
Software Requirements Specification

PARKING MANAGEMENT SYSTEM

Version 1.0 approved

Prepared by :

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1. Introduction:

1.1 Purpose:

The purpose of this 'Parking Management system' is to provide an alternative solution to the clients an innovative parking facility. Since most of the public places do not have a proper parking facility, we intend to provide a solution for this problem by accommodating a proper parking space along with security devices to monitor the movement of vehicles. Number plates will be recognized for maintaining a list of vehicles that have been entered or exist in a parking space.

1.2 Documentation Convention:

The IEEE template for System Requirement Specification Documents was used to construct this document.

1.3 Intended Audience and Reading Suggestions:

Developers: to ensure that they are working on the proper project that meets the requirements outlined in this document.

Testers: to create an exact list of the features and functionalities that must respond in accordance with the requirements and diagrams given.

Users: to become acquainted with the project's concept and to offer additional improvements that would make it more functional. Any organization, institution or industry's stakeholder might need to have a read.

1.4 Scope:

A vehicle parking management system is an automated system that processes data at a rapid rate and in a methodical manner. Parking is becoming more and more of a need. This system's development is extremely beneficial in this industry. This system can be sold to any company. They may effortlessly keep track of their records by using our system. Every aspect of parking management is covered by our system. Vehicle parking management systems will be in high demand in the future because of rapid urbanization every organization would be needing this system to provide an efficient method of parking in their premises.

1.5 References:

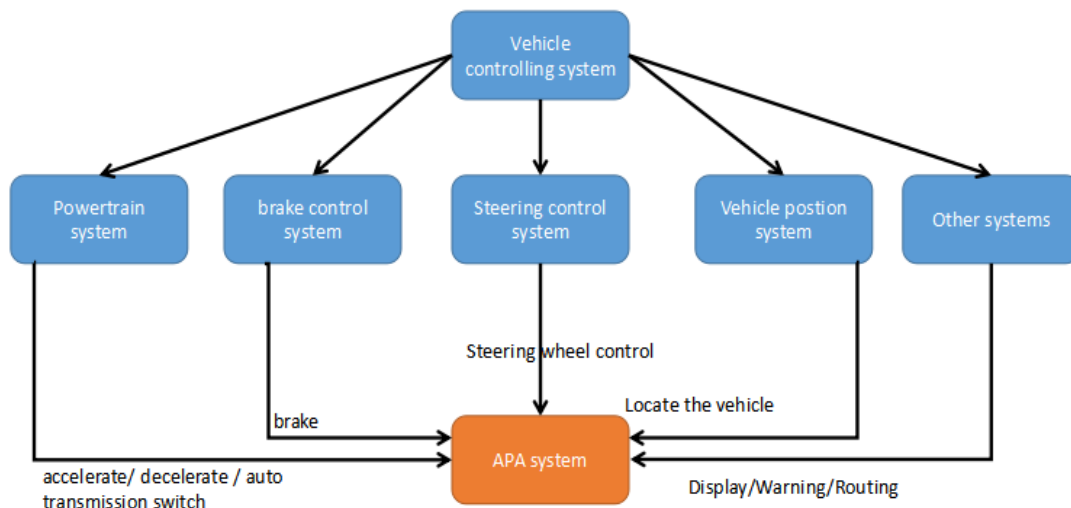
https://www.academia.edu/36410792/Parking_Management_System_Parking_Management_System

http://www.gmu.edu/schools/vse/seor/studentprojects/graduate/2008Fall/Parking/PARKme_SRS.docx

2. Overall Description:

2.1 Product Perspective:

This product is specially made to automate the parking system. It is a subsystem of a car's control system that assists the driver in automatically parking the vehicle. To achieve the goal of automatically parking the car throughout the operation, it will interface with many subsystems and hardware. The hardware and subsystems include the powertrain management subsystem, braking control subsystem, steering control subsystem, vehicle position subsystem, and various auxiliary systems.



2.2 Product Function:

Vehicle positioning, cruise control, and multidirectional scanning are all features of the system. When choosing features, the parking system should have the ability to find a parking spot based on parking preferences, compute the vehicle's parking trajectory, auto park, cancel/abort parking, and identify obstacles or approaching pedestrians. This system can upgrade its controlling software and can also interact with the driver via the HMI on a software level. Along with that, it will save the driver's data too like the number plate of the car and the image of the driver.

2.3 User Classes and Characteristics:

To implement the system, different classes were made according to requirements.

User: The driver of the vehicle can be of different categories. Like the ones who visit that parking space regularly, or those who are visiting that free slot of space for the very first time. The driver must have a driving license and must have an idea of an automated parking system. The driver must be alert in case of emergency situations where one is to exit quickly as possible.

2.4 Operating Environment:

- It will run on
- Window 8, 10, 11
- Linux
- Mac Os

2.5 Design and Implementation Constraints:

- Different governmental rules govern parking system testing and functionality.
- The vehicle is equipped with sensors and cameras.
- The sensors and cameras are in the right place.

- The touch screen is precise and sensitive.
- The display on the screen is in good working order.
- The brakes on your car are in good working order.
- To meet the trajectory, the connection to Pre-collision System is secure and open.
- The steering wheel is completely free of any obstructions.
- The connection to PCS is safe and open, allowing you to steer as needed to stay on track.

2.6 Assumption and Dependencies:

- The hardware is compatible with the vehicle.
- The driver can determine whether the parking space found is suitable for parking.
- The parking class's search function locates valid parking spots.
- Perpendicular parking requires a vehicle that is less than 8.5 feet wide.
- Side by side parking spaces is available that is 2 times the length of the car.
- Human-machine interface is quick to respond and precise.
- The sensors are responsive, accurate, and precisely aligned.
- The camera vision is clear and correctly oriented.

3. External Interface Requirements:

3.1 User interface:

The application will provide a visual feature to describe the parking space. User will enter his car id in parking area system and activate Auto parking system of his car. System will give a confirmation message to the user if all requirements are full filled. The admin will operate the system and give directions of available parking space.

3.2 Hardware Interfaces:

The system will take control of the sensors/steering wheel/brake through the subsystems such as Sensor Control System/Steering Control System/Brake Control System. An external camera will be detecting car registration number and face of driver. A scanner will be detection parking space and drivers license.

3.3 Software Interfaces:

The system interacts with the driver via the HMI. The touch screen has buttons that allow the driver to start recognizing the parking space or cancel the parking process. HMI displays images during the parking process.



3.4 Communication Interfaces:

The communication interface is a local area network through Ethernet to link all the systems with each other to operate the software.

4. System Features:

The system has vehicle positioning, cruise control, and omnidirectional scanning capabilities. During the options selected by system, the system identifies parking spaces based on parking preferences, calculates the vehicle's parking trajectory, automatically parks, cancels / cancels parking, and assigns obstacles. Or it must have a feature that makes it recognizable to pedestrians. At the software level, the System system has the ability to update its control software and can also interact with the driver via the HMI.

5. Functional Requirements:

1. Park system activated through the documentary system. This will be the only way to turn on.
2. The Human Machine Interface (HMI) is also in the documentary system, which is an 8-inch touch screen in the vehicle.
3. This will display system's state, prompt and receive inputs from the driver, and allow driver to abort the system at any time.
4. Communication between system and HMI must be encrypted to prevent malicious attempts to control the vehicle.
5. The System needs to be able to detect the status of sensors and cameras.
6. If a faulty sensor or camera is detected, System will alert the Driver of the problem through and the management.
7. HMI and System will be disabled until there are no faults detected.
8. In the HMI, there will be two parking options:
 - i. Parallel parking
 - ii. Perpendicular parking.
9. Front and rear cameras will be used to identify parking spots.
10. Ultrasonic sensors, mounted on both sides of the vehicle (front, midsection, and rear), will be used to identify parking spots.
11. System will notify the driver through the HMI, along with an beep sound, when a parking spot is found.
12. The driver will verify the parking spot through the HMI after System has found one.
13. In the HMI, the trajectory of the vehicle will be displayed to the driver.
14. System will not start parking until the driver has accepted the action through the HMI.

15. System will take control of the vehicle when the driver has verified the parking spot.
16. System will shift the transmission between drive and reverse as needed to match the verified trajectory.
17. System will brake as needed to match the verified trajectory.
18. System will turn the steering wheel as necessary to meet the verified trajectory.
19. Radar/cameras will be used during System to prevent collisions.
20. The driver may cancel System by braking, obstructing the steering wheel, or by hitting 'abort' through the HMI.
21. System will turn off once the vehicle has parked successfully.
22. If an obstacle is detected in the parking lane (while the car is parked), the system will stop the vehicle, park the vehicle and turn it off automatically
23. It will leave a notification for the driver through the HMI of why the system was turned.
24. System will include visual and audible prompts when the system is interrupted to alert the Driver.

6. Non-Functional Requirements:

6.1 Performance Requirement:

System Maintenance is a modification of the software product after delivery to Correct faults. Improve the performance or other attributes. Adapt the product to the change the environment.

6.2 Security Requirement:

The system must detect the original drivers identity when entering the parking lot and when leaving it. The driver is required to give the payment when leaving the area through HMI on exit. Make sure that original driver is present in the vehical at the time of exit.

6.3 Portability:

The system can be installed in every public parking area so problem of accommodating a proper parking space along with security is solved easily.

6.4 Performance Requirements:

- Secure access of confidential data (user's details).
- Maximum time availability.
- Better component design to get efficiency at peak time.
- Exception Handling.

Included Artifacts:

I. Stakeholder Identification and Classification

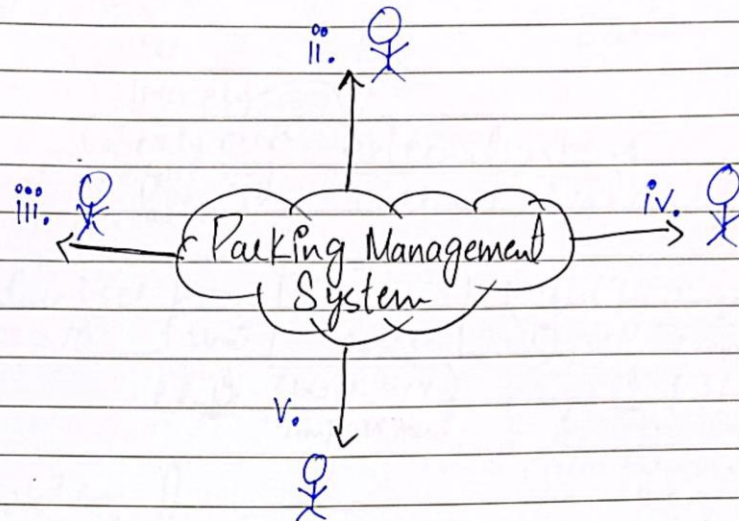
Stakeholder Identification:	
<ul style="list-style-type: none">• Pedestrians• Cyclist• Public transport user	i
<ul style="list-style-type: none">• Residents• Commuters• Employees• Travellers• Shoppers• Visitors	ii
<ul style="list-style-type: none">• Retailors• Financiers to developers• Developers• Architects• Professional Associations.	iii
<ul style="list-style-type: none">• Public transport provider• Parking operators• Parking entrepreneur• Technology providers• Parking Enforcers	iv
<ul style="list-style-type: none">• Transport/City Planner.• Traffic Engineers.	v
Stakeholder Classification.	
i- Non-user	
ii- User	
iii- Local business sector	
iv- Parking Industry	
v- Government officials	

II. Stakeholder Analysis

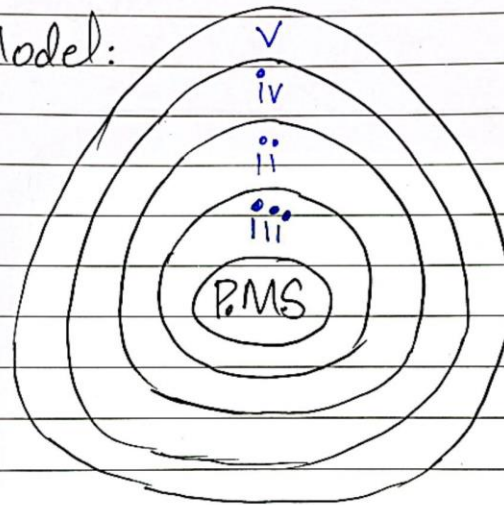
First-order category	Second-order category	Description
1.0 Car parking goals according to stakeholder levels	1.1 Individual level	This level refers to both non-consumer and consumer individuals such as pedestrians, public transport users, commuters and shoppers.
	1.2 Organisational level	This level refers to the non-consumer, consumer and supplier groups of stakeholders who have come together in an organised way. For instance, residents are individual consumers who may belong to an association specifically formed to campaign for a better community environment. Other organisational level groups may include chambers of commerce who act on behalf of the business community, or groups who campaign for retailer etc.
	1.3 Governmental level	This level refers to all government levels, including both national and local authority, and includes the range of different roles employed within those levels that parking touches, such as city planners and traffic engineers
2.0 Stakeholder prioritisation	2.1 Issue and context dependent	The prioritisation of stakeholders can vary according the both the issue and context at hand
	2.2 In parallel with local authority objectives	Stakeholders with interests connected to local authority objects are often prioritised over others with different aims
	2.3 The vociferous	Individuals acting alone or in groups, usually campaigning to protect their own parking interests
3.0 Stakeholder interaction with process	3.1 A vague process	Very few structures aimed at engaging stakeholders in the decision making process seem to be in place. Responsibility for stakeholder engagement seems to lie with either the stakeholder or the local authority
	3.2 Varies according to place in group and dimensional level	When stakeholders do engage in parking, the ways can vary depending on their place in the stakeholder groups and their dimensional level (individual, organisational or governmental)
	3.3 Complaints	Parking issues are often raised initially as a complaint, often by the user
	3.4 The media	Parking issues are often raised through media channels
	3.5 As part of a long term strategic plan or vision	where cities use parking to help achieve a long term strategic plan or vision, stakeholder engagement may become part of the process
4.0 Stakeholder perspectives of car parking	4.1 Insufficient understanding	Mostly, measures of stakeholder satisfaction are deficient, absent or unknown. Indicators of dissatisfaction are driven through stakeholder complaint, or observations of parking availability or accessibility
	4.2 Discrete perspectives	Stakeholder perspectives of parking issues do not usually take other stakeholder perspectives into account
	4.3 Consideration of other stakeholder perspectives	Consideration of other stakeholder perspectives of parking is usually given only in cases where financial gain is under deliberation
	4.4 Limited and lacking in knowledge	Stakeholder perceptions of parking issues are unlikely to be based on either thoroughly understood research or intelligence
	4.5 Inadequate policies	Stakeholder perceptions of parking issues result in ineffectual policies
5.0 Barriers to stakeholder engagement	5.1 Incongruent stakeholders	As stakeholders are representative of different groups, barriers such as unequal power or unrelated goals are more likely to impact on their ability to engage
	5.2 Political sensitivity	As parking is an emotive topic it may be considered politically sensitive
	5.3 Lack of well-informed knowledge	Due to the complex nature of parking, parking policies are not fully understood. People are often unaware they are not fully informed resulting in a misguided approach to parking
	5.4 Apathy	An uninterested approach to parking serves as a barrier to engaging in parking decision making. Where engagement has been attentive, people have shown support for the policies implemented

III. Stakeholder Map, Onion Model & Interest-Power Grid

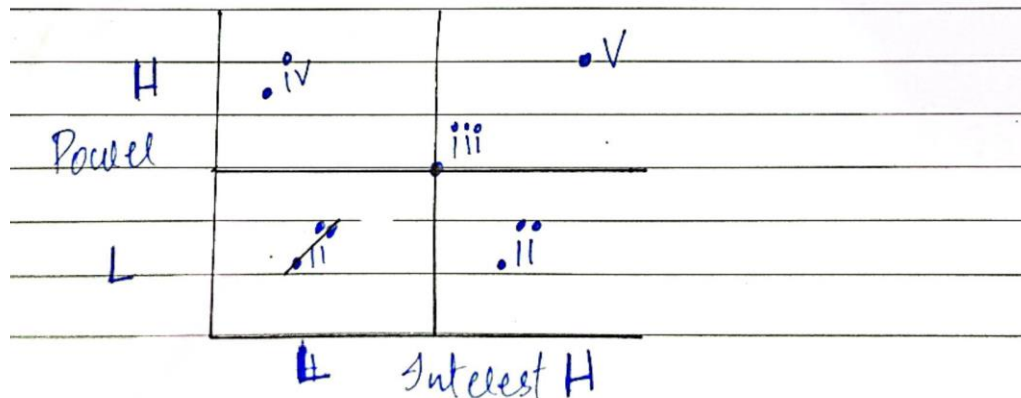
Stakeholder Map:



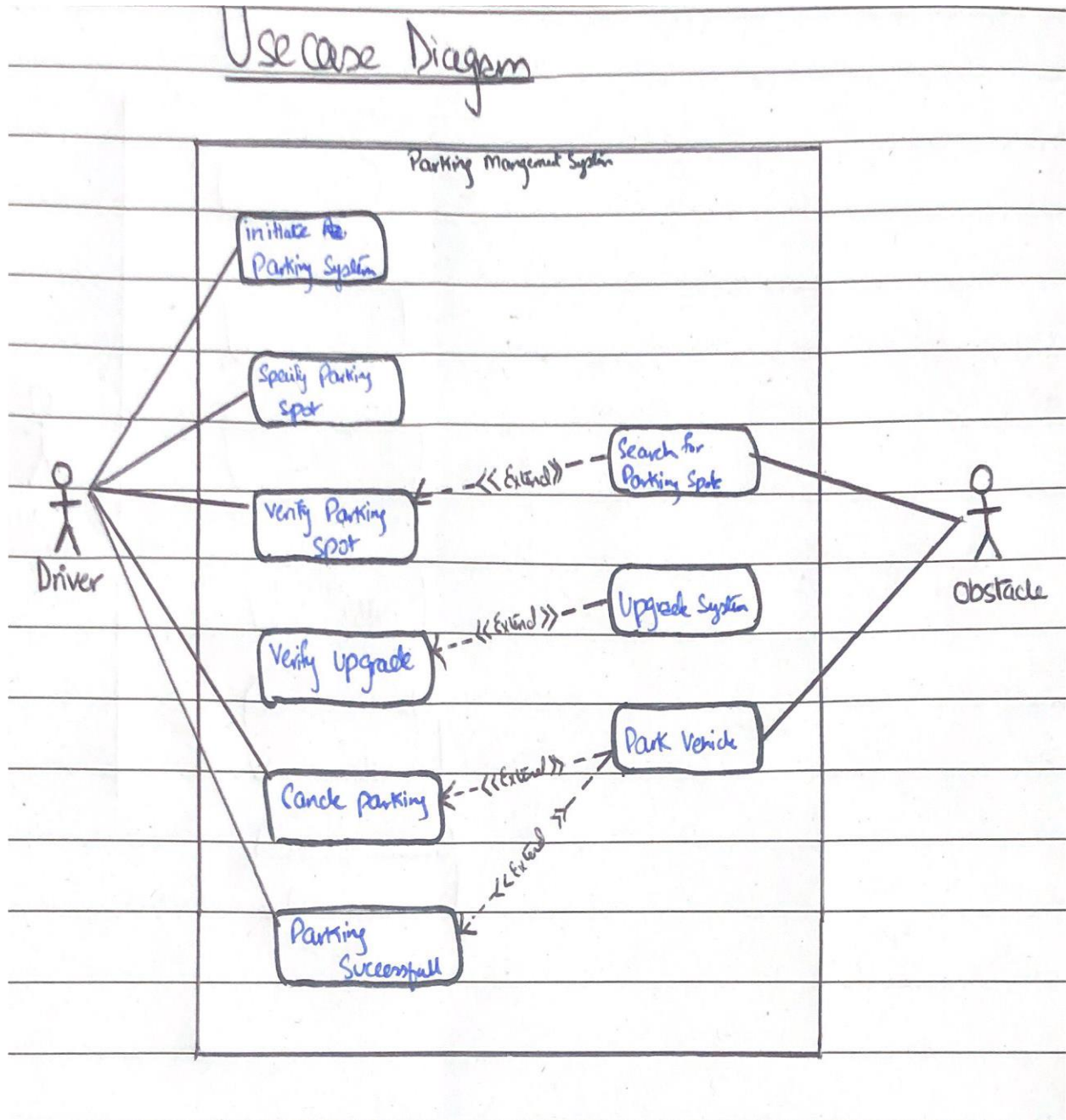
Onion Model:



Power Interest Grid.



IV. USE CASE Diagram



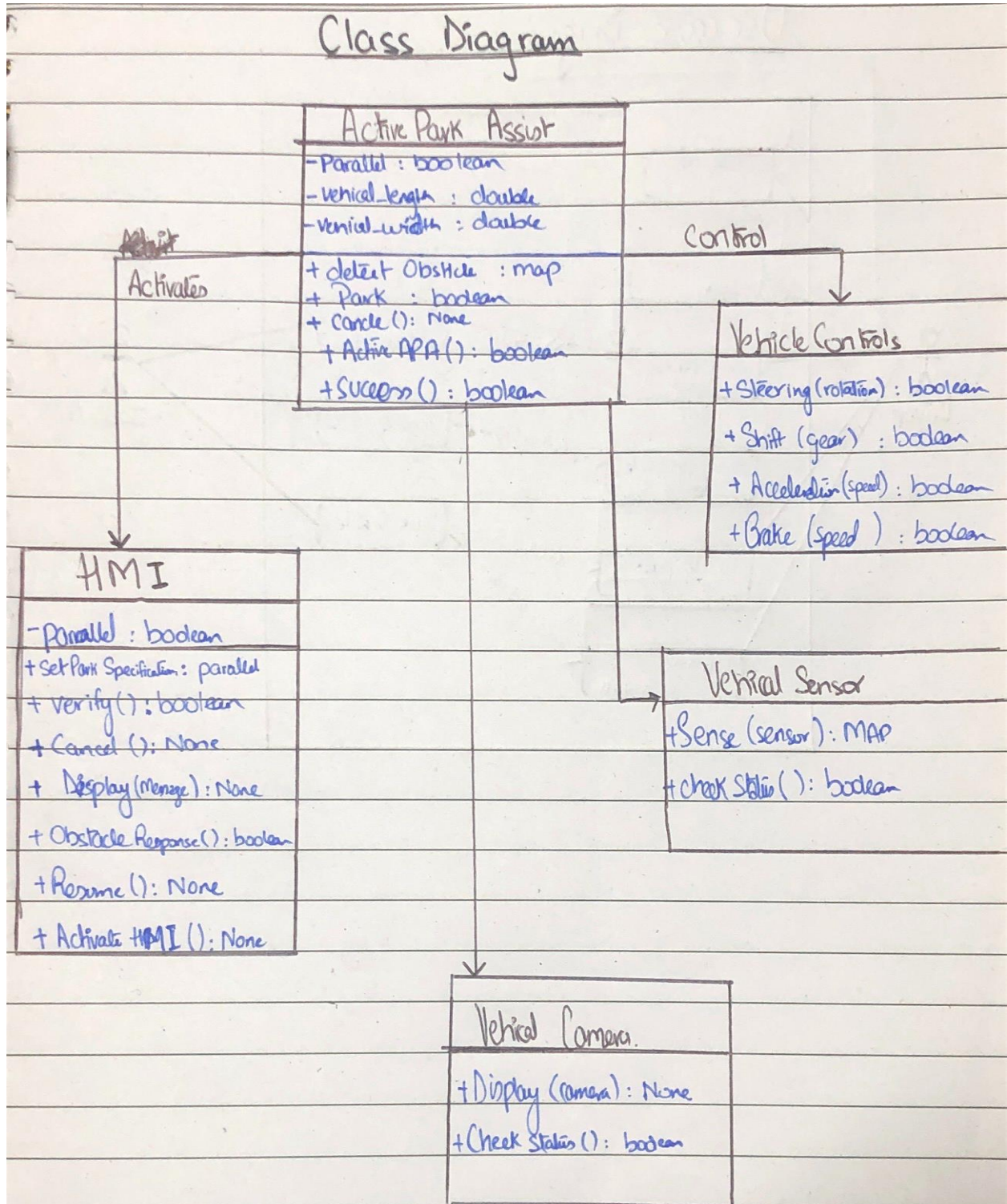
V. Interaction Matrix

Interaction Matrix

- R1) Driver must have his original license
- R2) Driver must know how to drive
- R3) Driver must have complete knowledge of system
- R4) Sensors and cameras are working properly
- R5) Drivers must select parking spot option ~~from considering~~
the length of the car vehicle before showing his license card.
- R6) Car functionalities ^{must} ~~are~~ working properly.
- R7) HMI must provide valid parking spot
- R8) HMI must be quick to respond and precise

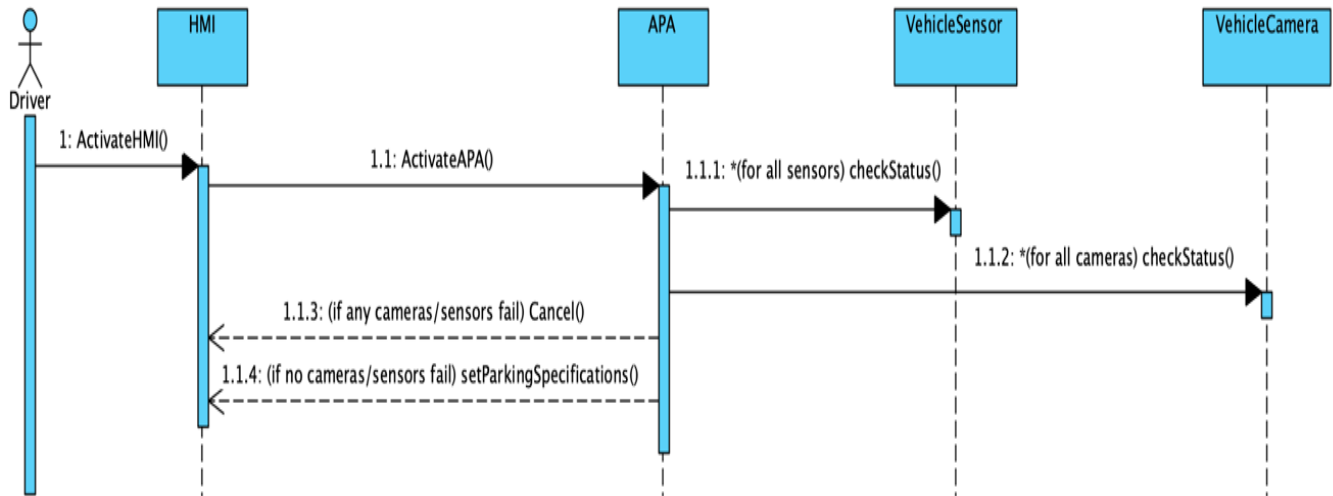
Requirement	R1	R2	R3	R4	R5	R6	R7	R8
R1	○	1000	○	○	○	○	○	○
R2	1000	○	○	○	○	○	○	○
R3	○	○	○	○	1	○	○	○
R4	○	○	○	○	○	○	○	○
R5	○	○	1	○	○	○	1000	1000
R6	○	○	○	○	○	○	○	○
R7	○	○	○	○	○	○	○	1000
R8	○	○	○	○	○	○	1000	○

VI. Class Diagram

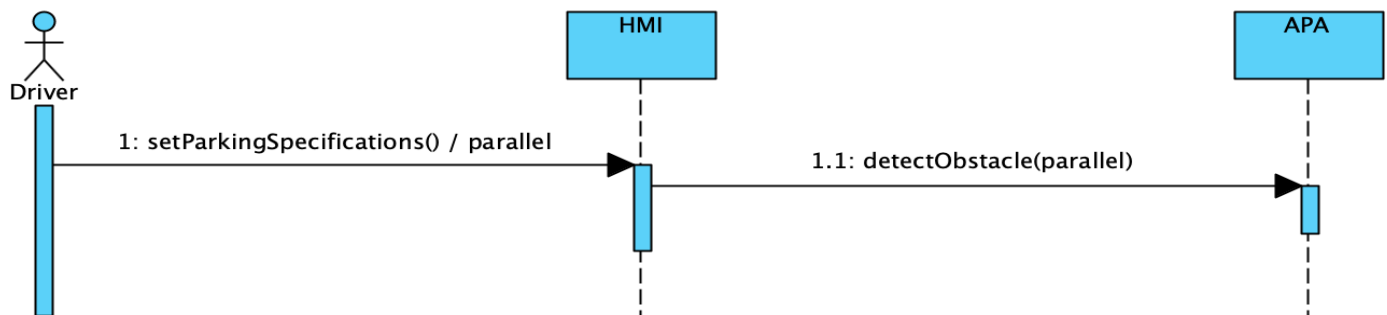


VII. Sequence Diagram

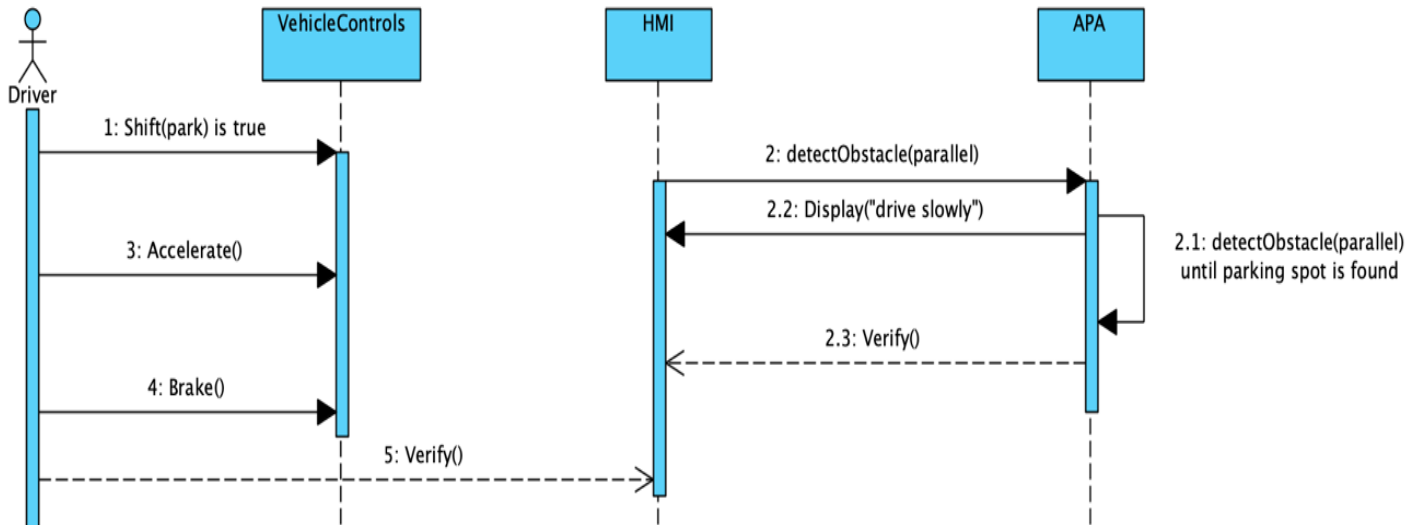
Initiate Parking System:



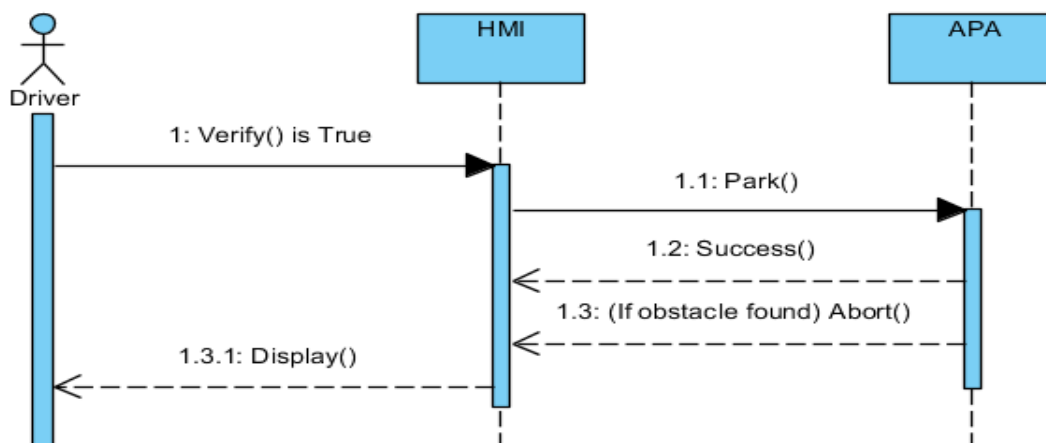
Specify Parking Preferences:



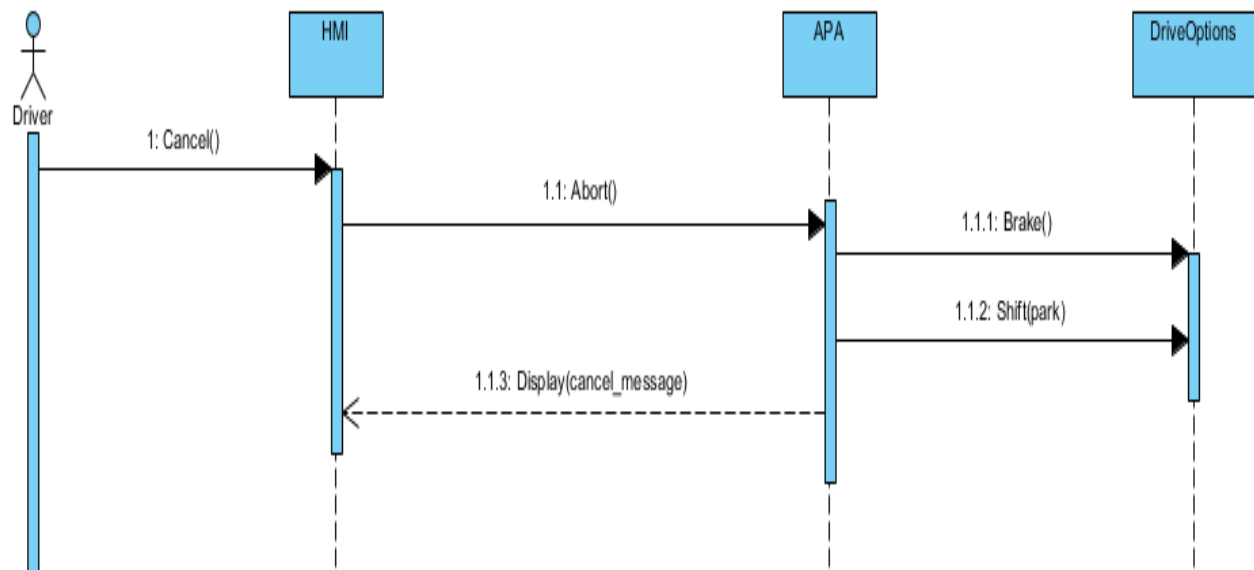
Search for Parking Spot:



Park Vehicle:



Cancel Parking:



Parking Successful:

