Cairo University  
Faculty of Computers and Artificial Intelligence

**CS251 - Software Engineering I**

Parking Garage System

Software Requirements Specifications (SRS)

Team Names

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# Team

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# Document Purpose and Audience

# Document purpose is a way of communication with client, project manager and developers to identify the goal of the system with features and cases that will be handled. It also provides information about the system what it should do.

# The audience targeted are the client and project manager.

# Introduction

## Software Purpose

## Purpose of the application is to facilitate the parking of cars into their suitable spots in the garage and also facilitate the payment of the parking fees.

## Software Scope

## Identify the vehicles' properties for selecting the suitable parking slot.

## Measure the duration spent by the car in the garage in order to calculate the parking fees for the specified duration.

## Show the available parking spots in the garage.

## Identify the suitable parking spot for the vehicle based on the active slot configuration (method).

## Calculate the total income and no. of vehicles that used the parking garage at a specified time using the user's selection.

# Requirements

## Functional Requirements

## 1. Parking garage app is an application that allow users to park their cars into the garage using the active slot configuration. There are two configurations:

## 1.1. First Come First Served approach which is the ability to select a parking slot for a vehicle based on the first free available slot from the parking garage slots.

## 1.2. Best-Fit approach which is the ability to select a parking slot for a vehicle based on finding the slot with the minimum dimension to hold the vehicle. This approach needs to identify the dimensions, model name, model year and identification number of a vehicle in order to find a slot compatible with the dimensions of a parking slot.

## 2. Application calculates the parking fees for each user by capturing the arrival and departure time of the user's vehicle.

## 3. Application should also have the feature to calculate the total income and no. of vehicles that used the parking garage at a specified time using the user's selection.

## 4. Application should also display the available parking slots to notify the user if reached the max capacity or not.

## Non Functional Requirements

|  |  |
| --- | --- |
|  | **Details** |
| **Constraints(Pseudo-Requirements)** | * **Parking application can be implemented by (JAVA programming language).** |
| **Performance** | * **Application shouldn’t take more than 30 seconds when assigning slots to vehicles.** * **Application shouldn’t take more than 60 seconds to calculate parking fees and to display a soft copy of the ticket after paying in 1-3 seconds.** |
| **Safety** | * **Parking application should provide security on driver’s data.** |
| **Maintainability** | * **Parking application should to be able to be updated every month to add new developments to the system.** |
| **Supportability** | * **Application can easily change parking price per hour.** |
| **Accessibility** | * **Parking System should provide Dark Mode and Light Mode.** |

# System Models

## Use Case Model

|  |  |  |
| --- | --- | --- |
| Use Case ID: | CASE\_001 | |
| Use Case Name: | **Identify Vehicle** | |
| Actors: | Driver | |
| Pre-conditions: | * Driver wants to park-in. * There are available slots in the garage. | |
| Post-conditions: | Driver parks-in | |
| Flow of events: | **User Action** | **System Action** |
| 1-Driver wants to park-in. |  |
|  | 2-System check for available slots. |
| 3- Driver enters the details of the vehicle [Model Name, Unique Identification Number, Model year and Vehicle Dimensions (vehicle width and depth)] |  |
|  | 4-System save user data. |
|  | 5-System generates an ID to the driver vehicle and display it to the driver. |
| 6- Driver receives the id generated by the system |  |
|  | 7- System displays a menu for the user to choose [1. Park-IN 2. Park-OUT 3. Display Available Slots] |
| Exceptions: | None | |
| Includes: | None | |
| Notes and Issues: | Parking application should provide security on driver’s data. | |

## Use Case Tables

|  |  |  |
| --- | --- | --- |
| Use Case ID: | CASE\_002 | |
| Use Case Name: | Park-IN->**First-In-First-Served Approach** | |
| Actors: | Driver | |
| Pre-conditions: | * Driver should have entered the details of the vehicle [Model Name, Unique Identification Number, Model year and Vehicle Dimensions (vehicle width and depth) ] and the system should have identified it * System generates an ID to the driver. * System displays a menu for the driver to choose. | |
| Post-conditions: | * Driver should be able to park his vehicle using First-In-First-Served Approach. * System should mark the arrival time of the vehicle. | |
| Flow of events: | **User Action** | **System Action** |
| 1- Driver chooses choice 1 (Park-IN) |  |
|  | 2- System receives the response  3- System checks if there is an available slots in the garage  4- System uses the First-In-First-Served Approach to search for the first free available slot from the parking garage slots  5- System finds the available slot and displays it to the driver |
| 6- Driver parks his vehicle in the slot selected by the system |  |
|  | 7- System marks the arrival time of the vehicle |
| Exception (1): | **User Action** | **System Action** |
| 1- Driver chooses choice 1 (Park-IN) |  |
|  | 2- System receives the response  3- System checks if there was available slots in the garage  4- System finds no available slots and displays “No Available Slots” message to the user |
| Includes: | CASE\_001 | |
| Notes and Issues: |  | |

|  |  |  |
| --- | --- | --- |
| Use Case ID: | CASE\_003 | |
| Use Case Name: | Park-IN🡪**Best fit approach** | |
| Actors: | Driver | |
| Pre-conditions: | System identifies the vehicle | |
| Post-conditions: | Driver parked the car in the returned slot | |
| Flow of events: | **User Action** | **System Action** |
| 1- Driver chooses choice 1 (Park-IN) |  |
|  | 2-System search in all available slots for the slot with minimum dimensions that can carry the vehicle. |
|  | 3- System displays slot number that fit the vehicle to driver. |
|  | 4- System assigns the vehicle to the slot. |
| 5- Driver park his vehicle in the slot that chosen by the system. |  |
|  | 6- System marks the arrival time of the vehicle |
| Exceptions: | **User Action** | **System Action** |
| 1- Driver chooses choice 1 (Park-IN) |  |
|  | 2- System search in all available slots for the slot with minimum dimensions that can carry the vehicle. |
|  | 3- System didn’t find available slot. |
| Includes: | CASE\_001 | |
| Notes and Issues: |  | |

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| --- | --- | --- |
| Use Case ID: | CASE\_004 | |
| Use Case Name: | Park-IN🡪**Display Available Slots** | |
| Actors: | Driver | |
| Pre-conditions: | None | |
| Post-conditions: | Driver should be able to display the available slots in the garage | |
| Flow of events: | **User Action** | **System Action** |
| 1- Driver enters the details of the vehicle [Model Name, Unique Identification Number, Model year and Vehicle Dimensions (vehicle width and depth)]. |  |
|  | 2- System receives the details of the vehicle  3- System generates an id for the vehicle  4- System displays a menu for the user to choose [1. Park-IN 2. Park-OUT 3. Display Available Slots] |
| 5- Driver chooses choice 3 (Display Available Slots) |  |
|  | 6- System receives the response  7- System displays the number of the available slots in the garage |
| Exceptions: | None | |
| Includes: |  | |
| Notes and Issues: |  | |

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| --- | --- | --- |
| Use Case ID: | CASE\_005 | |
| Use Case Name: | **Park-out** | |
| Actors: | Driver | |
| Pre-conditions: | * Driver should have entered the details of the vehicle [Model Name, Unique Identification Number, Model year and Vehicle Dimensions (vehicle width and depth) ] and the system should have identified it * System should have generated an ID for the driver. * Driver should already have parked in. | |
| Post-conditions: | * Driver successfully is able to initialize the park-Out process * System proceeds successfully in calculating the total fees for the specified ID. | |
| Flow of events: | **User Action** | **System Action** |
| 1- Driver chooses choice 2 (Park-OUT) |  |
|  | 2- System receives the response.  3- System requests the ID from the driver that was generated to the driver when Park-IN |
| 4- Driver enters the ID |  |
|  | 5- System receives the response  6- By using the ID entered, System displays to the driver the Departure Time.  7- System proceeds with calculating the total fees for the specified ID |
| Exceptions: | **User Action** | **System Action** |
| 1- Driver chooses choice 2 (Park-OUT) |  |
| 4- Driver enters the ID  6- Driver sends a report to complain about the wrong Departure Time displayed to him. | 2- System receives the response.  3- System requests the ID from the driver that was generated to the driver when Park-IN  5- System displays to the driver wrong Departure Time  7- System responds to the complaint and fixes the problem and displays to the user the right Departure Time  8- System proceeds with calculating the total fees for the specified ID |
| Includes: | CASE\_002 , CASE\_003 | |
| Notes and Issues: |  | |

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| --- | --- | --- |
| Use Case ID: | CASE\_006 | |
| Use Case Name: | **Calculate Fees** | |
| Actors: | * Driver | |
| Pre-conditions: | * Driver should already park out | |
| Post-conditions: | * Fees calculated successfully | |
| Flow of events: | **User Action** | **System Action** |
|  | 1- System calculates the total fees for the specified ID |
|  | 2- System displays the calculated total fees to pay |
| 3-Driver confirms the shown amount |  |
|  | 4- System receives the confirmation and asks the Driver for the payment method to begin the payment process |
| Exceptions: | None | |
| Includes: | CASE\_005 | |
| Notes and Issues: |  | |

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| --- | --- | --- |
| Use Case ID: | CASE\_007 | |
| Use Case Name: | **Payment Method(Cash)** | |
| Actors: | * Driver * Garage Owner | |
| Pre-conditions: | * System should have calculated the total fees * Driver should choose “Cash” as payment method | |
| Post-conditions: | * Payment is done successfully * Driver can leave the garage. | |
| Flow of events: | **User Action** | **System Action** |
|  | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”] |
| 2- Driver chooses the “Cash” as the payment method |  |
|  | 3- By using the ID, System displays the calculated total fees to pay. |
| 4-Driver pays the shown amount. |  |
|  | 5- Garage Owner collects the money from the driver. |
| Exceptions: | None | |
| Includes: | CASE\_006 | |
| Notes and Issues: |  | |

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| --- | --- | --- |
| Use Case ID: | CASE\_008 | |
| Use Case Name: | **Payment Method (Credit Card)** | |
| Actors: | * Driver * Credit Card Provider | |
| Pre-conditions: | * System should have calculated the total fees * Driver should choose “Credit Card” as payment method | |
| Post-conditions: | * Payment is done successfully * Driver can leave the garage. | |
| Flow of events: | **User Action** | **System Action** |
|  | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”] |
| 2- Driver chooses the “Credit Card” as the payment method |  |
|  | 3- System request from the Driver to enter the credit-card number and the password. |
| 4- Driver enters the credit-card number and the password |  |
|  | 5- System verify the credit-card number and the password by communicating with The Credit Card Service (Bank Provider). |
|  | 6- System displays the confirmation to the driver about the payment. |
| 7- Driver confirms the payment |  |
|  | 8- System displays ”Payment done successfully” message |
| 9- Driver leaves the garage. |  |
| Exception (1): | **User Action** | **System Action** |
| 2- Driver chooses the “Credit Card” as the payment method  4- Driver enters the credit-card number and the password.  7- Driver restarts the payment process. | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”]  3- System request from the Driver to enter the credit-card number and the password.  5- Credit card number is invalid and System request from driver to enter the Credit card number for 4 times till the driver enter the right number, if Driver enters 4 wrong numbers System should restart all payment process.  6-Password is invalid and System request from driver to enter the Password for 4 times till the driver enter the right Password to communicate with The Credit Card Service, if Driver enters 4 wrong Passwords System should restart all payment process and refuse this payment process. |
| Exception (2): | 2- Driver chooses the “Credit Card” as the payment method  4- Driver enters the credit-card number and the password.  8- Driver chooses another method to complete the payment. | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”]  3- System request from the Driver to enter the credit-card number and the password.  5- System cannot communicate with Credit Card Service because of signal issues and cannot verify the credit-card number and the password.    6- Parking System retry to communicate with Credit Card Service for 3 times.  7- After trying to communicate with Credit Card Service for 3 times, System suggest to the Driver to enter another credit card System suggest another Payment Method. |
| Exception (3): | 2- Driver chooses the “Credit Card” as the payment method  4- Driver enters its credit-card number and the password.  8- Driver choose one of the suggestions to complete the payment process. | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”]  3- System request from the Driver to enter the credit-card number and the password.  5- System verify credit-card number and the password by communicating with The Credit Card Service (Bank Provider).  6- The Credit Card has not enough money for payment process and The Credit Card Service (Bank Provider) communicated with System about this issue.  7- System displays to the driver that there's not enough money in the credit-card and suggest another payment method (like External-Service Method) or insert another credit card. |
| Includes: | CASE\_006 | |
| Notes and Issues: |  | |

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| Use Case ID: | CASE\_009 | |
| Use Case Name: | **Payment Method (Fawry Service)** | |
| Actors: | * Driver * Fawry Provider | |
| Pre-conditions: | * Driver should already park out * Driver should choose “Fawry Service” as payment method | |
| Post-conditions: | * Payment is done successfully * Driver can leave the garage | |
| Flow of events: | **User Action** | **System Action** |
|  | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”] |
| 2- Driver chooses the “Fawry Service” as the payment method |  |
|  | 3- System displays the calculated total fees to pay. |
|  | 4- System displays the confirmation with the driver about the payment |
| 5- Driver confirms the payment |  |
|  | 6- System displays ”Payment done successfully” message |
| 7- Driver leaves the garage. |  |
| Exceptions: | **User Action** | **System Action** |
|  | 1- System asks for the payment method[“Cash” , “Credit Card” , “Fawry”] |
| 2- Driver chooses the “Fawry Service” as the payment method |  |
|  | 3- System is unable to connect with Fawry service. System tries to communicate with Fawry service for 3 times.  4- After trying to communicate with Fawry Service for 3 times, System asks the Driver to choose another Payment Method. |
| 5- Driver Chooses another method to complete the payment. |  |
| Includes: | CASE\_006 | |
| Notes and Issues: |  | |

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| Use Case ID: | CASE\_010 | |
| Use Case Name: | **Display Income & No. of vehicles** | |
| Actors: | Garage owner | |
| Pre-conditions: | None | |
| Post-conditions: | Total income and no. of vehicles at given time displayed to garage owner | |
| Flow of events: | **User Action** | **System Action** |
| 1- Garage Owner enters the time needed to see the total income and no. of vehicles for the specified time. |  |
|  | 2- System validate the entered time. |
|  | 3- System calculate total income at this given time. |
|  | 4- System calculate no. of vehicles at this given time. |
|  | 5- System display total income and no. of vehicles. |
| 6- Garage Owner view the total income and no. of vehicles. |  |
| Exceptions: | **User Action** | **System Action** |
| 1- Garage Owner enters the time needed to see the total income and no. of vehicles. |  |
|  | 2- System validate entered time.  3- System reject this time.  4- System displays” Enter the time again” message. |
| Includes: |  | |
| Notes and Issues: |  | |

# Ownership Report

|  |  |
| --- | --- |
| **Item** | **Owners** |
| Use case diagram | Sherif Hassan, Kareem Waleed, Mahmoud Nader, Hussein Mohamed El-Morsy |
| Introduction, Requirements | Sherif Hassan, Kareem Waleed, Mahmoud Nader, Hussein Mohamed El-Morsy |
| Park-IN🡪**Display Available Slots** | Kareem Waleed |
| Park-IN->**First-In-First-Served Approach** | Kareem Waleed |
| **Park-out** | Mahmoud Nader |
| **Payment Method (Credit Card)** | Mahmoud Nader |
| Park-IN🡪**Best fit approach** | Sherif Hassan |
| **Display Income & No. of vehicles** | Sherif Hassan |
| **Identify Vehicle** | Hussein Mohamed El-Morsy |
| **Payment Method (Fawry Service)** | Hussein Mohamed El-Morsy |

# Policy Regarding Plagiarism:

1. تشجع الكلية على مناقشة الأفكار و تبادل المعلومات و مناقشات الطلاب حيث يعتبر هذا جوهريا لعملية تعليمية سليمة
2. ساعد زملاءك على قدر ما تستطيع و حل لهم مشاكلهم فى الكود و لكن تبادل الحلول غير مقبول و يعتبر غشا.
3. أى حل يتشابه مع أى حل آخر بدرجة تقطع بأنهما منقولان من نفس المصدر سيعتبر أن صاحبيهما قد قاما بالغش.
4. قد توجد على النت برامج مشابهة لما نكتبه هنا أى نسخ من على النت يعتبر غشا يحاسب عليه صاحبه.
5. إذا لم تكن متأكدا أن فعلا ما يعد غشا فلتسأل المعيد أو أستاذ المادة.
6. فى حالة ثبوت الغش سيأخذ الطالب سالب درجة المسألة ، و فى حالة تكرار الغش سيرسب الطالب فى المقرر.