A PRELIMINARY PROJECT REPORT
ON

Automatic Traffic E-challan Generation Using Computer Vision

Submitted to the Savitribai Phule Pune University in the partial fulfillment of the requirements for the award of degree

of

BACHELOR OF COMPUTER ENGINEERING

BY

Shrayank Mistry	Roll No:B150234309
Parag Nankar	Roll No:B150234318
Gaurav Patil	Roll No:B150234334
Prathamesh Tambe	Roll No:B150234390

PROJECT GROUP NO : 50

DEPARTMENT OF COMPUTER ENGINEERING
Accredited by NACC

STES'
SINHGAD COLLEGE OF ENGINEERING

S.N. 44/1, Vadgaon Bk, Off Sinhgad Road

Pune – 411041

YEAR 2018-19

Sinhgad Institutes

SINHGAD COLLEGE OF ENGINEERING

S.N. 44/1, Vadgaon Bk, Off Sinhgad Road

Pune – 411041

CERTIFICATE

This is to certify that the preliminary project report entitled
“Automatic Traffic E-challan Generation Using Computer Vision”

Submitted by

Shrayank Mistry	Roll No:B150234309
Parag Nankar	Roll No:B150234318
Gaurav Patil	Roll No:B150234334
Prathamesh Tambe	Roll No:B150234390

is a bonafide work carried out and is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University, Pune for the award of the Degree of Bachelor of Computer Engineering

This **project** work has not been earlier submitted to any other Institute or University for the award of any degree or diploma.

Place :Pune
Date :

Prof. M.R.Dhage
Internal Guide
Department of Computer Engineering

Prof. M. P. Wankhade
Head,
Department of Computer Engineering

Dr. S.D. Lokhande
Principal
SCOE, Pune

Acknowledgement

The success and final outcome of this project will require a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the project. All that we have done is only due to such supervision and assistance and we should not forget to thank them.

We respect and thank Mrs. M.R.Dhage, for providing us an opportunity to do the project work at Sinhgad College Of Engineering, Pune and giving us all the support and guidance. We are extremely thankful to her for providing such nice support and guidance.

We are thankful and fortunate enough to get constant encouragement, support and guidance from all Teaching staff of Department of Computer Engineering which helped us in successfully completing our project work. Also, we would like to extend our sincere esteem to all staff in laboratory for their timely support.

Shrayank Mistry.

Parag Nankar.

Gaurav Patil.

Prathamesh Tambe.

Abstract

The Automatic recognition of license plate is the basis of effective management in traffic,in license plate recognition, the automatic detection and localization of license plate is an important part.License plate detection and localization contain how to extract or segment the license plate region from the license plate image a new deep learning network structure was designed, and designed network structure was used to detect and locate the license plate automatically.

Now-a-days the system that is being used involves human intervention.Image for the camera at signals is given as information to the person checking for traffic violation in traffic control room and manually checks the registration number from number plate and enters the registration number of the vehicle manually and the challan for that vehicle is generated.This requires lot of human labor.It is also time consuming and it is not possible to practically apply this on all the traffic signals.

The system proposed by us involves automatic detection of vehicles that break the traffic rules at respective signals and registration number for every vehicle is recognized. The vehicle number detected is searched in the database for type of vehicle and owner’s information. This information is used to generate e-challan in the name of the person who owes the vehicle directly and instantly and send appropriate fine message to the owner.So it will be more fast,efficient and will require less human intervention.

List of Figures

Name	**Page No.**
System Overview Diagram	6
WaterFall Diagram	13
Time Line chart	14
Use Case Diagram	16
Data Flow Diagram	17
Class Diagram	18
Sequence Diagram	19
Deployment Diagram	20
Actitvity Diagram	21

List of Tables

Name	**Page no.**
Unit Testing	23
Integration Testing	24
Acceptance Testing	25

Abbreviation

OCR	- Optical Character Recognition
E-Challan	- Electronic Challan
API	- Application Programming Interface

Organization of project report

Project planning, management and the purpose of system to provide a complete solution for automatic challan generation is described in Chapter 2. Chapter 3 describes mathematical model, methodology along with analysis and design. Chapter 4 describes various test cases which are used for testing with their results.

Chapter 1 gives the Introduction to Background and Basics, Literature Survey conducted, about project to be undertaken, Problem definition and scope of the project.

Chapter 2 gives overview of project planning and management. It states the detailed Functional, non-functional requirements and other requirements. This project also specifies the Project process model used to develop this project.

Chapter 3 gives Analysis study and Designing of the project. It consists of Mathematical model and all UML diagrams specifying how to build the required system.

Chapter 4 gives the test cases identified for various types of testing.

CONTENTS

TITLE **PAGE NO**

Certificate i
Acknowledgement ii
Abstract iii
List of Figures iv
List of Tables v
Abbreviation vi
Organization of project report vii

Chapter No. Title Page No.

1 INTRODUCTION 1

1.1. Background And Basics 1
1.2. Literature Survey 2
1.3. Project Undertaken 3
1.3.1 Problem Definition 3
1.3.2 Scope Statement 3
1.4. Organization Of the Project Report 4

2 PROJECT PLANNING AND MANAGEMENT 5

2.1. Detail System Requirement Specification 5
2.1.1 : System Overview 5
2.1.2: Functional Requirements 7
2.1.3: Non- Functional Requirements 9
2.1.4 : Deployment Environment 10
2.1.5 : External Interface Requirements 11
2.2. Project Process Modeling 13
2.3. Project Scheduling 14
2.3.1 Time Line Chart 14

3 ANALYSIS & DESIGN 15

3.1. Mathematical Model 15
3.2. Use-Case Diagram 16
3.3. Data Flow Diagram 17
3.4. Class Diagrams 18
3.5. Sequence Diagram 19
3.6. Deployment Diagram 20
3.7. Activity Diagram 21

4 TESTING 22

4.1 Introduction 22
4.2 Unit Testing 23
4.3 Integration Testing 24
4.4 Acceptance Testing 25

5 References 26

Chapter 1

INTRODUCTION

1.1 Background and Basics

Now a days,there is increase in traffic rule violation.For that the system currently used is not so efficient in detecting all the the people who are breaking the rules.For one signal analysis there is a requirement of two people.Analysis of all the traffic signals is technically not possible,in this way,as the human intervention required is a lot,which is a part of concern.

Image for the camera at signals is given as information to the person checking for traffic violation in traffic control room and manually checks the registration number from number plate and enters the registration number of the vehicle manually and the challan for that vehicle is generated.

The system proposed by us involves automatic detection of vehicles that break the traffic rules at respective signals and registration number for every vehicle is recognized. The vehicle number detected is searched in the database for type of vehicle and owner's information. This information is used to generate challan in the name of the person who owes the vehicle directly and instantly and send appropriate fine message to the owner.

1.2 Literature Survey

The work done in [1] Using Deep Learning and Applied the model of convolutional neural network(CNN), Recognized the license plate by converted object detection problem into a binary classification problem.The candidate regions are generated on the sliding window by using selective search algorithm, at last Support Vector Machine is used for classification.

In [2] This paper present an approach which is based on characters of the number plate, for that an adaptive preprocessing method was used because not every time the illumination condition is constant ,then segmentation of character were done using vertical and horizontal projection of the extracted license plate. Finally character recognition were done using K-nearest neighbor classifier based on feature vector which was extracted from the boundary analysis of the character.

In paper [3], in this paper an automatic system for LP detection and recognition based on deep learning approach, which is divided into three parts: detection, segmentation, and character recognition. To detect an LP, many pretreatment steps should be made before applying the first Convolution Neural Network (CNN) model for the classification of plates / non-plates. Subsequently, we apply a few pre-processing steps to segment the LP and finally to recognize all the characters in upper case format (A-Z) and digits (0-9), using a second CNN model with 37 classes. The performance of the suggested system is tested on two datasets which contain images under various conditions, such as poor picture quality, image perspective distortion, bright day, night and complex environment.

1.3 **Project Undertaken**

1.3.1 Problem Definition

Automatic Traffic E-challan Generation Using Computer Vision

Detection of Vehicle Number Plate & E-challan Generation on Rule Violation by Using Computer Vision.

1.3.2 Scope Statement

The purpose of are system is to automate e-challan generation when vehicles cross zebra crossing during traffic signal. The system is based on detection of the vehicles that have broken the rule, license plate detection of the vehicle breaking rule and effective e-challan generation. We will have a database server the has information of all the vehicle registered. After registration number is obtained database is searched for all owner information related to that number, after which e-challan is generated in the name of that person who will receive a text message regarding the same. Above all, we hope to provide a smooth, easy and hassle-free system for the traffic authority.

1.4 **Organization Of the Project Report**

The product is designed to update the existing system of challan generation which includes two people who manually check if rule is broken and then generate challan.

Image Pre-processing:Capture the image and cropping the image above the zebra crossing and removing noise to make it ready for license plate detection.

License Plate detection: Multiple License plate from vehicles that have broken the rule will be detected.

Feature Extraction: The alphabets and numbers on the number plate are extracted and recognized.

Database Verification: The obtained registration number is searched in the database for owner name.

E-challan Generation: An e-challan will be generated in the name of the owner.

Chapter 2

PROJECT PLANNING AND MANAGEMENT

2.1. DETAIL SOFTWARE REQUIREMENTS SPECIFICATION (SRS)

2.1.1. **System Overview**

The Product we are developing is supposed to be a project for the Government Officials. The system is a python software developed to automatically to detect rule violation at signals and generate a report regarding the very same. The system uses Computer Vision to capture image and system process the image required for registration number plate recognition.

The input to the system is the image captured by still frame camera when the signal at any junction goes red and later the image is per-processed to remove any noise if present. The processed image is use to identify all the number plates in the image and all those plates are used to recognize all registration number. The registration number is searched in database to get all user information to generate e-challan in the name of the user.

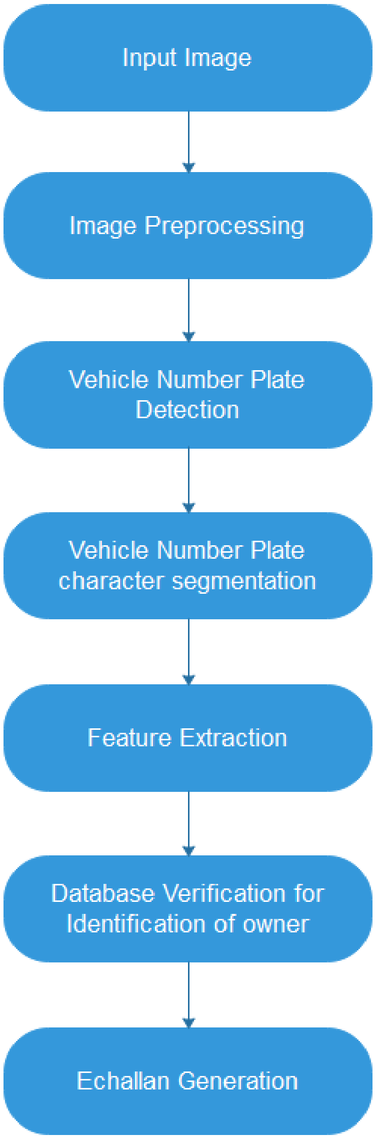

Input Image
Image Preprocessing
Vehicle Number Plate Detection
Vehicle Number Plate character segmentation
Feature Extraction
Database Verification for Identification of owner
Echallan Generation

Fig. 2.1 System Overview

2.1.2. **Functional Requirements**

The system being developed has two main features:

1) Detecting the vehicles that have violated the rule.
2) Generating e-challan for the vehicles that have broken the rule.

Detecting of rule violation

Description and Priority

When the signal is red the vehicles that have violated the rule have to be detected, this is a high priority requirement.

Stimulus/Response Sequences

1) Image is taken when signal goes red.
2) The image taken is cropped from the zebra line.
3) Noise is filtered out of the image.
4) The vehicles in existing image have broken the rule.
5) Traffic authorities receive all the registration number of vehicles that have broken the rule.

Functional Requirements

REQ-1:
A high resolution camera should be used to take the image, when signal goes red.

REQ-2:
The image taken should be filtered to remove noise, and it should be cropped to detect vehicle.

Automatic E-challan Generation

Description and Priority

Once the traffic authorities receive all the registration number, the system will automatically generate challan for all the vehicles, this is high priority.

Stimulus/Response Sequences

1) System will get all the registration number of vehicles that have violated the rule.
2) Using the government api for finding vehicle information, system will get owner information of all the registration numbers detected.
3) Once owner information is found, using way2sms api message about rule violation and fine is recorded**.**

Functional Requirements

REQ-1:

The registration number detected by system should be correctly detected by the system.

REQ-2:

The government api for owner information should be running 24/7 and respond quickly for the system to be efficient.

REQ-3:

The way2sms api should be running 24/7 and send message to respective owner .

2.1.3. **Non-Functional Requirements**

2.1.3.1. Performance Requirement

All the vehicles that have violated the rule at particular signal have to be detected instantly and without any errors in normal climatic conditions is a particular hardware requirement that has to be meant.

Camera used should take image exactly when signal goes red.

Image should be sent to system quickly and without any faults.

System should recognize number correctly.

The apis necessary should be running constantly to get vehicle information and send e-challan information.

2.1.3.2 Security Requirements

The user data obtained from apis should be stored securely and should not be misused to generate wrong challans. The rules regarding the rules of api should not be violated.

2.1.3.3. Software Quality Attributes

The system should be robust as multiple request to process rule violation may occur at the same time in a particular region.

The system must be reusable in different regions by making the system adapt to various different hardware interfaces.

The system must be reliable and run 24/7 under any circumstances

2.1.4. **Deployment Environment**

The hardware requirements of the system are:

1. Processor speed of 2 GHz or above.
2. Hard Disk space of at least 20 GB.
3. Minimum 2 GB RAM

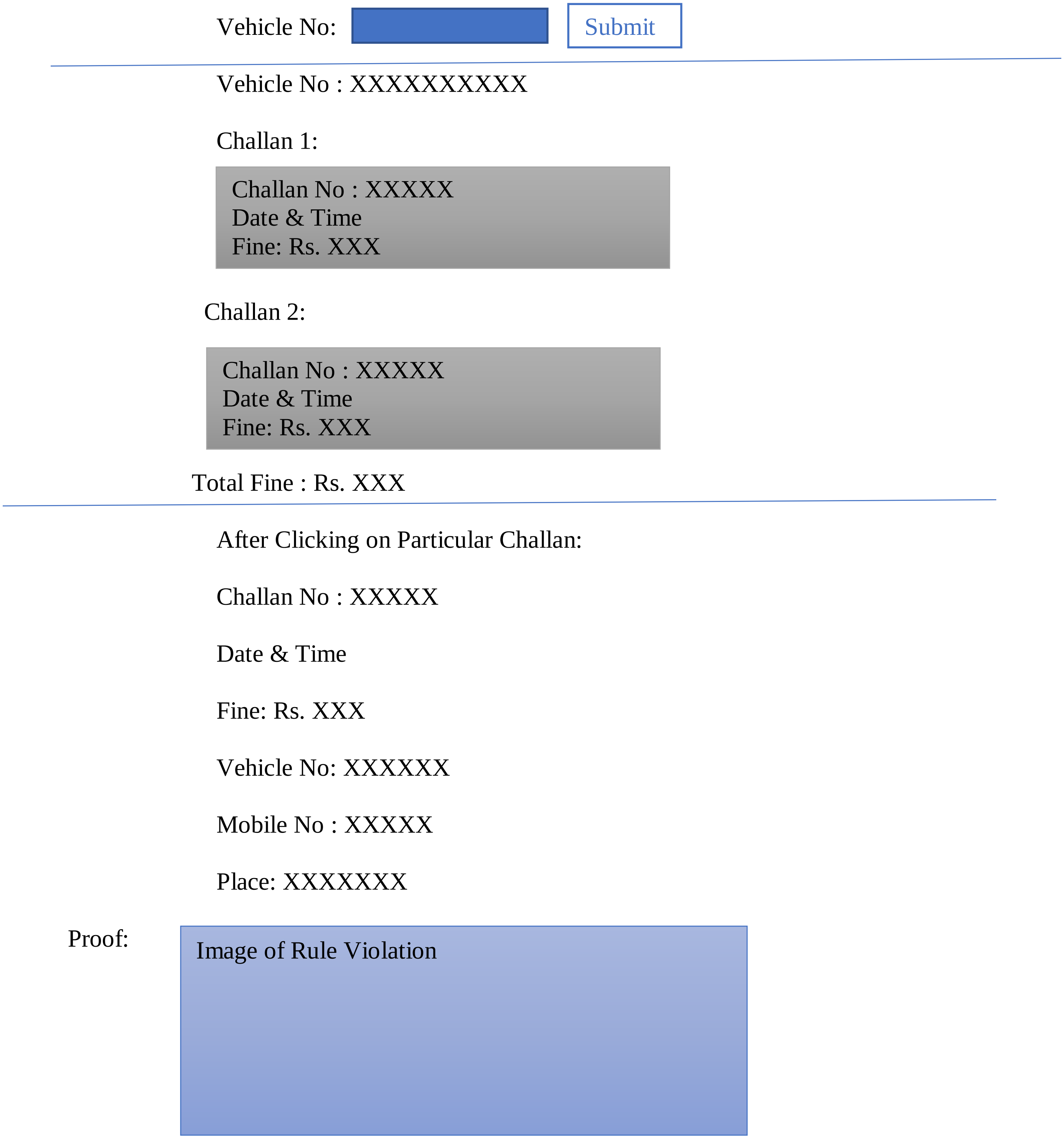
The software requirements of the system are:

1. Python version 3 and above.
2. Windows 7 OR Linux Operating System.
3. API for database verification.(parivahan.gov.in/rcldstatus)
4. API for message sending (Way2sms)

2.1.5. **External Interface Requirements**

1. User Interfaces

The traffic authority personal and administrators interact with the system through a web-portal, an administrator should also be able to log in to the web-portal where he/she can administer the system.



Vehicle No:

Vehicle No : XXXXXXXXXXX

Challan 1:

Challan No : XXXXX
Date & Time
Fine: Rs. XXX

Challan 2:

Challan No : XXXXX
Date & Time
Fine: Rs. XXX

Total Fine : Rs. XXX

After Clicking on Particular Challan:

Challan No : XXXXX

Date & Time

Fine: Rs. XXX

Vehicle No: XXXXXX

Mobile No : XXXXX

Place: XXXXXXX

Proof:

Image of Rule Violation

2. Hardware Interfaces

Traffic Camera will be used for capturing Image.

3. Software Interfaces

Software Used	Description
Operating System	We have chosen windows OS for its best support and user friendliness.
Python	To implement the project we have chosen python language for its more interactive support and its features.
Api for vehicle	parivahan.gov.in/rcldstatus
Api for sms	way2sms

4. Communications Interfaces

Api for vehicle details(parivahan.gov.in/rcldstatus)
This api is used to get owner information of the vehicle from its registration number

Api for sending sms(way2sms)
This api is used for sending sms to owner regarding rule violation and fine generated.

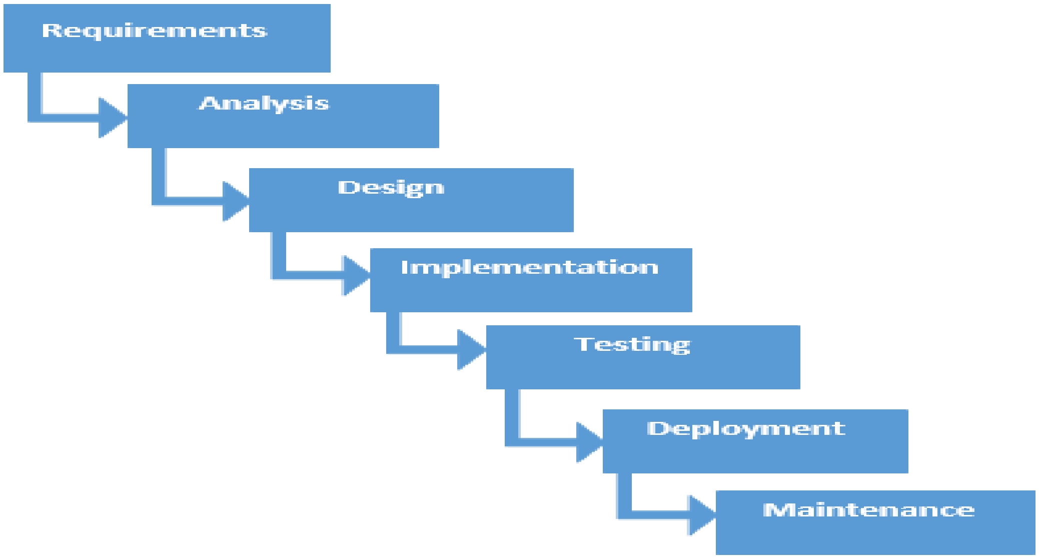
2.2. PROJECT PROCESS MODELING

The Waterfall Model is the process model which we are following for the development of are software. In this model, the whole process of *software development* is divided into separate phases. The outcome of one phase acts as the input for the next phase sequentially. This means that any phase in the development process begins only if the previous phase is complete. The waterfall model is a sequential design process in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of **Conception, Initiation, Analysis, Design, Construction, Testing, Production/Implementation and Maintenance.**

As the **Waterfall Model** illustrates the software development process in a linear sequential flow; hence it is also referred to as a **Linear-Sequential Life Cycle Model.**

Sequential Phases in Waterfall Model:

- REQUIREMENTS
- SYSTEM DESIGN
- IMPLEMENTATION
- INTEGRATION AND TESTING
- DEPLOYMENT OF SYSTEM
- MAINTENANCE



2.3. PROJECT SCHEDULING

2.3.1 Time Line Chart

Project Scheduling communicates what activities need to perform and in what time frame.

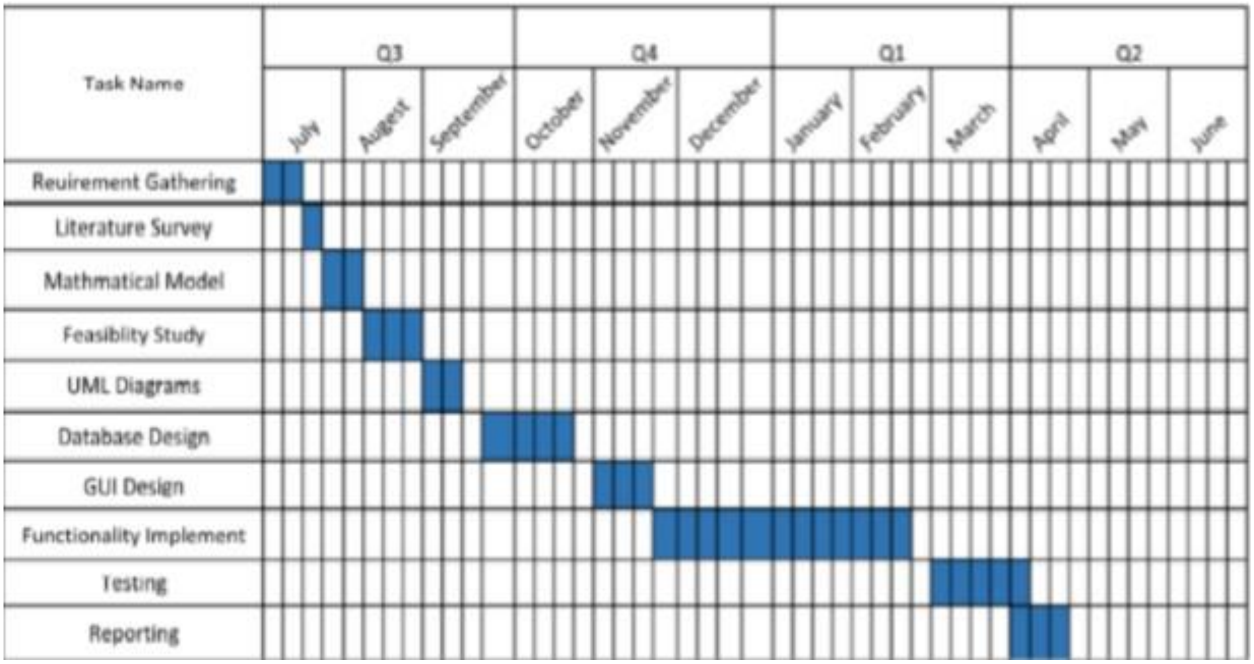


Figure 2.3.1. Time Line Chart

Chapter 3

ANALYSIS AND DESIGN

Introduction

This chapter covers the analysis and design of the system as a whole. The chapter deals with analysis of each module separately as well as the cumulative analysis of the system.

3.1 Mathematical Model

Let S represent the events of the system.

S= {s,e,I,O,F,DD,NDD,Success,Failure}

Where I is the set of inputs
O is the set of outputs,
s is the initial state the set of functions,
e is the final state

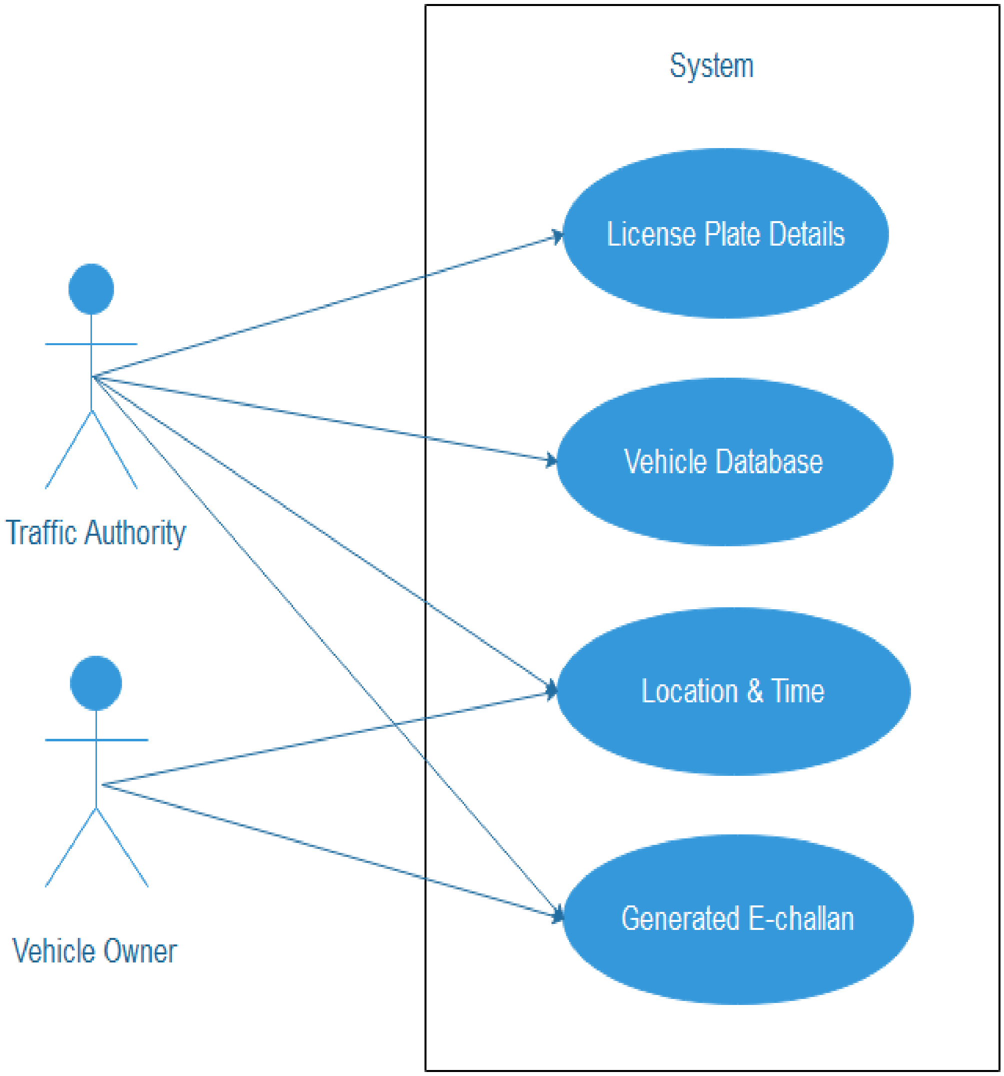
F= {F1, F2, F3, F4}
F1= Capture_image()
F2 = Pre-processing()
F3= Character_recognization()
F4= E-challan_generation()
I= {Video Stream, Configuration}
DD = Deterministic Data
NDD = Non Deterministic Data

Success (S1,S2}
S1= {The License plate Detected Successfully}
S2 = {License plate recognize Successfully}
S3= {E-challan Generated successfully}

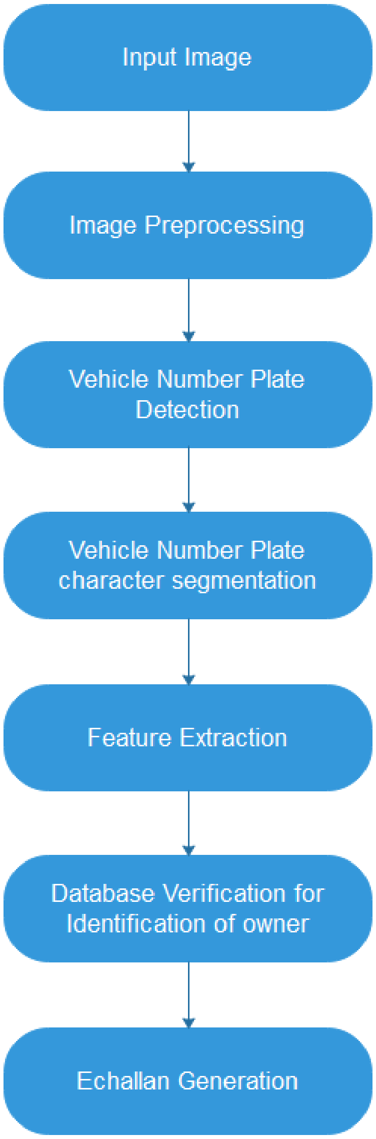
Failure= {F1,F2}
F1={Failed to recognize characters}
F2-{Failed to produce output}

3.2 Use Case Diagrams

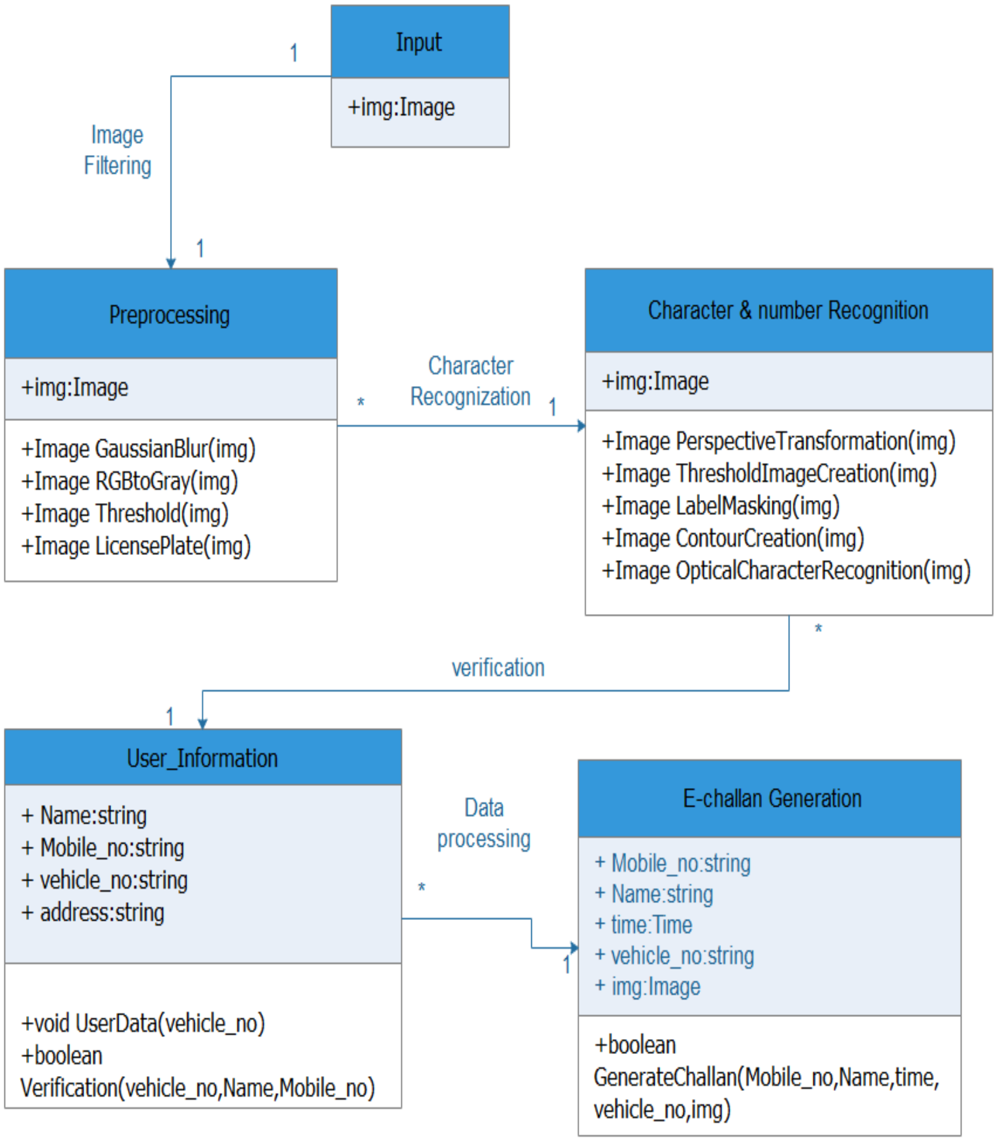
The Use Case Diagram of the project depicts the user’s interaction with the system



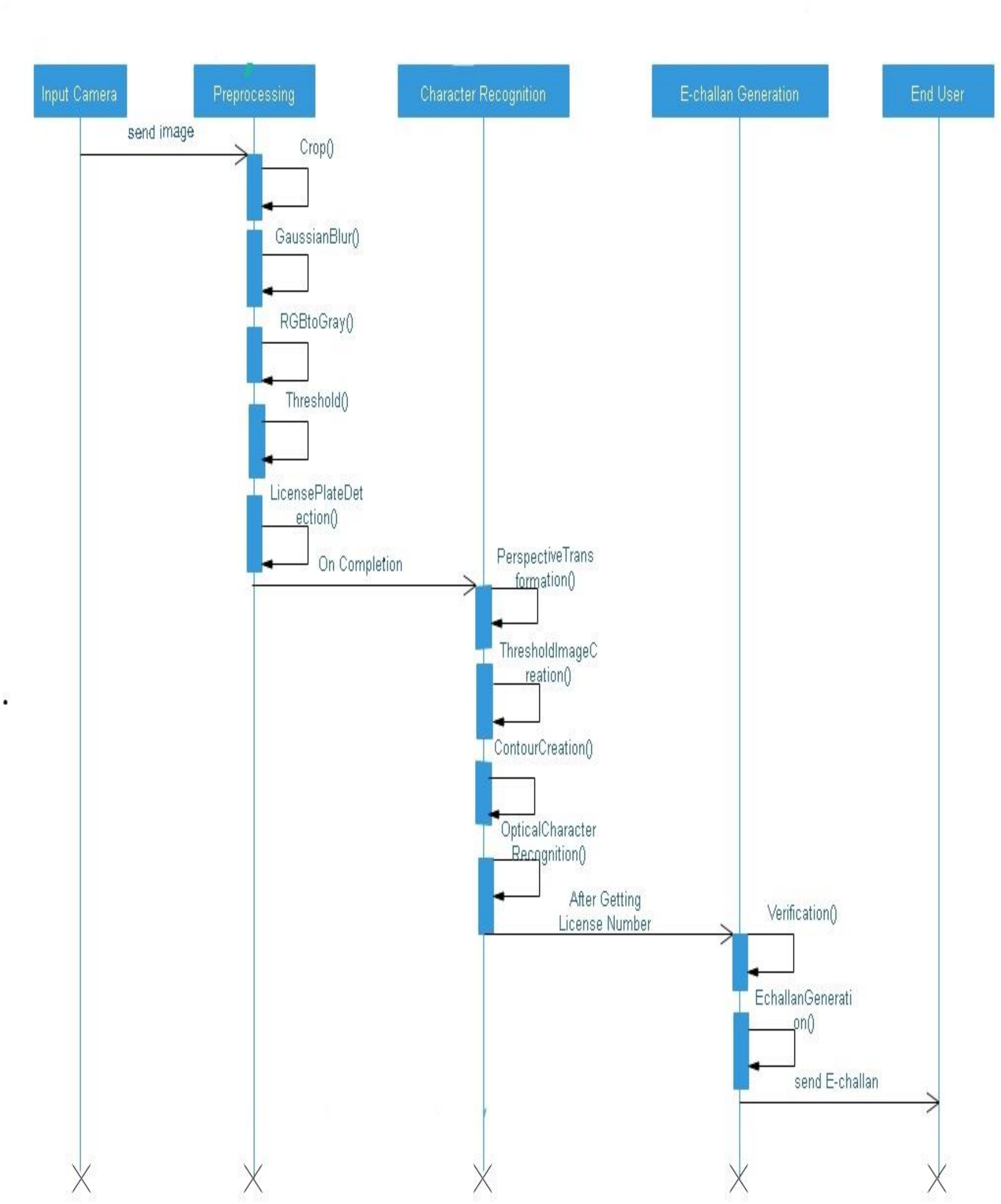
3.3 **Data Flow Diagram**


Input Image
Image Preprocessing
Vehicle Number Plate Detection
Vehicle Number Plate character segmentation
Feature Extraction
Database Verification for Identification of owner
Echallan Generation

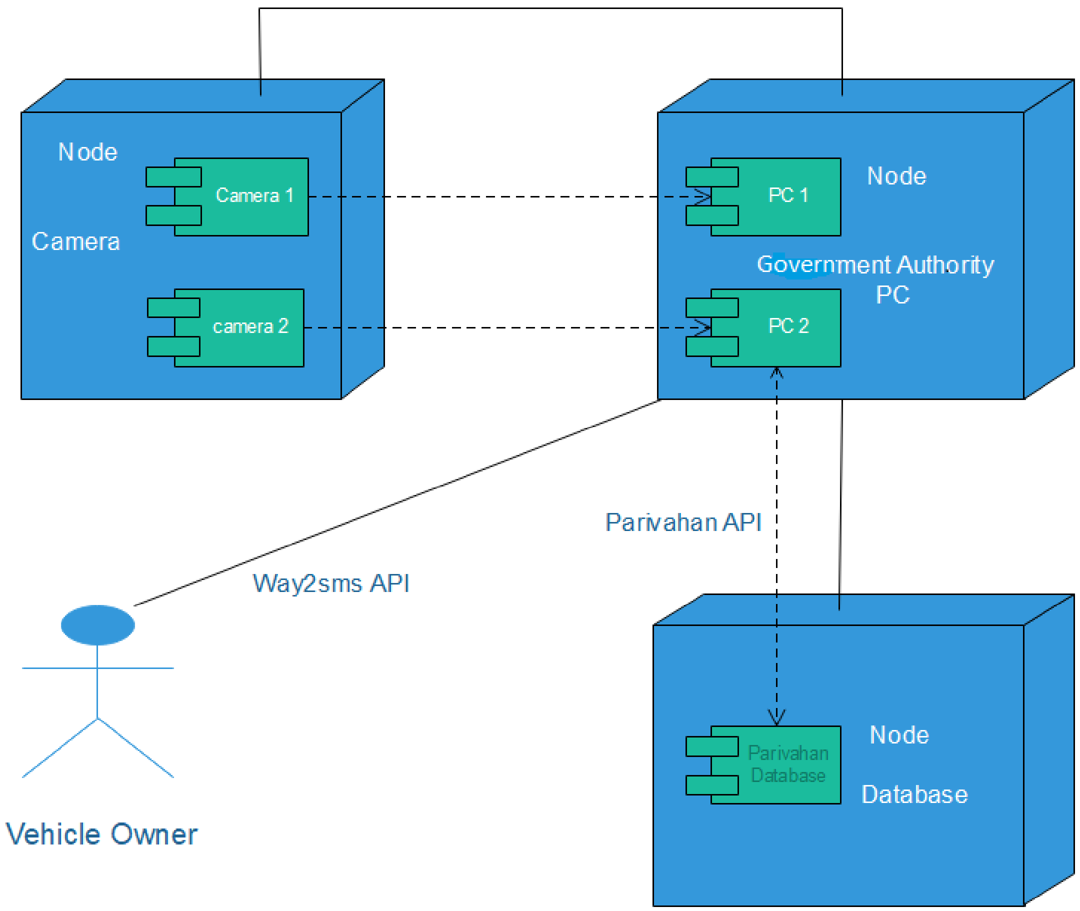
3.4 Class Diagram



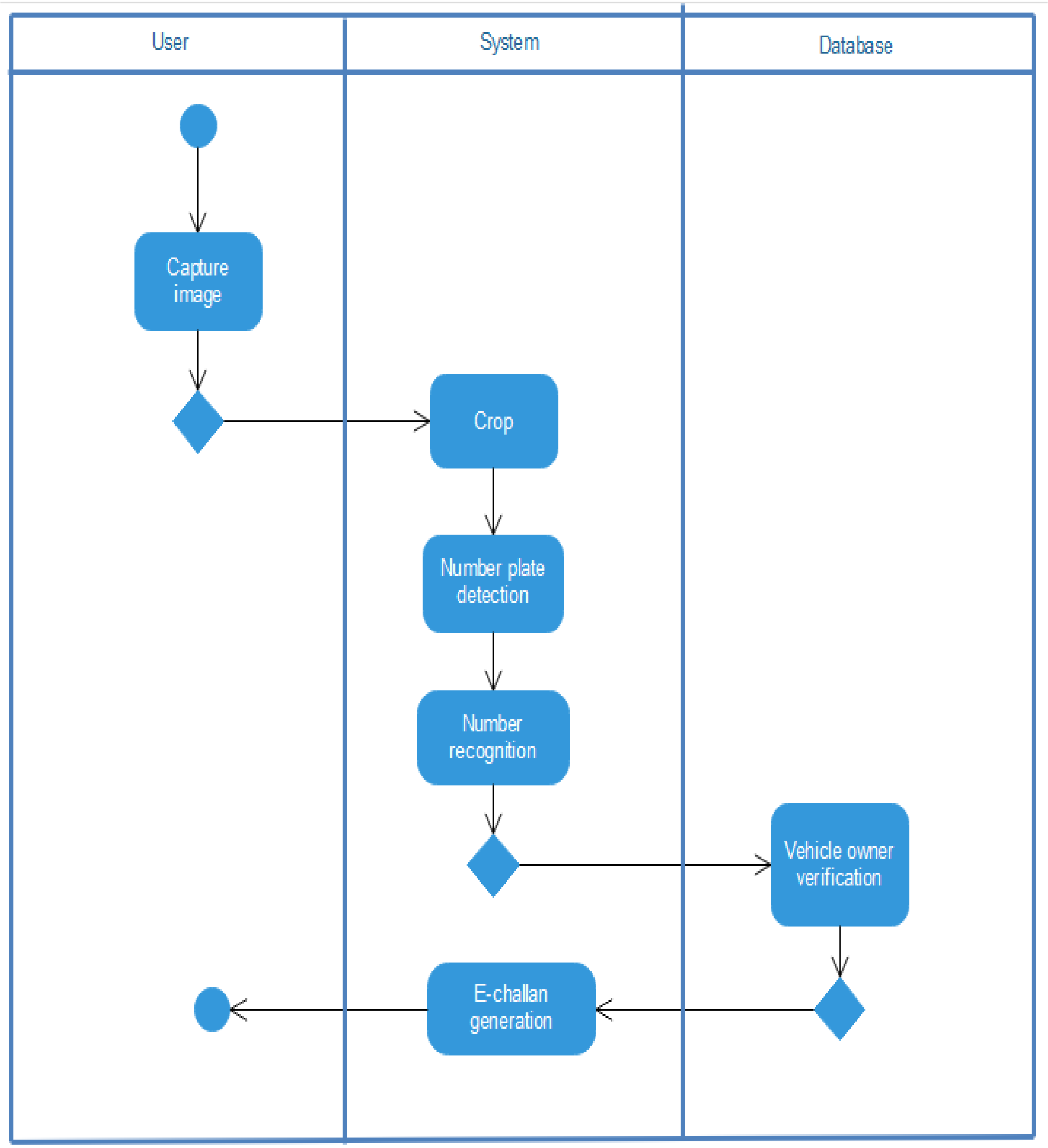
3.5 **Sequence Diagram**



3.6 Deployment Diagram



3.7 Activity Diagram



Chapter 4

TESTING

4.1 Introduction

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process. The various types of testing that we have tested the system over are as follows:

1- Unit Testing

2- Integration Testing

3- Acceptance Testing

This chapter covers the testing approach used and the test cases.

4.2 Unit Testing

UNIT TESTING is a level of software testing where individual units/ components of a software are tested. The purpose is to validate that each unit of the software performs as designed. A unit is the smallest testable part of any software. It usually has one or a few inputs and usually a single output. The following table shows the various test cases of smell recognition module.

Table 4.1: Unit Testing

Sr.No.	Testing Conducted	Input	Expected Output	Actual Output
1.	Pre-Processing	Captured image	Number plate detection	NA
2.	Pre-Processing	Number plate	Noise free number plate	NA
3.	Feature Extraction	Noise free number plate	Number Recognition	NA
4.	Verification	1. License Number 2. Database	1. Owner of the vehicle 2. E-challan Generation	NA

4.3 Integration Testing

INTEGRATION TESTING is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing.

Integration Testing is the second level of testing performed after Unit Testing and before System Testing.

Integration testing, in context of the system, is the testing of various modules with the dependencies taken into consideration. That means, integration testing deals with the impact of the one module over other module.

The following depicts the various scenarios in which the system works :

Table 4.2: Integration Testing

Sr.No.	**Testing Conducted**	**Input**	**Expected Output**	**Actual Output**
1.	Pre-Processing	Captured Image	Noise free number plate image	NA
2.	Feature Extraction and verification	Noise free number plate image	Finding Owner of the Vehicle an E-challan Generation	NA

4.4 Acceptance Testing

ACCEPTANCE TESTING is a level of software testing where a system is tested for acceptability. The purpose of this test is to evaluate the system's compliance with the business requirements and assess whether it is acceptable for delivery. Acceptance Testing is the fourth and last level of software testing performed after System Testing and before making the system available for actual use.

Table 4.2: Acceptance Testing

Test ID	**Test Category**	**Test Description**
1.	License plate Detection and License plate number Recognition.	License plate is detected and license plate number is recognized for further processing.
2.	E-challan Generation	E-challan generated and notified to user using message.

REFERENCES

[1] TANG Yufeng, LUO Bin,TANG Jin, WU Fubu. New heuristic algorithm of license plate location based on statistical feature.[J] Computer Engineering and Application, 2015,51(6): 154-158.

[2] Abolghasemi V, Ahmadyfard A. An edge-based color-aidedmethod for license plate detection[J]. Image & Vision Computing, 2009, 27(8):1134-1142.

[3] Comelli P,Ferragina P,Granieri M N. Optical Recognition of Motor Vehicle License Plates[J], Vehicular Technology, IEEE Transactions on, 1995,44: 790-799.

[4] SI Qing-ya. The design and implementation of License Plate Recognition System based on robust illumination[D]. Nanjing: Nanjing University of Posts and Telecommunications, 2013.

[5] Deneen K M V. An Algorithm for License Plate Recognition Applied to Intelligent Transportation System[J]. IEEE Transactions on Intelligent Transportation Systems, 2011, 12(3):830-845.

[6] TANG Yufeng, LUO Bin,TANG Jin, WU Fubu. New heuristic algorithm of license plate location based on statistical feature.[J] Computer Engineering and Application, 2015,51(6): 154-158.

[7] Abolghasemi V, Ahmadyfard A. An edge-based color-aided method for license plate detection[J]. Image & Vision Computing, 2009, 27(8):1134-1142.

[8] Comelli P,Ferragina P,Granieri M N. Optical Recognition of Motor Vehicle License Plates[J], Vehicular Technology, IEEE Transactions on, 1995,44: 790-799.

[9] SI Qing-ya. The design and implementation of License Plate Recognition System based on robust illumination[D]. Nanjing: Nanjing University of Posts and Telecommunications, 2013.

[10] Deneen K M V. An Algorithm for License Plate Recognition Applied to Intelligent Transportation System[J]. IEEE Transactions on Intelligent Transportation Systems, 2011, 12(3):830-845.

Appendix A : Photo copy of Project Approval form.
Appendix B : Paper Published by the project groups with proof