PARKING AUTOMATION

UCS503

Software Engineering Project Report

Mid-Semester Evaluation

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1. OVERVIEW

The massive integration of information technologies, under different aspects of the modern world, has led to the treatment of vehicles as conceptual resources in information systems. Since an autonomous information system has no meaning without any data, there is a need to reform vehicle information between reality and the information system. This can be achieved by human agents or by special intelligent equipment that will allow identification of vehicles by their registration plates in real environments. Among intelligent equipment, mention is made of the system of detection and recognition of the number plates of vehicles. The system of vehicle number plate detection and recognition is used to extract the image from the image. By using this technique, we are making an automated car parking management system. In this system, when a vehicle will come, it will stop on a particular spot in between and the camera sensor will capture the image of car. From that image, using the technique mentioned above, number on license plate will be extracted and stored in a database. Our system then checks if there is any vacant spot present for the vehicle, if yes then number vacant will be displayed on screen. Car once parked; database will get updated. Now, when the car will leave the parking spot, based on time, the user has to pay the amount and a receipt will be generated. This type of management system will reduce human time and labour.

2. PROJECT REQUIREMENTS

2.1 FUNCTIONAL REQUIREMENTS

IMAGE CAPTURING

After stopping the vehicle on a particular spot, the image will be captured by the camera sensor so that post processing of image can be done and text can be extracted and stored in a database.

IMAGE CONVERSION

After capturing, one of the main tasks is to extract the text from the image that is the number on the license which will be stored in the database.

PARKING SLOTS

The system will find the nearest empty spot for the parking of vehicle and will display on the screen.

RENT RECIEPT

When the user along with vehicle leaves the parking and enter the spot number in machine on exit, rent will be displayed on the screen and the user will pay through available mode.

2.2 NON-FUNCTIONAL REQUIREMENTS

PERFORMANCE

Our aim is to minimize the response time taken by the system in doing the post processing task and finding the slot for the vehicle.

CONCURRENCY

Our aim is that the database keeps on updating and remain in sync and can handle multiple users at a time.

MAINTENANCE

Like any other software or hardware, our system also needs periodic maintenance although the administrator can remotely monitor if the system is working fine or not.

USABILITY

End user satisfaction and acceptance is one of the key pillars that supports our project's success. Taking the user experience requirements is a win bet, and it will especially save a lot of time at the project release as the user won't ask for changes.

ETHICS

The user will be completely assured that the platform is fully secured and his/her personal detail won't be leaked.

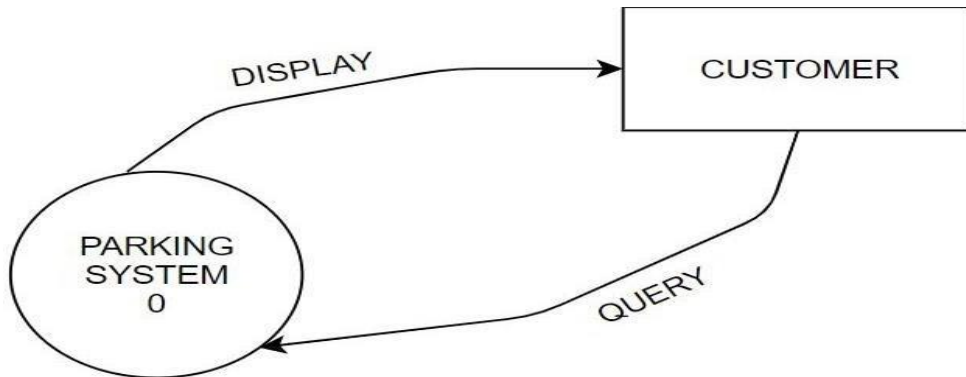# 3. Structured Analysis

3.1 Data Flow Diagram:

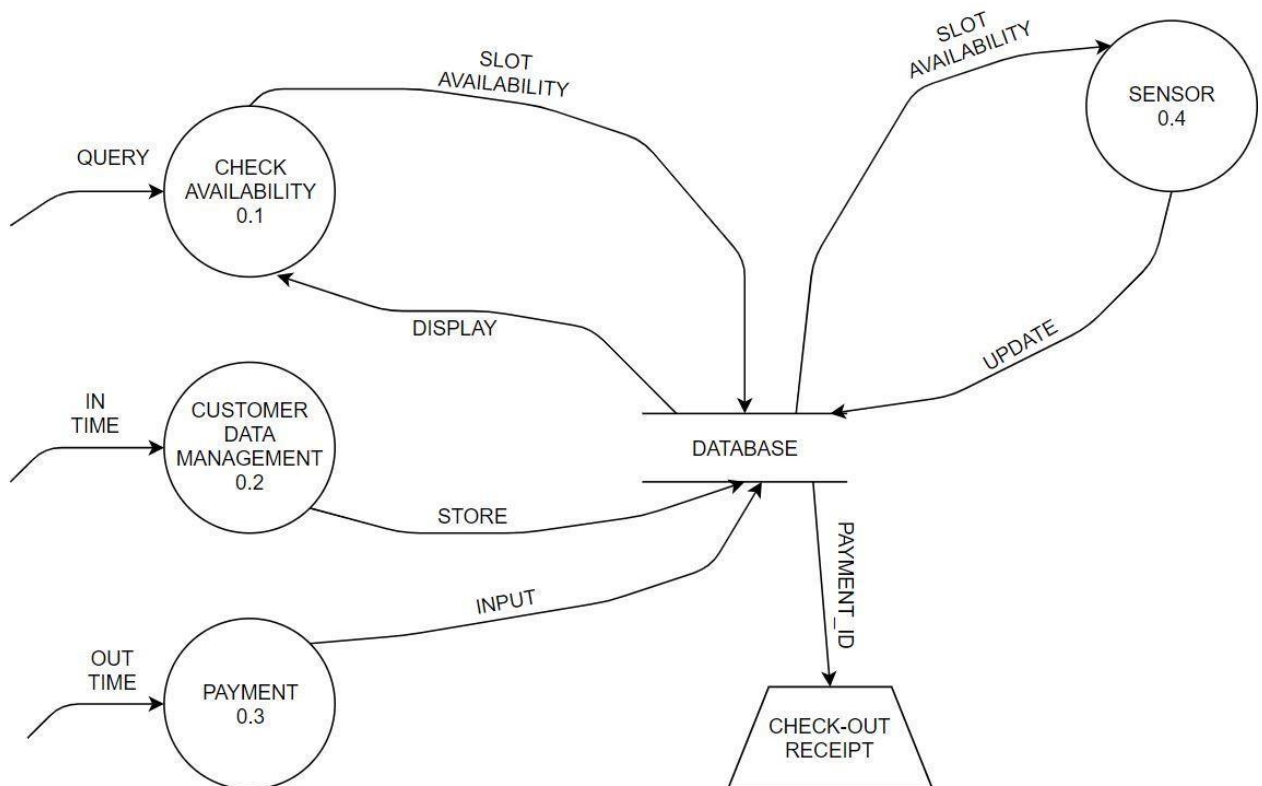### 3.1.1 Level 0

Figure 1 DFD level 0

3.1.2 Level 1

Figure 2 DFD Level 1

3.1.3 Data Dictionary:

Signup:

Data Item	Data Type	Data Format	Description	Example
Mobile No.	Number	10 Digit	Customers Mobile Number	9864382156
License Plate No.	Varchar	Atleast 3 char and 6 Numbers	Unique Number plate of Vehicle	PB 03A 8888
Arrival Time	Time	24-Hour format	Time of Arrival of Customer	12:05
Departure Time	Time	24-Hour format	Time of Departure of Customer	14:08

Spot Checking:

Data Item	Data Type	Data Format	Description	Example
Spot No.	Number	2 Digit	Free Spot for Parking	08
Availability	Varchar	Bool Type	Either Spot is Available?	Yes

Payment Method:

Data Item	Data Type	Data Format	Description	Example
Payment ID	Varchar	3 numbers with 2 char all in Uppercase	Unique ID of the Customer	AN1290
Amount	Number	Amount in Rupees	Total Amount	50
Total time	Number	Time in Hours	Time taken by Customer	3

3.2 ER Diagram:
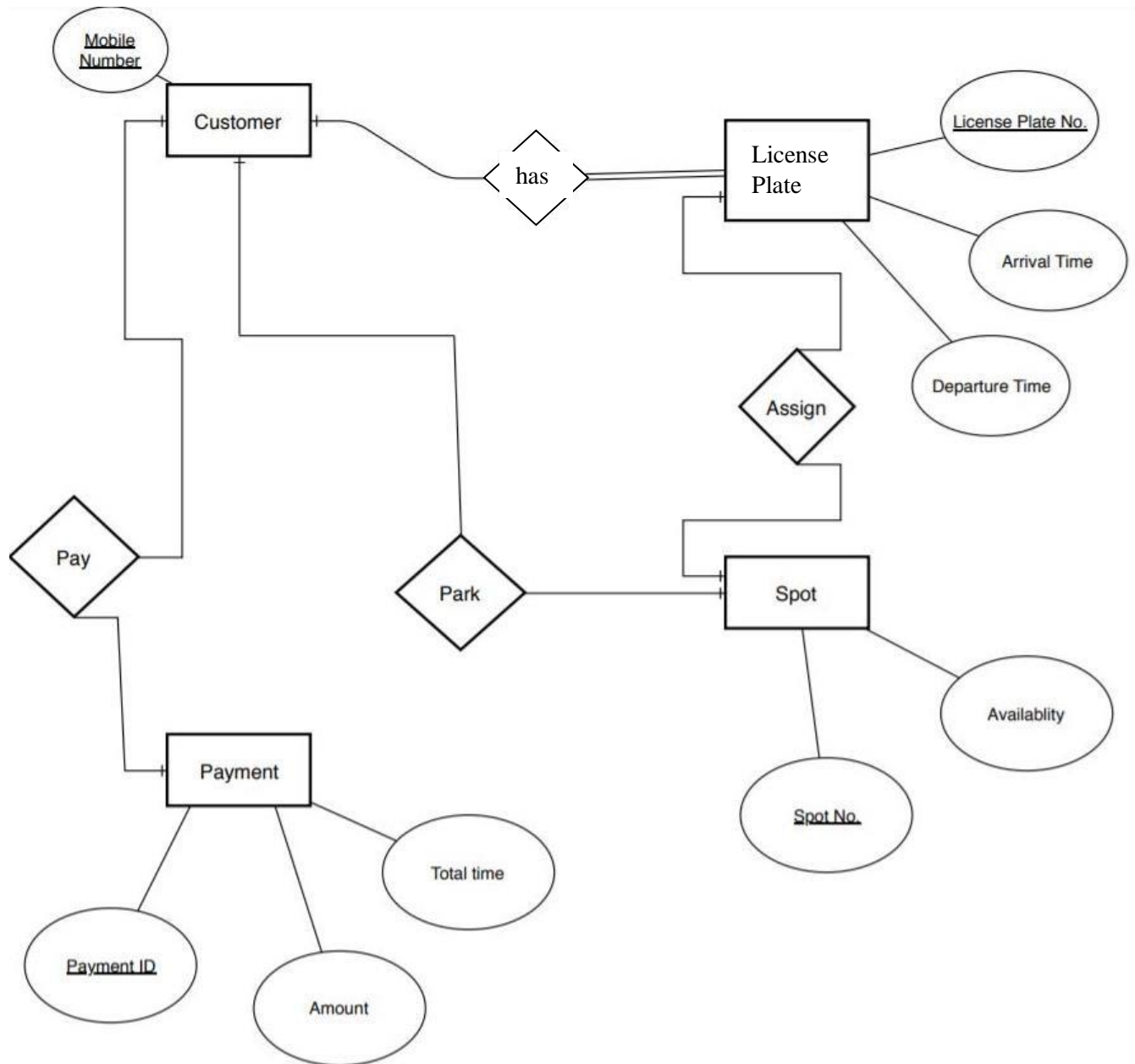
Figure 3 ER Diagram

4. Object Oriented Analysis
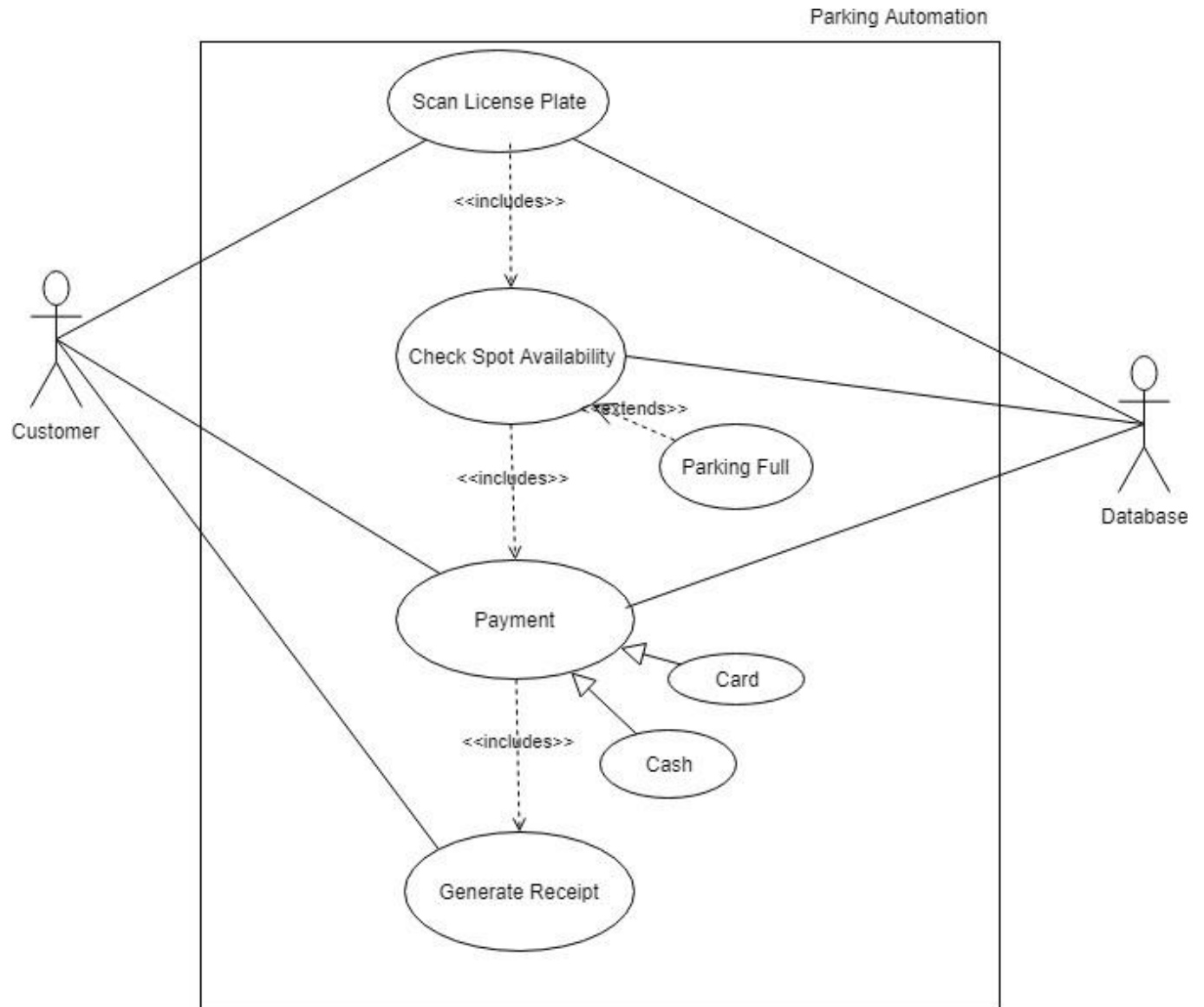
4.1 Use Case Diagram

Parking Automation

Scan License Plate

<<includes>>

Check Spot Availability

<<extends>>

Parking Full

Customer

<<includes>>

Database

Payment

Card

Cash

<<includes>>

Generate Receipt

Figure 4 Use Case Diagram

4.2 Use Case Template (For Parking Automation)

Use Case Name	Parking Automation
Authors	Ashutosh (Bansal), Ashutosh (Sharma), Ayush, Kamakshi
Last Revision	18 Sept, 2019
Actors	User
Uses	Parking of Vehicle
Extends	Parking Full(No parking)
Pre-conditions	1. Sensor is on which scans the license plate and checks for the availability
Basics Course/ Main Scenario	1. Car enters Parking Area. 2. Sensor scans the license plate. 3. Database is checked for empty slot. 4. If available: Car gets the information about the slot number details. The slot gets booked to that license plate. 5. Car parks. 6. After some time user wants to leave the place. 7. User can pay through either Cash or Card. Payment receipt is generated. 8. Else: Car is informed about no parking. Car is escorted towards exit.
Other Scenarios	1. Car owner changed his mind and wants to go exit area.
Post- Conditions	1. Car successfully parked. 2. Successful Payment 3. Car out of parking area.
Error- conditions	1. If car is parked at wrong slot number. 2. Empty slot may be available but parking may not be available. 3. Wrong Payment receipt is generated 4. Payment is unsuccessful.

Use Case Scenario (For Parking Automation)

1. (SR): The system starts scanning License Plate.
2. (SA): After successful scan, system checks for spot availability.
3. (SR): System returns the available spot number.
4. (AA): Customer parks at the given spot number.
5. (SA): The system calculates the amount according to the time duration of parking.
6. (SR): The system asks for payment from the customer.
7. (AA): The customer makes payment.
8. (SA): The system processes the payment.
9. (SR): After payment is received successfully, system generates receipt.
10. (AA): Customer collects the receipt and exits.

Alternate Flow of Events:

3. Parking is full.

Exceptional Flow of Events:

8. If the processing of payment is unsuccessful, then the system displays an error message to make payment again.
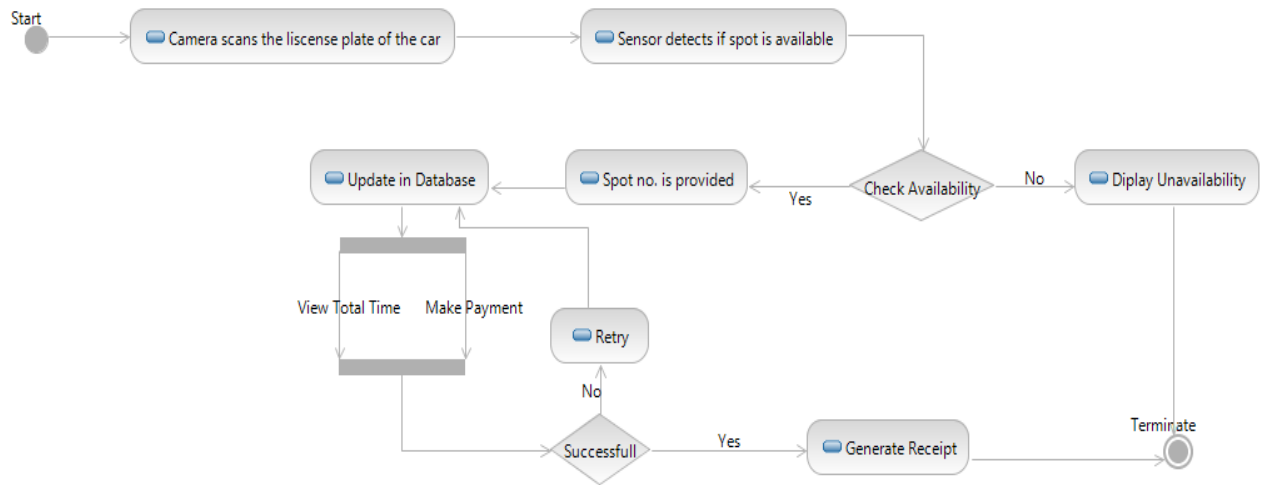
4.3 Activity Diagram

Figure 5 Activity Diagram
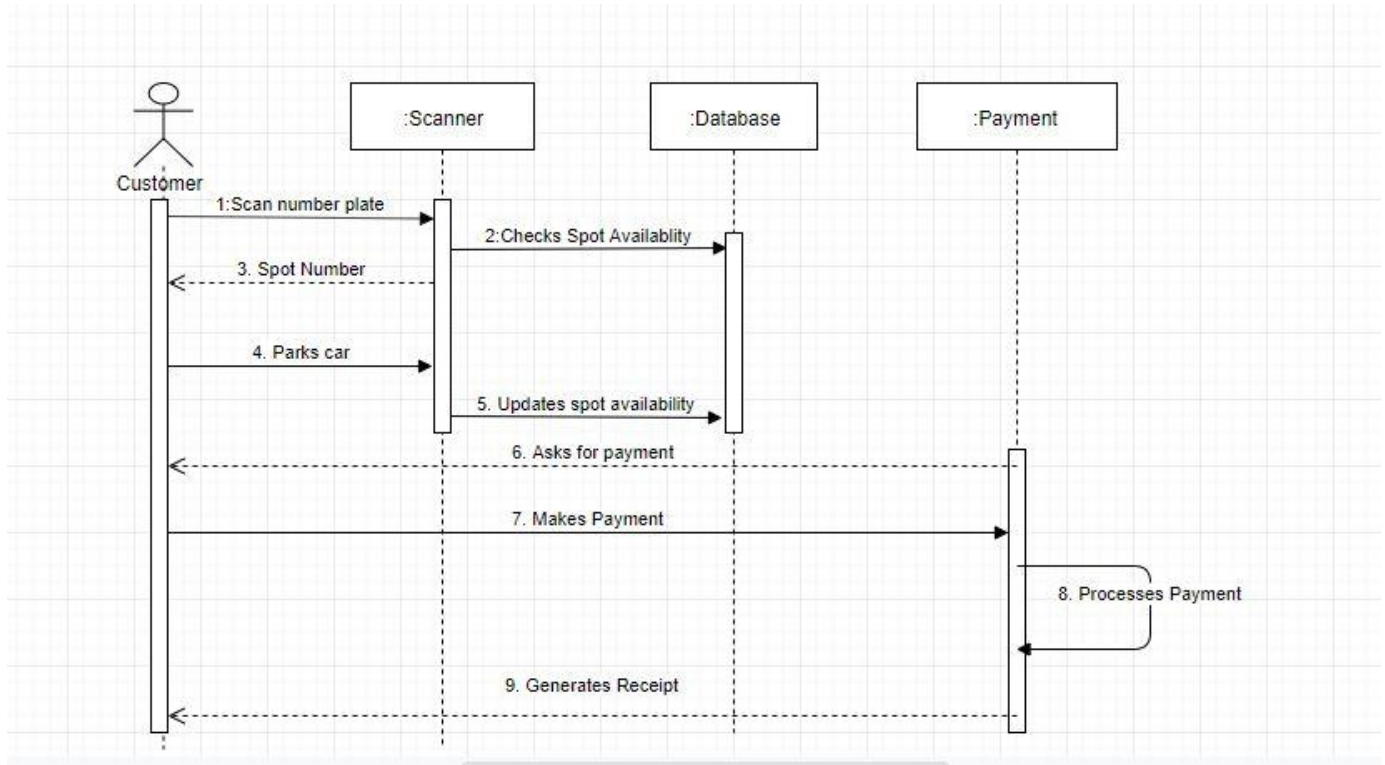
4.4 Sequence Diagram
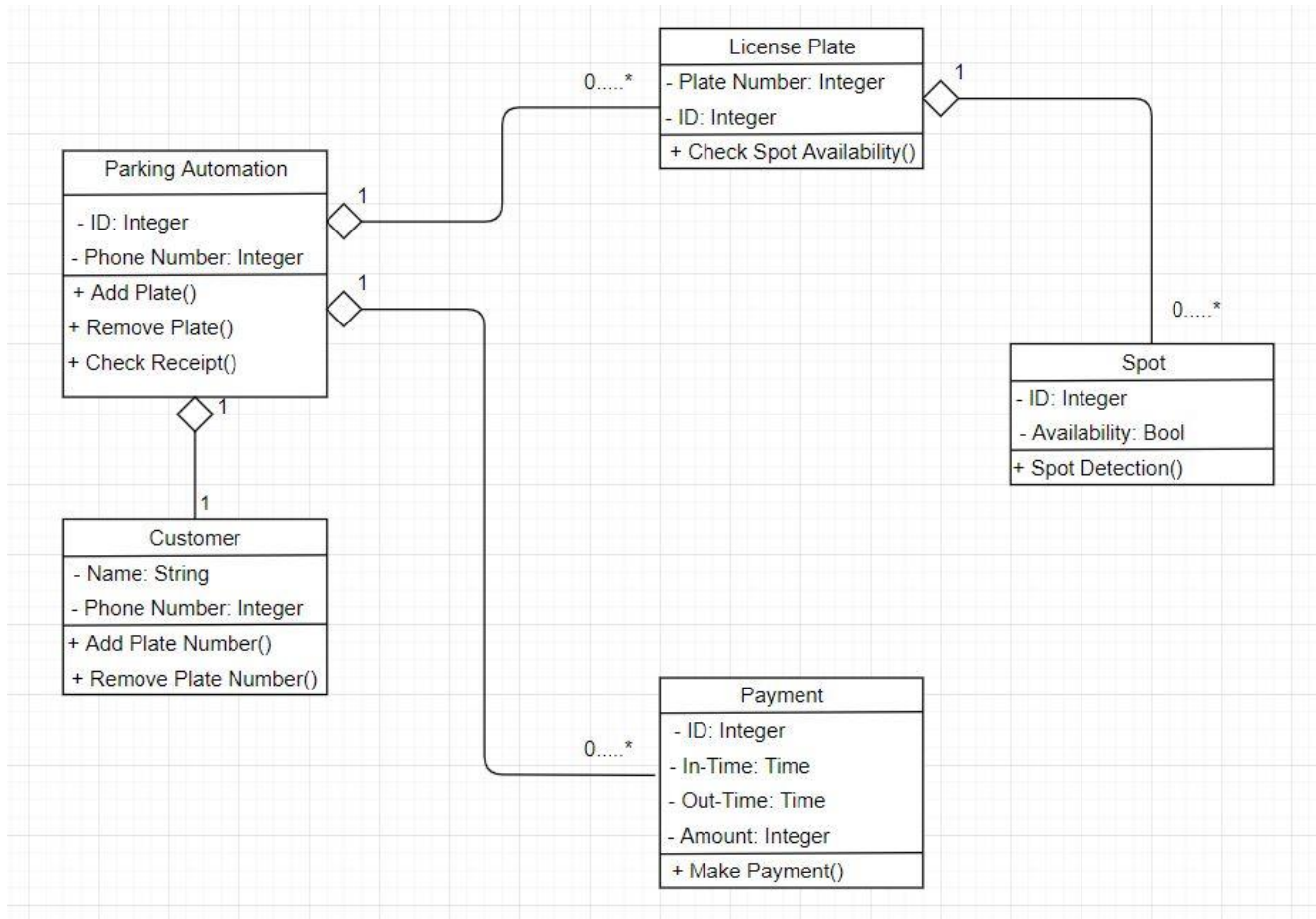

Figure 6 Sequence Diagram

4.5 Class Diagram

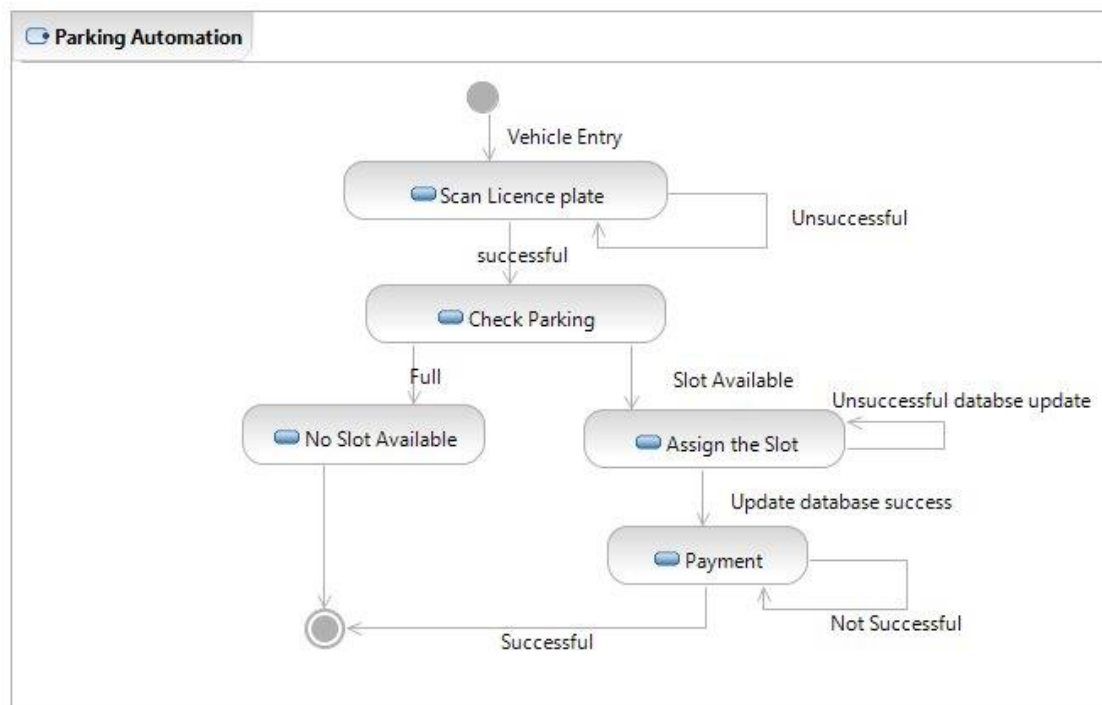**Figure 7 Class Diagram**

4.6 State Chart Diagram

Figure 8 State Chart Diagram

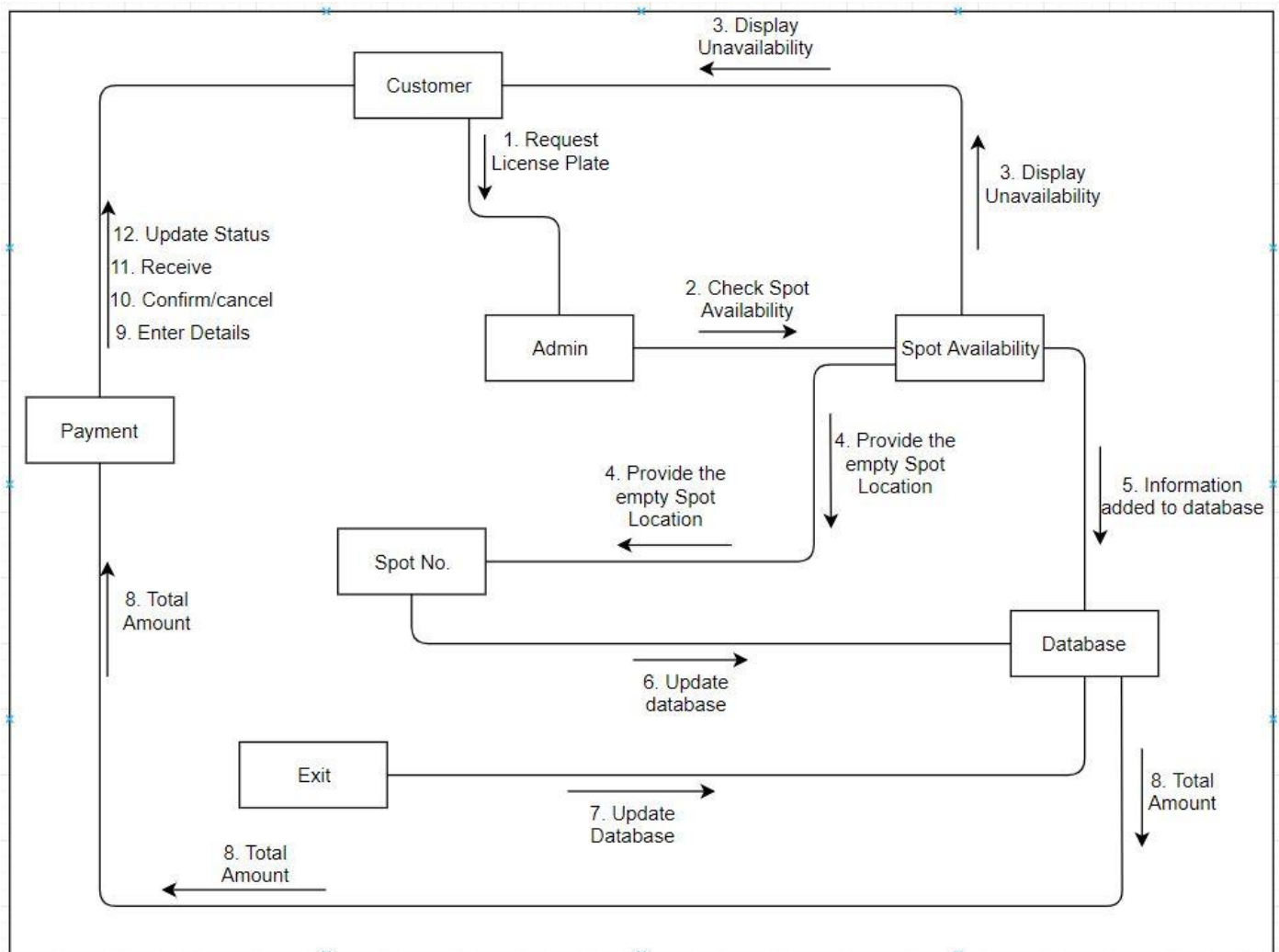## 4.7 Collaboration Diagram

Figure 9 Collaboration Diagram
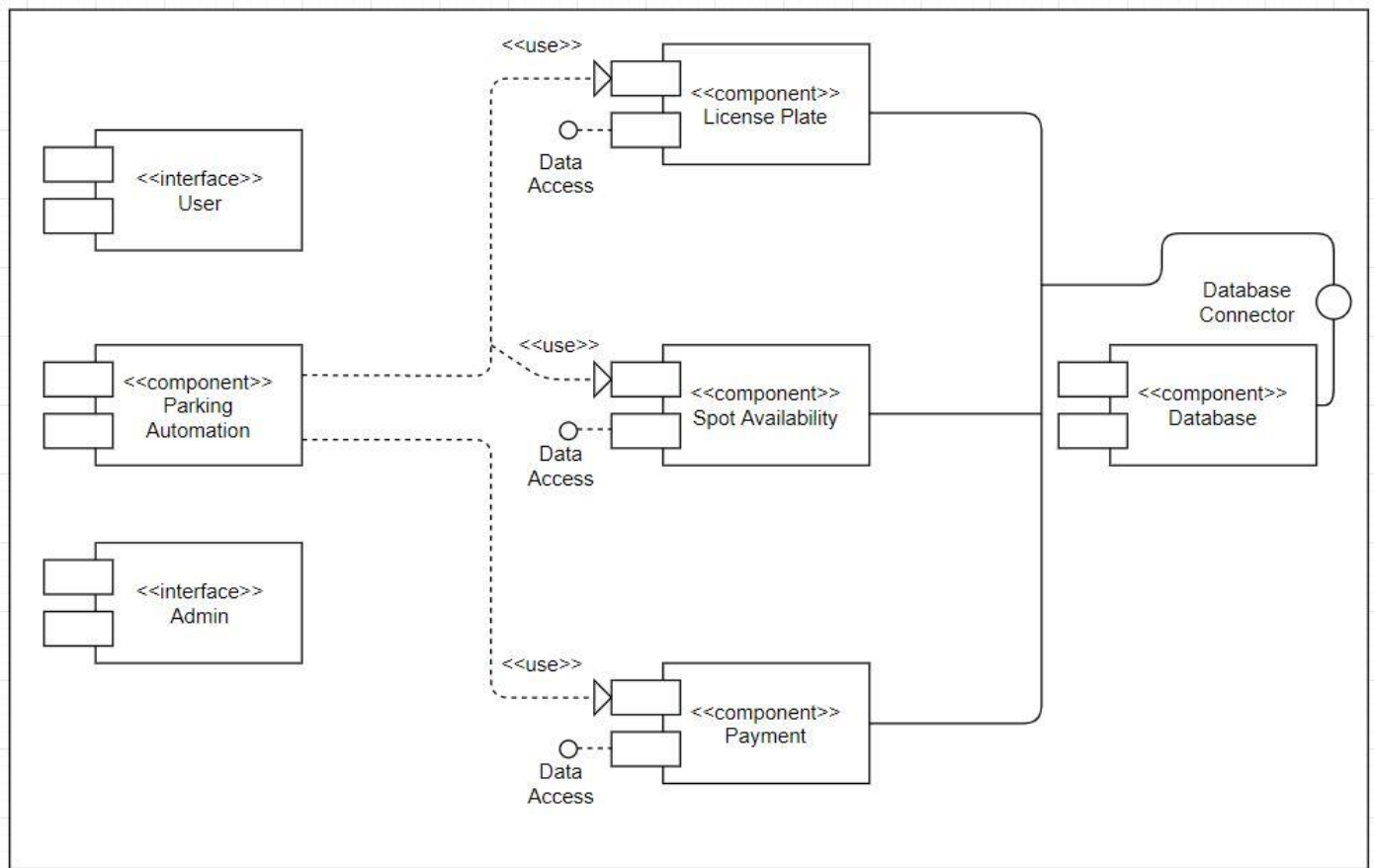
4.8 Component Diagram

Figure 10 Component Diagram
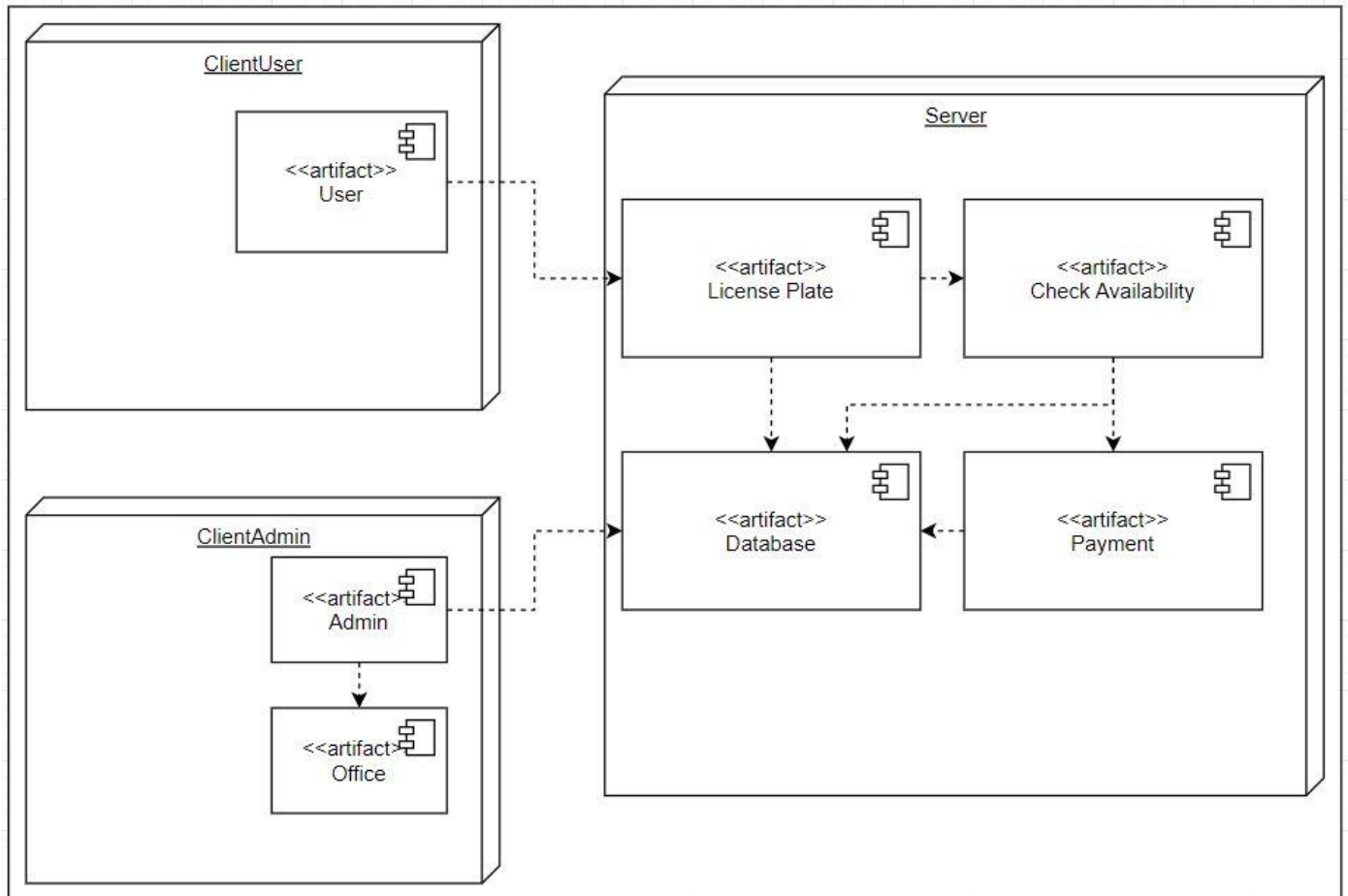
4.9 Deployment Diagram

Figure 11 Deployment Diagram

5. TESTING

5.1 TEST PLAN

The objective of the test is to verify that the functionality of Automatic car parking system works according to the specifications. The test will execute and verify the authentication process, identify, fix and retest all high and medium severity defects considering all constraints. There are mainly two parts in the system: Number Plate scanning and Payment. . It was made sure that the databases are reliable and robust against all cases. Security issues are also handled like the personal information of the user.

Scope

To test the listed functional requirements of the product along with speed, robustness and accuracy of the product.The purpose of this test is to make sure critical defects are removed before the next levels of testing can start.

Approach

Manual testing of application on two different devices for any bugs or non compliance with the requirements

Features to be tested (various functionalities)

- Scan the number plate
- Number Plate Scan successful
- Payment
- Successful Payment
- Receipt Generator

Item pass fail criteria

If the testing produces the desired result for every activity without any freezing or taking very long time to execute, it is considered pass, otherwise fail.

5.2 Test Case Report

Test Case #: 1	Test Case Name: Number Plate scan
System: Automatic Parking System	Subsystem: Spot Availability
Designed by:	Design Date: 22/11/2019
Ayush,Kamakshi,Ashutosh,Ashutosh	Execution Date: 26/11/2019
Executed by: Ayush, Kamakshi	
Short Description: Tests the scanning of number plate.	

Pre-conditions

- The system has working camera.
- There is sufficient light in the area.
- The car is standing still.

Step	Action	Expected System Response	Pass/Fail	Comment
1.	Number plate is in front of camera.	The camera detects number plate.	Pass	
2.	**Check Post-Condition 1**			
3.	User clicks for spot number	The system returns the spot number to the user.	Pass	
4.	**Check post-condition 2**			

Post-conditions

- The number plate is updated in database.
- Parking spot number is updated in database.

	Test Case #: 2	Test Case Name: Payment
	System: Automatic Parking System **Designed by:** Ayush,Kamakshi,Ashutosh,Ashutosh **Executed by:** Ayush, Kamakshi	**Subsystem:** Payment gateway **Design Date:** 22/11/2019 **Execution Date:** 26/11/2019

Short Description: Tests the process of payment.

Pre-conditions

- The system has working internet connection.
- The user has payment applications installed.
- The user has active internet connection.

Step	Action	Expected System Response	Pass/Fail	Comment
1.	The user exits the parking for payment.	The system scans the number plate and displays the amount on screen.	Pass	
2.	User clicks continue button on screen.	The system directs the user to external payment application.	Pass	
3.	**Check post-condition 1**			
4.	The user pays the amount through the application.	The system is directed back from the external application.	Pass	
5.	The user presses exit button.	The system checks if payment is successful.	Pass	
6.	**Check post-condition 2**			

Post-conditions

1. The payment details are updated in database.
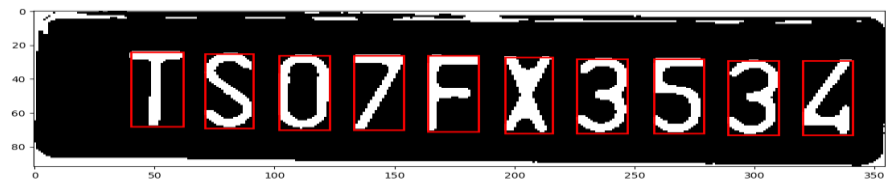2. The scanned number plate is removed from the database.

TEST CASE REPORT

Initial two test cases passed. There were no bugs or freezing of the system. All the requirements were met and the system was running as required.

5.3 Screenshots

- ## **<u>Number Plate Scanner</u>**

```
Classification result
[array(['T'], dtype='<U1'), array(['S'], dtype='<U1'), array(['0'], dtype='<U1'), array(['7'], dtype='<U1'), array(['F'], dtype='<U1'), array(['X'], dtype='<U1'), array(['3'], dtype=
Predicted license plate
TS07FX3534
License plate
TS07FX3534

Process finished with exit code 0
```

- **Payment gateways**