validation of NIC and License ensures reliability to the entire system. Tesseract library which is identified to be used in text extraction in the sub component "document validation" has proven nearly 100% accuracy when it comes to different images and is considered best highly portable open source OCR engine currently available [1,2]. Classification algorithm supposed to be used in the profile rating is identified as an algorithm which outperforms others [3]. So, this component will affect the reliability of whole system.

3.5.2 Availability

The system will be available to the user at 99.9% of the time, without the consideration of a network failure. In scenarios like users going offline during the trip, it won't affect overall functionalities as the system will be using the cloud for data storage.

3.5.3 Security

The users are expected to log in to the system using correct login credentials. The system shall not allow access if the user fails to provide correct login information. The users are identified with the NIC number to eliminate fake registrations. Images of the documents submitted at the registration will validate the users. The sensitive data collected from the users will be stored in the database in encrypted format.

3.5.4 Maintainability

The code will be written in such a way that it favors further implementations. Proper documentation will be maintained, with a properly commented code base. Main components will be developed as separate web services so that they can be easily modified and maintained even after the release of the software. As the logic is hosted in the backend server, the changes in the algorithms will not be noticed or affected to the users of the system.

3.6 Other requirements

- Open source technologies are preferred.
- Usage of a reliable web server
- Application and database should be available 24x7
- Smartphone with enough memory, RAM, network connection and battery power

4. Supporting Information

4.1 Appendices

Throughout the SRS, we have elaborated the solution that we presented to overcome the traffic congestion due office working crowd. For that, DVPRM plays a major role in the implementation.

From 1st January 2016, each new NIC has a unique 12-digit number [6]. Due to this scenario, considered converting all extracted NIC numbers from images into a 12-digit format.

4.2 References

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