

Software requirement specification

Parking payment system via license plate recognition



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# 1.0 Introduction

## 1.1 Purpose

The purpose of this document is to integrate a license plate recognition system into the current parking payment system and innovative the methods for users to pay their parking fees via digital methods or manual method at the pay station. This document will specify both the functional and non-functional requirements required by the client in order to develop a working prototype Parking Payment System.

## 1.2 Intended Audience

This document is intended for:

* **Developer Team:** A group of 4 who develop the proposed system.
* **Client:** For checking the requirements mentioned in this document.
* **End users:** 
  + **Customer:** Visitors who intended to enter the building
  + **Staff:** Workers who receive parking ticket and payment from customers without the application
  + **Admin:** Manager/Person in charge of managing the whole system. / Head of security department.

## 1.3 Project Scope

The scope of this project is to develop a parking payment system via license plate recognitions using an automatic license plate detection and recognition using machine learning. The systems are linked to an online database which will be integrated into the parking system. The system will automatically record the car plate number upon entering and exiting the carpark. The fee that needs to be paid will be calculated and the user can either choose to pay via cash or e-payment. This project also benefits the staff and admin where it reduces the workload of the staff. For Admin side, they can access information and analytics record (daily/weekly/monthly) reports.

## 1.4 Definitions, Acronyms and Abbreviation

|  |  |
| --- | --- |
| **Terminology** | **Definition** |
| Android Studio | An IDE use for Android App development. |
| HTML | Hyper Text Markup Language (HTML) is the standard markup language used for creating web pages. |
| CSS | Cascading Style Sheets (CSS) is used to make styling for web pages, including design, layout and many others. |
| JavaScript | A scripting language used to make responsive and interactive webpages. |
| Python | Object-oriented, high-level programming language. |
| MySQL | Use to create database for storing and manipulating data. |

# 2.0 Overall Description

## 2.1 Product Perspective

The Parking System is a web-based and mobile-based software develop to automatically handle a parking payment system. The main purpose is to fulfill the social-distancing rules which the users can enter the carpark without any physical contact with the ticket dispenser or staff. The system can be implemented into multiple carpark outlets such as schools, shopping malls and many others.

## 2.2 Product Features

The system provides the following features:

1. **Customer**
   1. Registration
   2. Login
   3. Logout
   4. Receipt
   5. View the amount of time stayed in carpark.
   6. Profile editing/setting
2. **Staff**
   1. Login
   2. Logout
   3. Search/View customer’s parking record
   4. Edit Record
3. **Admin**
   1. Registration
   2. Login
   3. Logout
   4. Search/View customer’s parking record
   5. Edit Record
   6. View analytics report
4. **License plate module (Machine learning)**
5. License plate detection
6. Character recognition

## 2.3 User Classes and Characteristics

**Client**

The client is the product owner and the secondary stakeholder of the system, who propose to have this system developed. As the current pandemic going on, the client felt that there is a need to improve the current manual parking system to a more digital system in order to respect the social-distancing rules.

**Developers**

The developers are the secondary stakeholders of the system. They are in charge of design and develop the parking system that fulfill the requirements of the client.

**Customer**

The customers are the primary stakeholders of the system. They must use the system upon entering/exiting the car park. They must register themselves in order to use the system and uses the system to pay their parking fees.

**Staff**

The staff are the primary stakeholders of the system. They are in charge of the customer’s parking record. They can edit customer’s parking records in the database.

**Admin**

The admin are the primary stakeholders of the system. They are able to view customer’s parking record and receive analytics reports produced by the record. They can access customer’s information and analytics (daily/weekly/monthly) reports.

## 2.4 Design and Implementation Constraints

**Language**

English will be used as primary language for the system. For example, in the GUI (graphical user interface) and also the database. You can

**Database**

The system uses MySQL to create a database to store data.

**Security**

Data such as customer’s information, analytic reports will be confidential and stored in a secured database. Only specific authorized personnel will be able to access this information. The training/testing dataset used for machine learning is also will not be disclosed.

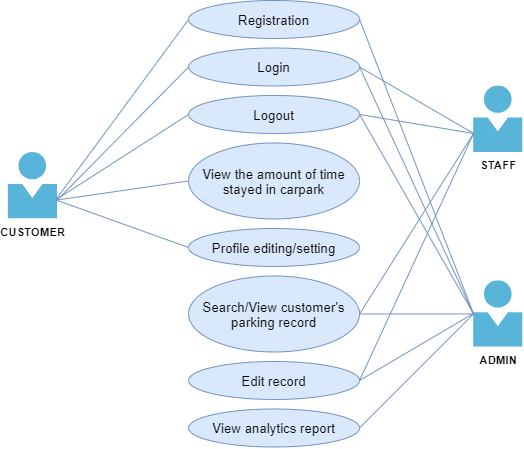
## 2.5 Assumption

The following are assumptions that are discussed throughout the development of the system:

* Users can understand English.
* Users are computer literate.
* Users have smart devices.
* Users have access to the Internet.
* Users must have a vehicle with a license plate.

# 3.0 System Features

## 3.1 Use Case Diagram



### 3.1.1 Registration

|  |  |
| --- | --- |
| Use Case Name | **Registration** |
| Actors | Customer, Admin |
| Precondition(s) | Must be new user (no pre-existing account) |
| Success Guarantee | New user account is created and added into the database. |
| Main Success Scenario | 1. User navigate to the register page. 2. User enters their basic information (name, password, vehicle number plate, handphone number and e-wallet of preference) 3. User submits the form. 4. Display create account successful notification. 5. System will be redirected to login page. |
| Extension | 3a. Checks for pre-existing accounts/ invalid username or password.  3a1. If yes, shows error message and prompt user to re-enter details.  3a2. Return to step 2. |

### 3.1.2 Login

|  |  |
| --- | --- |
| Use Case Name | **Login** |
| Actors | Customer, Staff, Admin |
| Precondition(s) | User is registered into the system. |
| Success Guarantee | User able to login successfully. |
| Main Success Scenario | 1. User navigate to the login page. 2. User enters their username and password. 3. User submit the form. 4. System will navigate to homepage. |
| Extension | 3a. Checks for invalid username and password.  3a1. If yes, shows error message “Invalid username or password”.  3a2. Return to step 1. |

### 3.1.3 Logout

|  |  |
| --- | --- |
| Use Case Name | **Logout** |
| Actors | Customer, Staff, Admin |
| Precondition(s) | User is logged into the system. |
| Success Guarantee | User successfully logs out of the system. |
| Main Success Scenario | 1. User click on the Logout Button. 2. Display successfully logout notification. 3. Redirected to the login page. |
| Extension | - |

### 3.1.4 Receipt

|  |  |
| --- | --- |
| Use Case Name | **Receipt** |
| Actors | Customer |
| Precondition(s) | Customer had made payment. |
| Success Guarantee | Receive a receipt via email. |
| Main Success Scenario | 1. User vehicle’s exit the carpark. 2. Receive a receipt via email after exited. |
| Extension | - |

### 3.1.5 View the amount time stayed in carpark

|  |  |
| --- | --- |
| Use Case Name | **View the amount of time stayed in carpark** |
| Actors | Customer |
| Precondition(s) | User is logged in to the system. |
| Success Guarantee | The user will be able to see their total amount of time stay in carpark through the app. |
| Main Success Scenario | 1. User able to see the total amount of time stayed in the carpark at the homepage. |
| Extension | - |

### 3.1.6 Profile editing/setting

|  |  |
| --- | --- |
| Use Case Name | **Profile editing/setting** |
| Actors | Customer |
| Precondition(s) | User is logged in to the system. |
| Success Guarantee | User can edit their information. |
| Main Success Scenario | 1. Click on edit profile. 2. User make changes to their information. 3. Submit the form. |
| Extension | - |

### 3.1.7 Search and view customer’s parking record

|  |  |
| --- | --- |
| Use Case Name | **Search and View customer’s parking record** |
| Actors | Staff, Admin |
| Precondition(s) | User is logged in to the system. |
| Success Guarantee | User can view customer’s parking record. |
| Main Success Scenario | 1. Go to the Customer’s record page. 2. Type Customer name in the Search Filter. 3. Click on submit. 4. Customer’s record will be shown. |
| Extension | 3a. Checks for invalid input  3a1. If yes, display error message.  3a2. Return to step 2. |

### 3.1.8 Edit Record

|  |  |
| --- | --- |
| Use Case Name | **Edit Record** |
| Actors | Staff, Admin |
| Precondition(s) | User is logged in to the system. |
| Success Guarantee | 1. User can toggle the payment status of customers who entered the building (paid/haven paid) 2. User with admin privilege can edit records regarding money |
| Main Success Scenario | 1. **Staff** 2. Type car plate number or name in the search filter 3. Click on submit. 4. Customer’s record will be shown. 5. Staff make changes to the information. 6. Submit the form.   \*\*\*   1. **Admin** 2. Type in staff name or ID 3. Click on submit. 4. Staff records will be shown. 5. Admin make changes to the information. 6. Submit the form. |
| Extension | 1b&2b. Checks for invalid input  (1b&2b)1. If yes, display error message.  (1b&2b)2. Return to step 1a/2a. |

### 3.1.9 View analytics report

|  |  |
| --- | --- |
| Use Case Name | **View analytics report** |
| Actors | Admin |
| Precondition(s) | User is logged into the system. |
| Success Guarantee | User can view the visualization of the access data stored in the database. |
| Main Success Scenario | 1. User navigate to the Analytics page. |
| Extension | - |

# 4.0 External Interface Requirements

## 4.1 User Interfaces

The user interface used must be simple and consistent throughout the whole system and the color used must be web-safe color and in high contrast to prevent eye strain. Other than that, the user interface also must be user-friendly and responsive and support most of the devices with different screen resolutions. The complexity of each page will be low.

## 4.2 Software Interfaces

The Car Plate Recognition System is a multi-platform-based application, which the customer can access to it through the mobile app, while for the staff and admin, they can access to the system via the web-based application.

# 5.0 Functional Requirements

* The system must be able to determine that the same license plate will not be scanned multiple times to prevent double charge.
* The license plate detection must be able to detect a car plate accurately.
* The character recognition module must extract the characters on the license plate accurately.
* The time needed for the image recognition module to analyze the image and character extraction must not exceed 1 minute.
* The data entered by customers (e.g., username, password, e-wallet detail) must be stored in the database accurately (no error)
* The calculation of parking fees must be accurate (no error).

# 6.0 Non-Functional Requirements

## 6.1 Quality Attributes

### 6.1.1 Usability

* The system comes with a user-friendly interface.
* The layout of the system is consistent.
* Color used is web-safe color and in high contrast to provides better readability.

### 6.1.2 Reliability

* The system shows accurate information.
* The system will not crash.

### 6.1.3 Portability

* The system can run on multiple web browsers such as Google Chrome, Mozilla Firefox, Safari, Microsoft Edge.
* The web version of the system will be able to run at Windows Operating Systems.
* The mobile version of the system will be able to run in the Android Operating System.

### 6.1.4 Maintainability

* The system can perform maintenance/update easily.
* In the future, the extra features can be plug-in/integrate into the system.

### 6.1.5 Security

* Users’ data are confidential and will be stored in a secured database.
* Only authorized personnel will be able to access this information stored inside the database.
* The training/testing dataset used for machine learning will not be disclosed to public.

# 7.0 Document Approval

This document is approved by the following:

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(Project Client)

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