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Project report submitted to the

UNIVERSITY OF MOHAMED BOUDIAF – MSILA

FACULTY OF MATHMATICS AND COMPUTER SCIENCE
DEPARTEMENT OF COMPUTER SCIENCE

In partial fulfillment of the requirements for the degree of

License in **Computer science**

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Title of the project

A web application for cars rental agency management

Under the supervision of

Bahache Mohamed

Contents

General introduction

Although there are many cars in the world due to the advancement of technology and fierce competition from many automobile companies, some of the world's population still cannot own a car, the main reason for this is that car prices are too expensive compared to per individual income. this issue has led to the emergence of companies that provide car rental services but with time, some of these partnerships began to deteriorate, in addition to the decline in their position in the market, so that some of them reached the brink of bankruptcy, due to several factors, including poor management within the company, which led to the deterioration of the car condition, poor service returns due to inconsistency between the tasks of employees, judicial consequences due to the lack of permanent monitoring of car documents, in addition to customer complaints about the poor condition of cars, our project aims to solve this needs by providing a user-friendly online platform for renting vehicles.

Objectives

Our aim is to build a web application for the efficient operation of the company, ensuring the provision of the following services:

- Storing all information about cars, employees and the cutomers within the company, ensuring easy access and management of data.
- Creating accounts for employees to document their activities and track their performance.
- Tracking the timeline of the agency's activity, such as the status of cars and the percentage of revenues and expenses.
- Offering services to customers through the system, allowing them to make reservations, view available vehicles, and submit inquiries or feedback.

The project was divided into three chapters that explain our work. The first chapter explains the most important definitions that include the project, the second chapter presents the design of the our application, that were approved and the third chapter highlights the work environment and the most important means that were used to complete our project.

Chapter1 Agency Structure Analysis

1. Introduction

In this part, we will explore the services provided by the agency and its components, and we will identify the problems and difficulties facing the agency employees in accomplishing their job.

2. The definition of cars rental agency

A car rental agency, also known as a car rental company, is a company that provides vehicles for short-term rental periods, usually ranging from a few hours to a few days. These dealerships typically have a fleet of vehicles that customers can choose from based on their needs, such as economy cars, luxury cars, SUVs, and minivans.

3. Agency structure analysis

3.1 Company management department

In this department, several activities are carried out by the manager and his assistant regarding the cars and employees. We will explain them.

Recruiting employees after they are accepted and storing all their important information in the company's database.

Acquiring the car and listing it in the company database, specifying the conditions for renting the car and the duration of its use in the company.

3.2 Maintenance Department

At the level of this department, periodic maintenance of cars is carried out, such as changing the engine oil, and the damage to the car is also assessed at the end of the rental process ,also the car must cleaned and prepared for the customer.

3.3 Reception desk

The employee in this office settles the rental process from beginning to end with the customer. This process is explained in the sequence diagram in the second chapter.

3.5 Resources department

This section provides all the necessary resources for the company, such as: automobile spare parts, oils, wheels, and cleaning materials. The storekeeper works to acquire these materials based on the company's need for them.

4. Examples of car rental conditions

A car rental agency is subject to many conditions that vary from country to country and company to company. Generally, the vehicle must be returned in the condition in which it was rented, and must not exceed the mileage restrictions, on otherwise additional charges maybe incurred.

Some companies set the minimum and/or maximum rental age for insurance reasons. In some cases, the minimum age for leasing can reach 25, even in countries where the minimum legal age for a driver's license is much lower, for example 14, 15, 16 or 17 in the United States. It is fashionable to have an additional charge for young drivers under the age of 25.

The majority of car rental companies require the use of a credit card to charge an additional fee in case a defect is found in the car on its return, road tolls, for car fines.

5. Advantages of cars rental agency

- Convenience and Flexibility: Car rental agencies offer great convenience to customers who don't own a car or need a vehicle for a specific period, such as travel or vacations.
- Variety of Options: Rental agencies often provide a diverse range of cars in different sizes and styles, allowing customers to choose the vehicle that best suits their needs.
- Customer Service: Some car rental agencies excel in customer service, offering support and assistance around the clock to their clients.
- Flexible Costs: Renting a car might be significantly cheaper than buying a new or even a used car, and customers can return the car at any time without long term commitments" additional charges".

6. Conclusion

In this chapter's the main topic was agency structure analysis as it relates to rental cars. The definition of agency rental cars, a detailed analysis of its components, including agency employees and their assigned responsibilities, and documentation procedures were all examined in this research. the next chapter is reserved to present the design of our application.

Chapter2: Application design

1. Introduction

In this chapter, the program is designed, which is considered a basic stage that accurately describes the program using UML diagrams, which are: use case diagram, sequence diagram, and state diagram.

2. The definition of UML

The Unified Modeling Language (UML) was created to forge a common, semantically and syntactically rich visual modeling language for the architecture, design, and implementation of complex software systems both structurally and behaviorally. UML has applications beyond software development, such as process flow in manufacturing.

It is analogous to the blueprints used in other fields, and consists of different types of diagrams. In the aggregate, UML diagrams describe the boundary, structure, and the behavior of the system and the objects within it.

It is analogous to the blueprints used in other fields, and consists of different types of diagrams. In the aggregate, UML diagrams describe the boundary, structure, and the behavior of the system and the objects within it.[1]

3. The definition of UML diagrams

Here we focus only on three diagrams use case diagram and sequence diagram, class diagram.

Use case diagram: Represents a particular functionality of a system, created to illustrate how functionalities relate and their internal/external controllers (actors).[1]

Sequence diagram: Shows how objects interact with each other and the order of occurrence. They represent interactions for a particular scenario.[1]

Class diagram: The most commonly used UML diagram, and the principal foundation of any object-oriented solution. Classes within a system, attributes and operations and the relationship between each class. Classes are grouped together to create class diagrams when diagramming large systems.[1]

4. The presentation of UML diagrams

4.1 Use case diagram

Textual description of use case diagram

The use case and actor representation of the manager and mechanic are depicted in the automobile information storage system diagram. Working with vehicle documents and storing their data, the manager enters information about the vehicles. Not only that, but he can also update data on a regular basis or fix data entry errors, but all of this calls

for system login. An automobile must be inspected and its documentation verified by a mechanic before being purchased. See the figure (1).

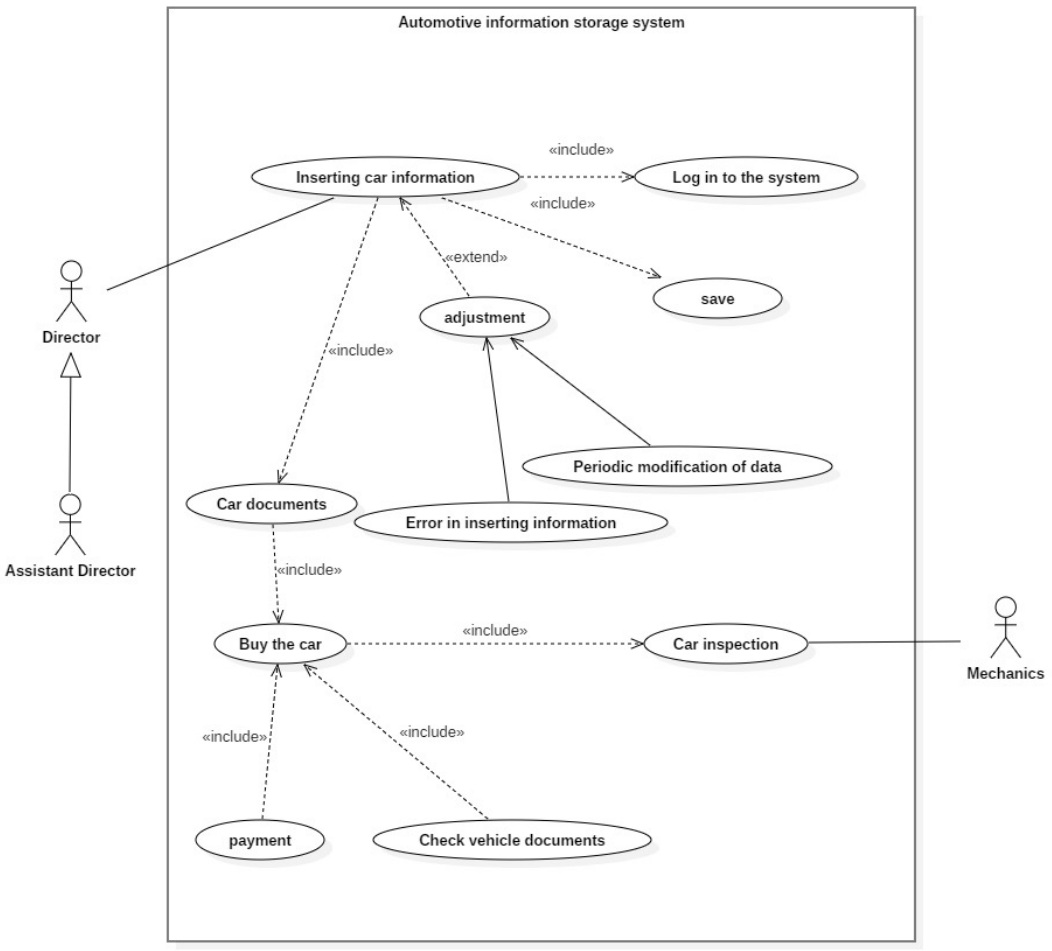

Figure 1: Use cas Diagram

Textual description of use case diagram

It displays a schematic of a system used to store personnel data. The manager and his helper enters data into the system and saves it, and works on entering personnel information. In addition to periodically altering data, it also enables him to fix errors in the case that inaccurate data is input. All of these operations include logging into the system. where the worker is given the chance to interview for a job with the company and receive an acceptance or rejection at the end. See the figure (2).

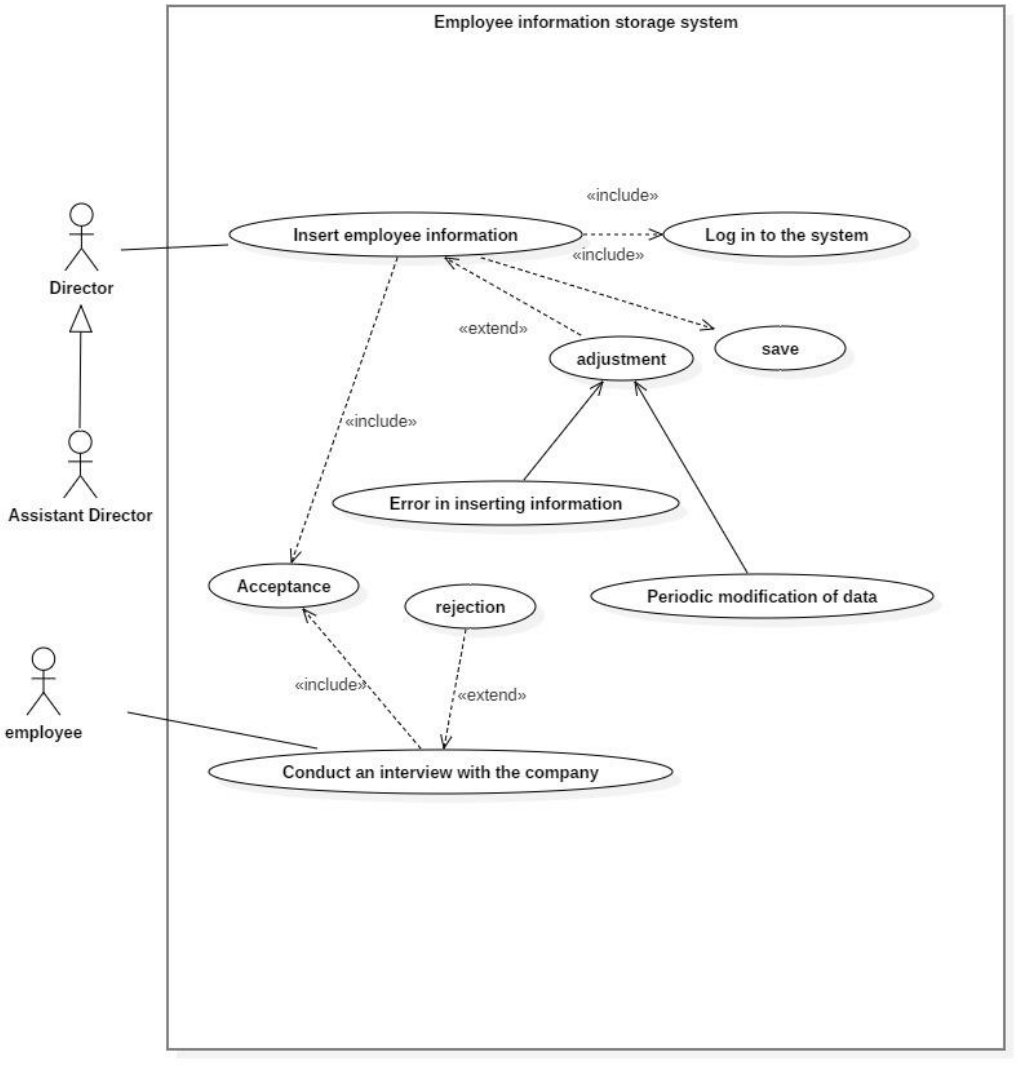

Figure 2: Use cas Diagram

Textual description of use case diagram

Officials offer the car for rent; the diagram depicts the vehicle display management system by managers. For this to happen, you'll need to log into the system and provide all of the registration car information, set rental limitations, have a mechanic check on the car's technical condition, and have the car cleaned. See the figure (3).

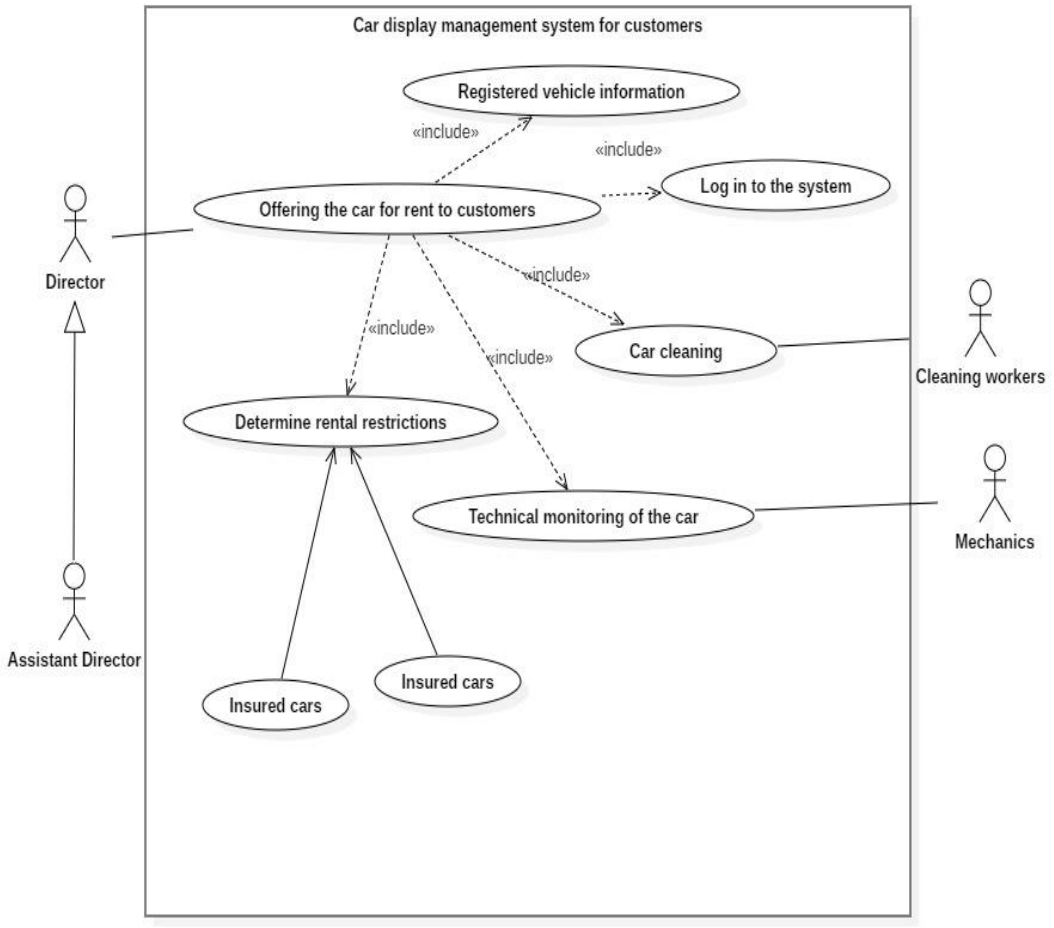

Figure 3: Use cas Diagram

Textual description of use case diagram

Employees can create private accounts, as seen in the system diagram below. The managers are responsible for making accounts for employees, which necessitates logging into the system in order to create an identity for the worker. See the figure (4).

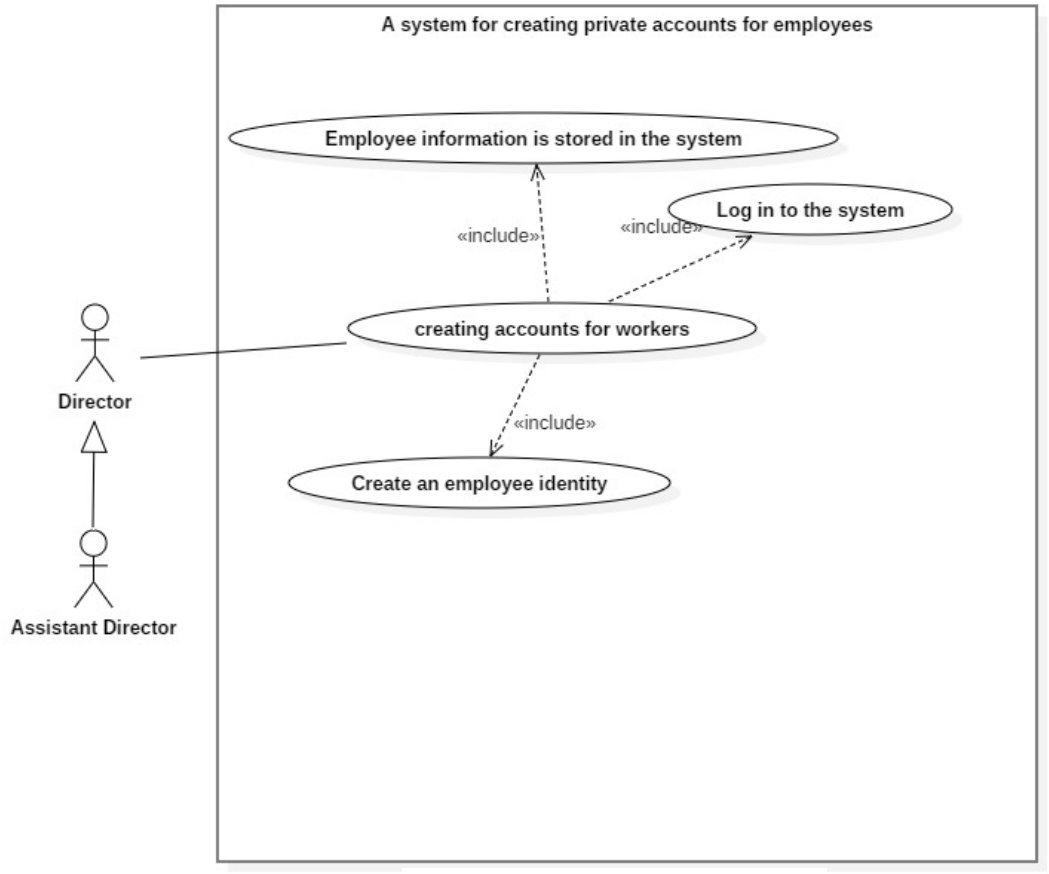

Figure 4: Use cas Diagram

4.2 Sequence diagram

The following sequence diagram explains how a car reservation system works. It visually illustrates the interactions between different actors, like the customer and the reception desk, and the system. These interactions allow users to make car reservations, identify themselves with required documents, and complete the reservation process.

Textual description of sequence diagram

The vehicle must pass the following inspections before it can be shown to clients: it must be clean, in working order, or have been rented. See the figure (5).

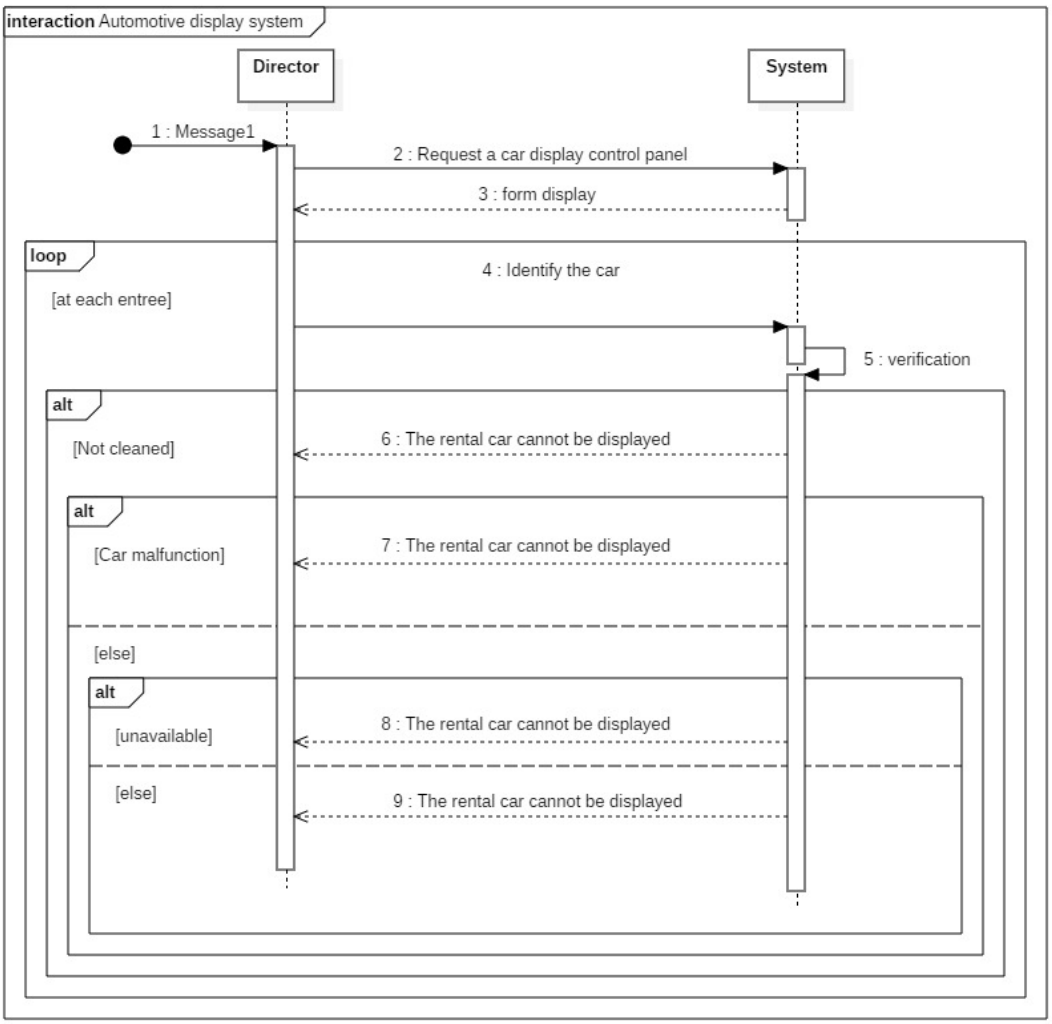

Figure 5 : Sequence Diagram

Textual description of sequence diagram

The information about the car in the system changes when its status changes, as illustrated in the diagram below, which shows how it goes from being available for hire to being unavailable. See the figure (6).

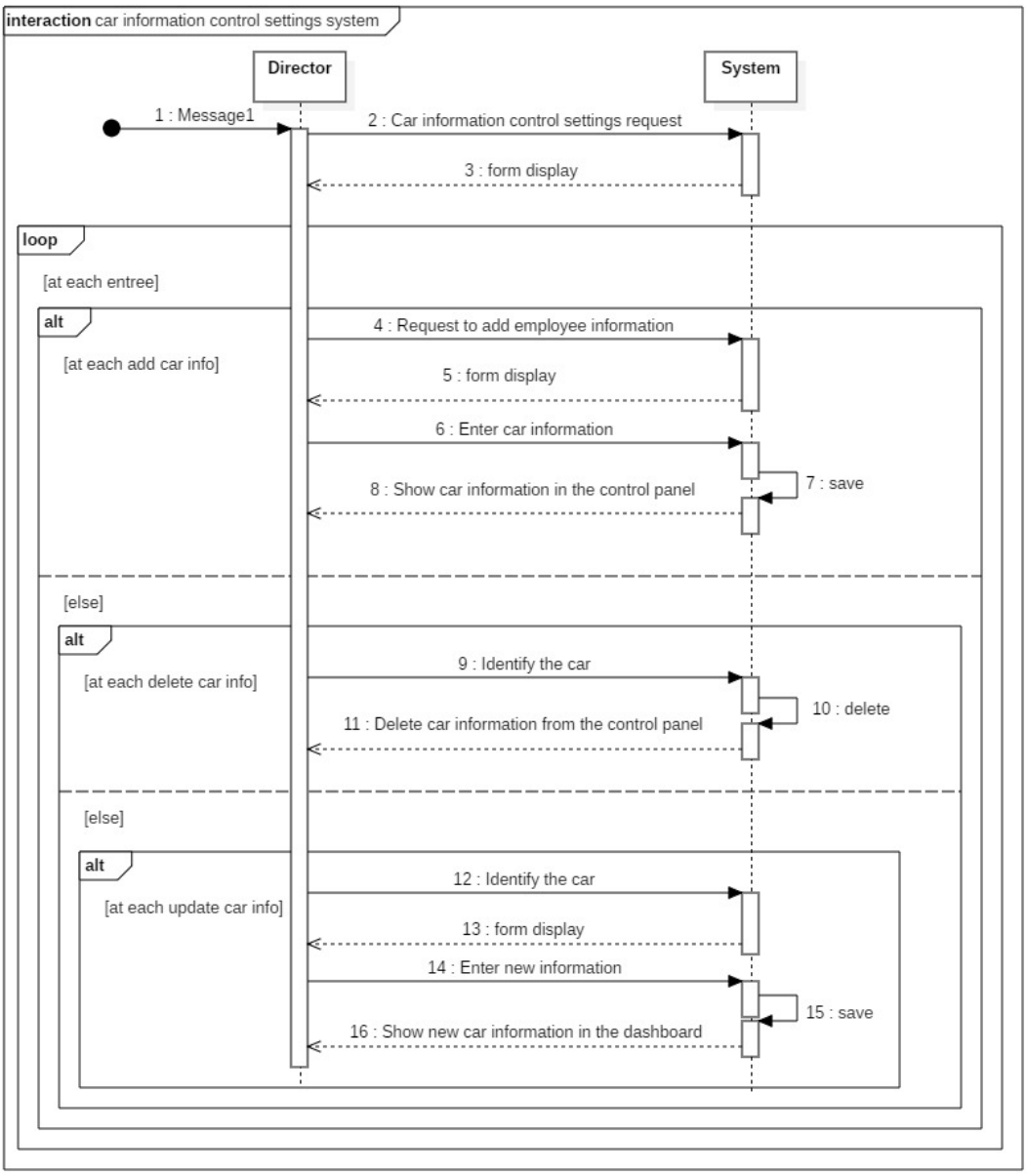

Figure 6 : Sequence Diagram

Textual description of sequence diagram

If the customer wants to reserve the car, they will need to provide certain paperwork and money. The following diagram illustrates how the reservation process works if the requirements are satisfied. See the figure (7).

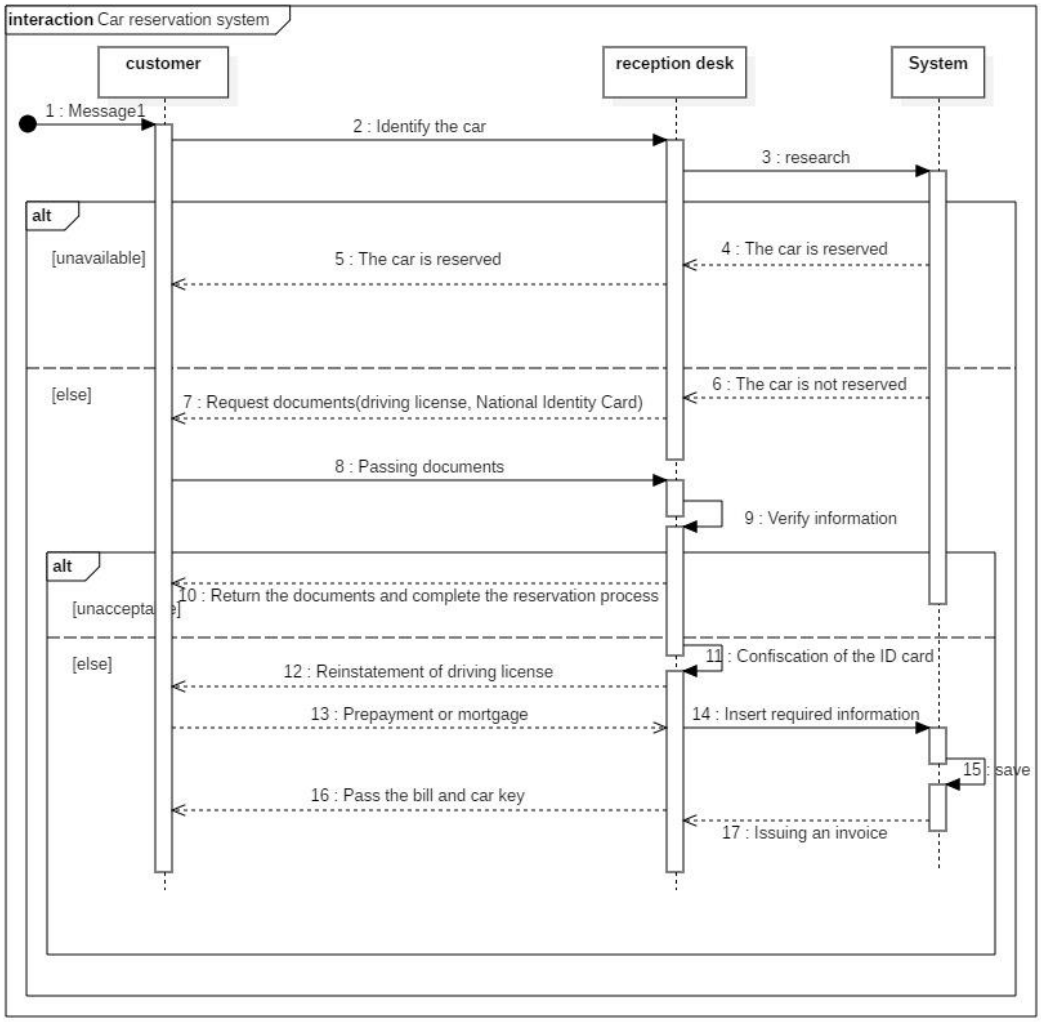

Figure 7 : Sequence Diagram

Textual description of sequence diagram

The information about customers and the changes that can be made to them is displayed in the current diagram. See the figure (8).

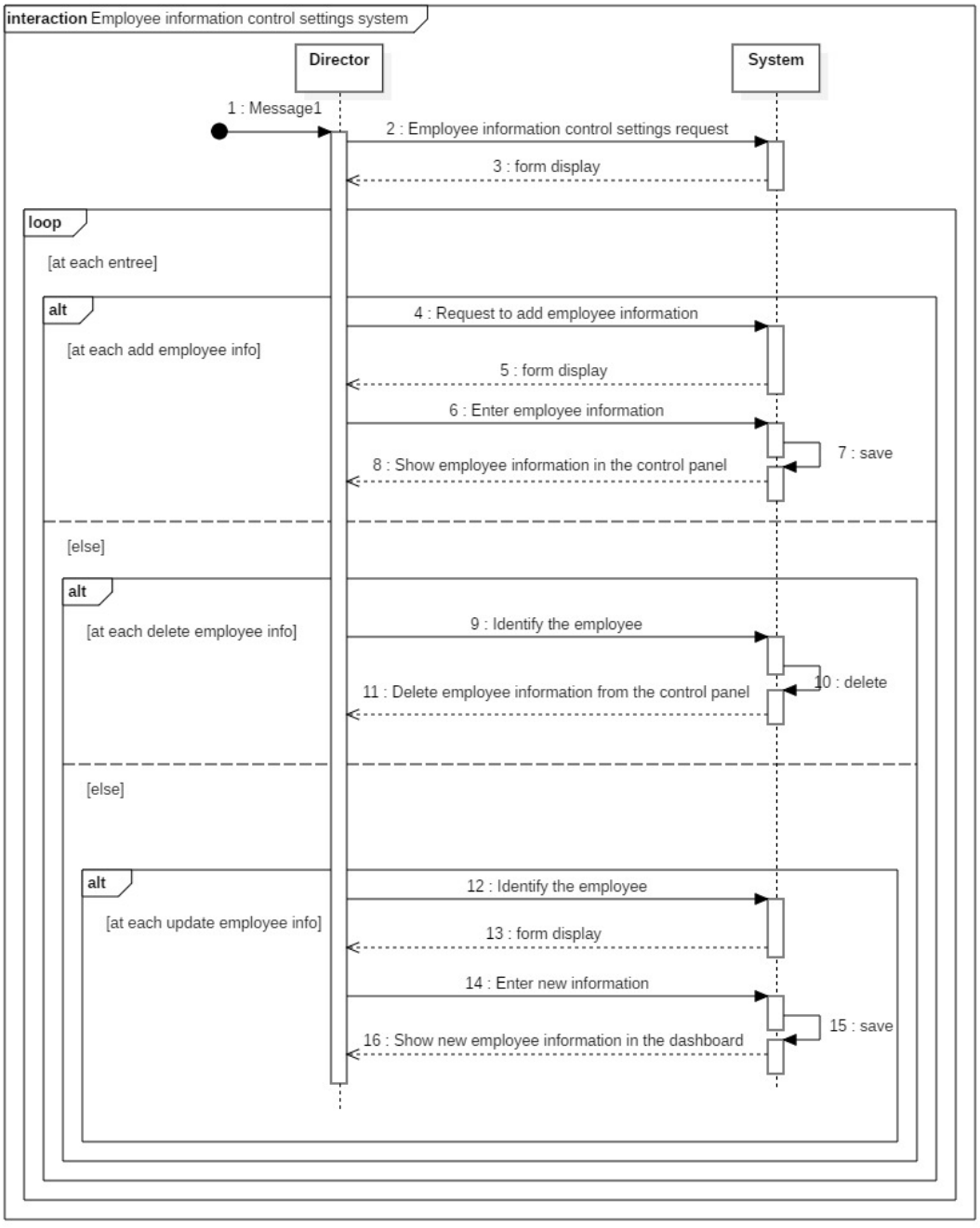

Figure 8 : Sequence Diagram

Textual description of sequence diagram

When the user interface displays, information such the password and user name must be entered, and the system verifies the accuracy of the information. If the data is entered correctly, it is authenticated; if not, an error message is displayed. See the figure (9).

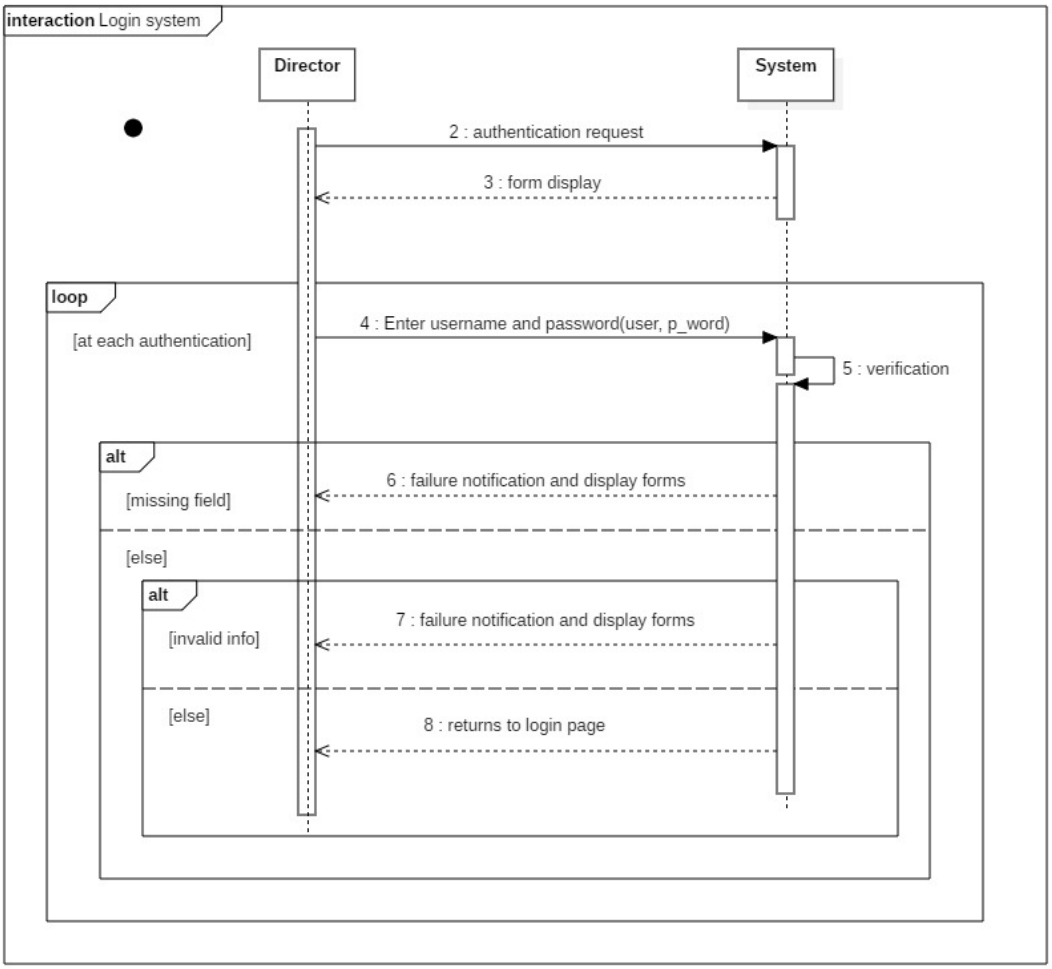

Figure 9 : Sequence Diagram

4.3 Class diagram

Textual description of class diagram

The following diagram shows employers managing the agency. The agency contains several departments, including the reception desk, the car repair shop, and the car cleaning department. Customers can rent a car or several cars in coordination with the reception desk. See the figure (10).

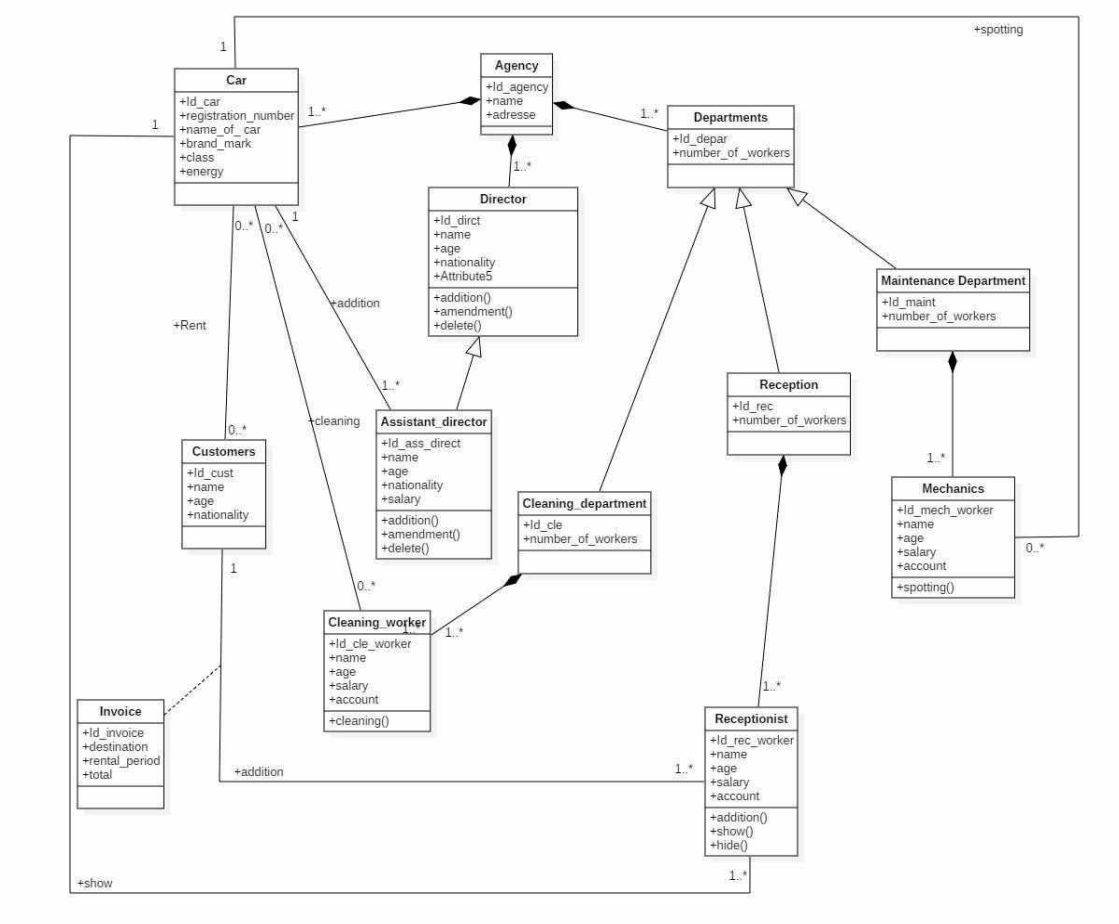

Figure 10 : Class diagram

5. Relational model

- Agency(id_agency , name , adresse).
- Car(id_car, registration_number, name_car, brand_mark, class, energy, # id_agency).
- Customers(id_cust, name, age, nationality).
- Invoice(id_invoice, destination, rental_period, total, # id_cust, #id_car).

- Director(id_direct, name , age, nationality, attributes, # id_agency)
- Assistant_director(id_ass_direct, name, age, nationality, salary, #id_direct).
- Departments(id_depar, number_of_workers, # id_agency).
- Cleaning_department(id_cle, number_of_workers, #id_depar).
- Reception(id_rec, number_of_workers, #id_depar)
- Maintenance Department(id_maint, number_of_workers, #id_depar).
- Cleaning_worker(id_cle_worker, name, age, salary, account, # id_cle).
- Receptionist(id_rec_worker, name, age, salary, account, # id_rec).
- Mechanics(id_mech_worker, name, age, salary, account, # id_maint).

6. Conclusion

We discussed the design of the program using the Unified Modeling Language and designed some of its diagrams with a textual description of the diagrams, which are the use case diagram, the sequence diagram, and the class diagram.in the next chapter we'll present our application.

Chapter3: Development

Introduction

Once the design phase has been presented, we will go on to the execution phase, where we will describe the features provided by Our technology and software as well as the technologies and software that we employed.

2.Work Environment

2.1Hardware environment

- Device name DESKTOP-U259T6V
- Processor Intel(R) Core(TM) i3-1005G1 CPU @ 1.20GHz 1.20 GHz
- Installed RAM 8.00 GB (7.69 GB usable)
- Device ID 46004D5E-9C9D-4EAD-BA0A-4D48A2D93D9C
- Product ID 00326-10000-00000-AA778
- System Type 64-bit operating system, x64 processor
- Pen and touch functionality Touch or pen input functionality is not available on this display

2.2Software environment

Technical choices

In this part we present the different languages and tools used for the development of our rental car application

Plugins and software

This part lists each software and development tools to use in creating the application:

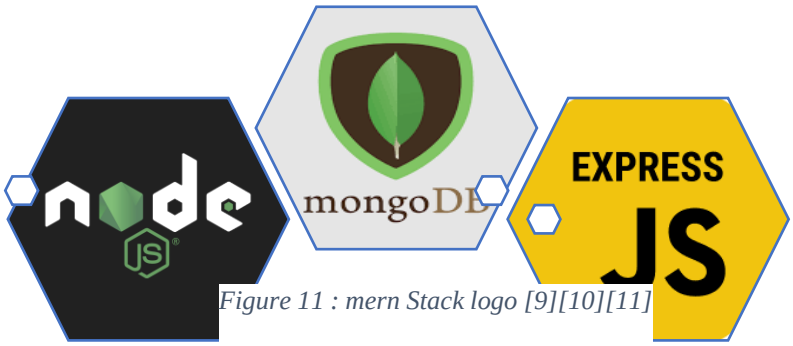

Figure 11 : mern Stack logo [9][10][11]

2.2.1.1. Node.js

Node.js is an open-source and cross-platform JavaScript runtime environment. It is a popular tool for almost any kind of project!

Node.js runs the V8 JavaScript engine, the core of Google Chrome, outside of the browser. This allows Node.js to be very performant(Please see the official website [2]

Figure 12 : Node.js logo [12]

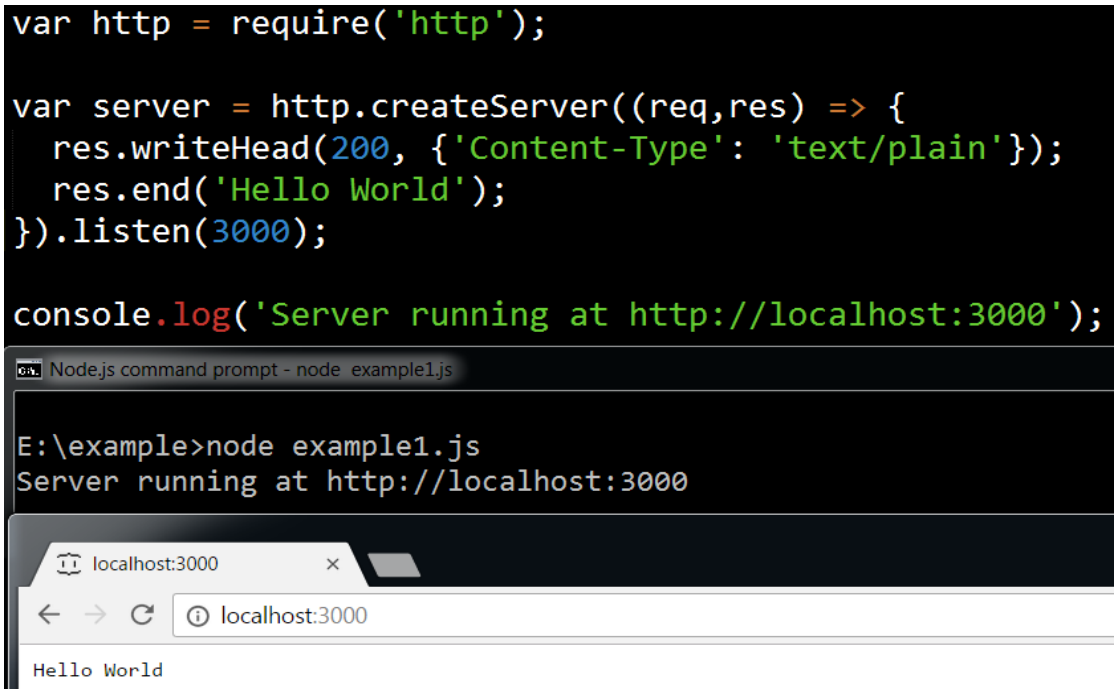

Figure 13 : An Example Node.js Application

2.2.1.2. Express js

Fast, unopinionated, minimalist web framework for Node.js [3]

Web Applications

Express is a minimal and flexible Node.js web application framework that provides a robust set of features for web and mobile applications.

APIS

With a myriad of HTTP utility methods and middleware at your disposal, creating a robust API is quick and easy.

Performance

Express provides a thin layer of fundamental web application features, without obscuring Node.js features that you know and love.

Frameworks

Many popular frameworks are based on Express.

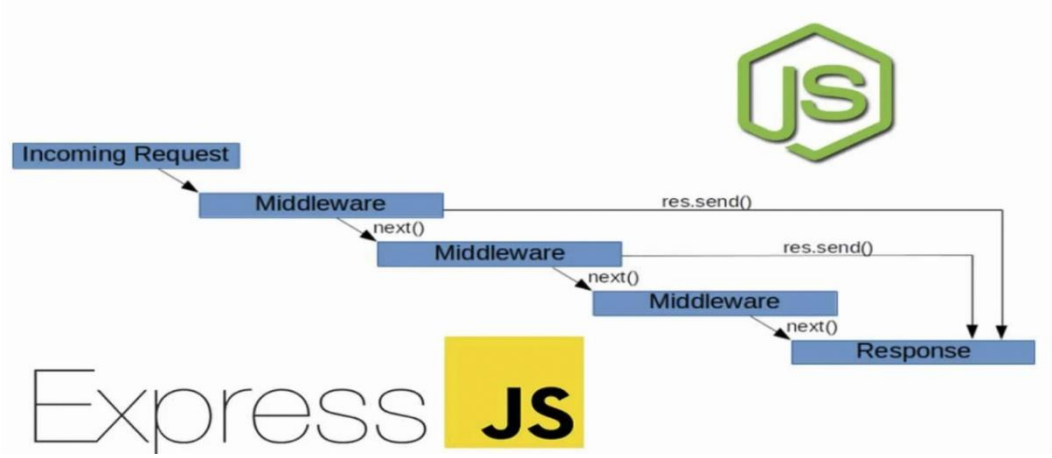

Figure 14 : express logo [13]

2.2.1.3. Mongo dB

MongoDB is a cross-platform and open-source document-oriented database, it is a kind of NoSQL database. As a NoSQL database, MongoDB shuns the relational database's tablebased structure to adapt JSON-like documents that have dynamic schemas which it calls BSON.

This makes data integration for certain types of applications faster and easier. MongoDB is built for scalability, high availability, and performance from a single server deployment to large and complex multi-site infrastructures. [4]

Figure 15 :mongodb logo [14]

2.2.2. Visual Studio Code

Visual Studio Code is a free, multi-platform, open-source code editor (Windows, Mac, and Linux) developed by Microsoft, not to be confused with Visual Studio, the proprietary IDE of Microsoft. VS Code is developed with Electron and exploits advanced editing features of the Monaco Editor project.

Primarily designed for application development with JavaScript, Typescript and Node.js, the editor can adapt to other types of languages thanks to a well-supplied extension system [5]

- **Main features**

VSCode offers different elements that can be interesting for developers at all levels, so that compared to other text editors (e.g. Brackets), the level is rather intermediate / advanced. Nevertheless, VSCode can be a good starting choice even for a beginner in the prospect of then reaching some expertise. In addition, the advanced editing

features of VSCode can also be exploited in other areas such as formatting / cleaning of text files or raw data.

Among the main features of the software are:

- **IntelliSense**

an advanced technology that offers, in addition to highlighting the syntax and automatic completion of the code, an inference system articulated and based directly on the logic of the source code;

- **Native integration with Git**

the software implements the Git version management system directly in the editor interface, which is an advantage to be able to perform versioning operations more easily

- **Integrated command line**

Always in the editor interface, it is possible to launch the command line and execute all the commands available on the operating system;

- **Eco-system of extensions**

the extensions are at the heart of the project and there is even a simple system to develop / publish its own extensions

- **Integrated Debugging**

For more advanced developers, there are also debugging features directly inside the editor.

Figure 16 : VS code logo [15]

2.2.3.HTML

HTML is the standard markup language for creating Web pages.

- HTML stands for Hypertext Markup Language.
- HTML is the standard markup language for creating web pages.
- HTML describes the structure of a web page .
- HTML consists of a series of elements .
- HTML elements tell the browser how to display the content .
- HTML elements label pieces of content such as “this is a heading ”, ”this is a paragraph “, “this is a link “,etc .[6]

Figure 17 : An Example code HTML

2.2.4.CSS

Css is the language we use to style a Web page.[7]

- CSS stands for Cascading Style Sheets.
- CSS describes how elements are to be displayed on screen, paper, or in other media.
- CSS saves a lot of work. It can control the layout of multiple web pages all at once .
- External stylesheets are stored in CSS files.

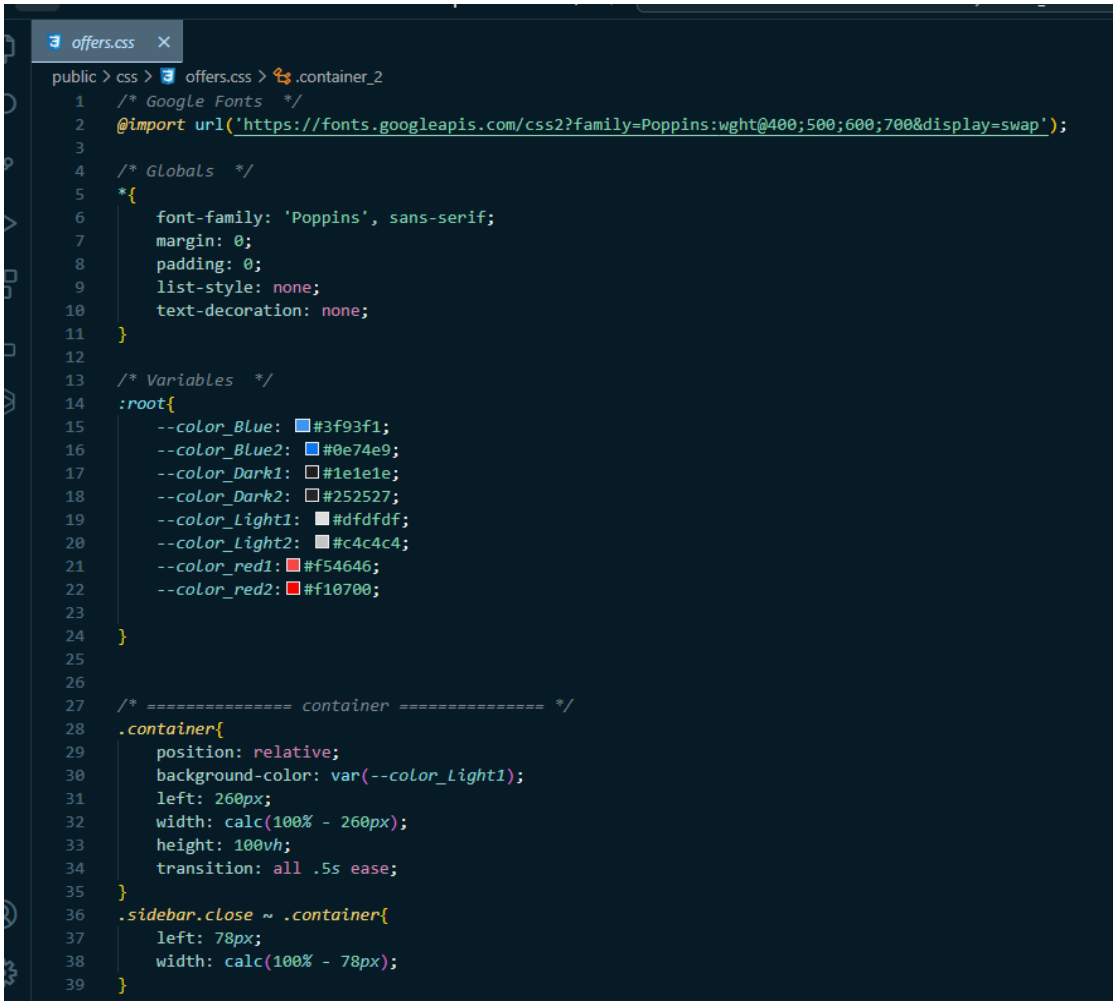

Figure 18 : An Example code CSS

2.2.5. javaScript

JavaScript is the Programming Language for the Web.

JavaScript can update and change both HTML and css.

JavaScrpit can calculate, manipulate and validate data.[8]

Figure 19 : An Example code JS

2.2.6: MongoDb Atlas

Database-as-a-Service(DBaaS) is a service that allows you set up, deploy, and scale a database without worrying about on-premise physical hardware, software updates, or the details of configuring for performance . with DBaas, a cloud provider does all that for you-and gets you up and running right away.[4]

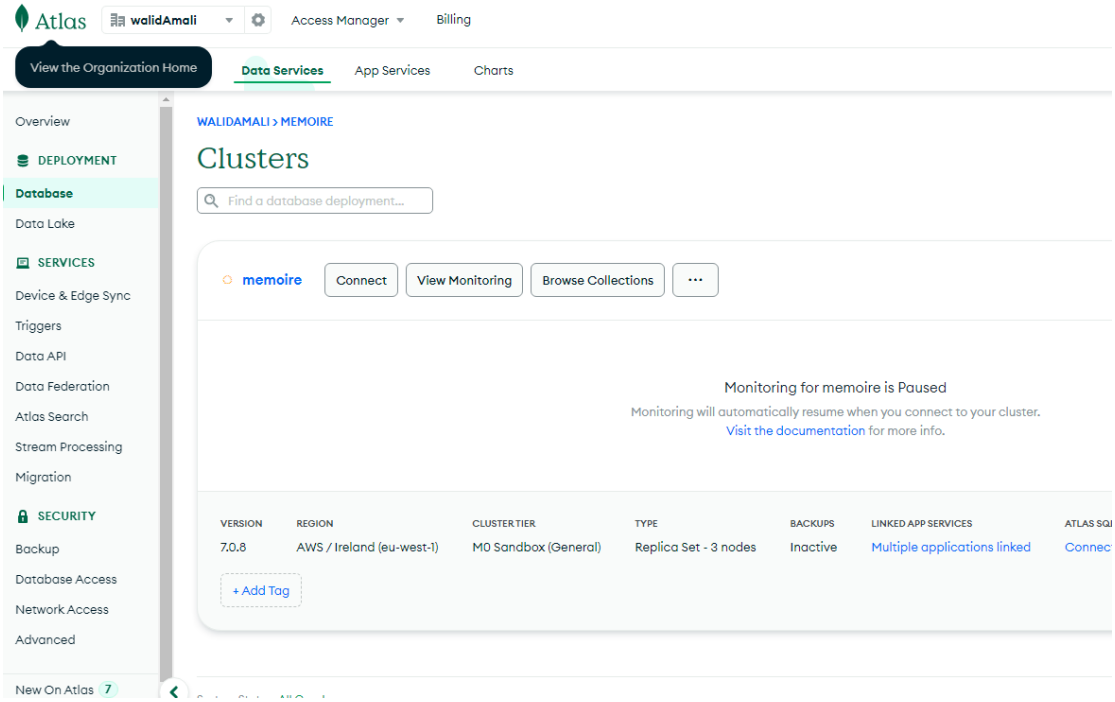

Figure 20 : mongoDb Atlas

3.Application presentation

3.1.Login Interface

The employees and managers login interface to the system is shown in the following figures (21,22,23).

Figure 21 :managers login interface

Figure 22: login interface

Figure 23 : employees login

3.2.Offers Interface

The interface allows the customer to select the car that best suits his needs by displaying the cars that are available for rental, which Employers are able to add or remove cars with it. See the figure (24).

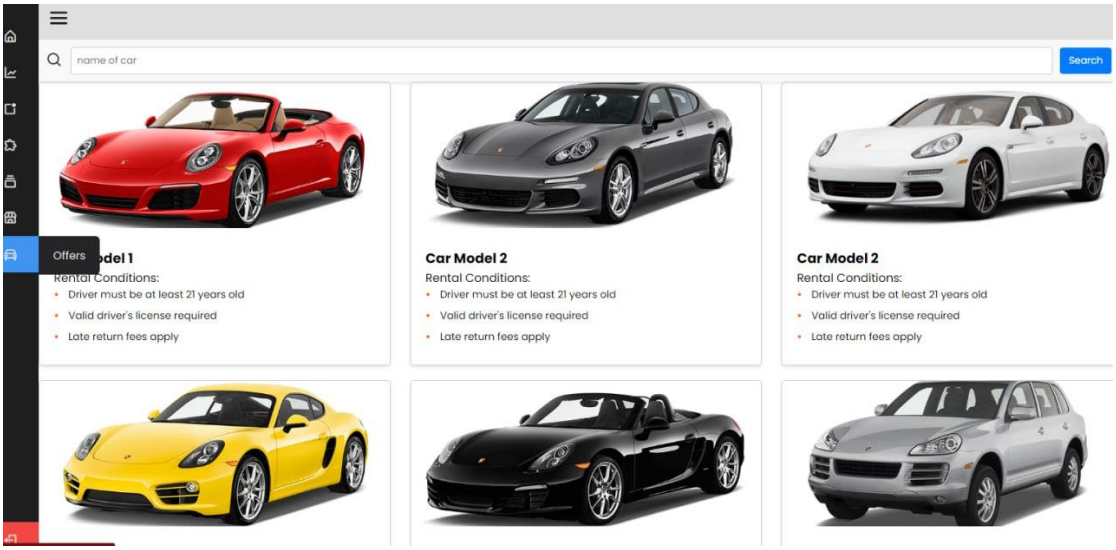

Figure 24 : Offers Interface

3.3.Car reservation

In order to finalize the reservation procedure, the customer must finish registering his details after selecting the vehicle. See the figure (25).

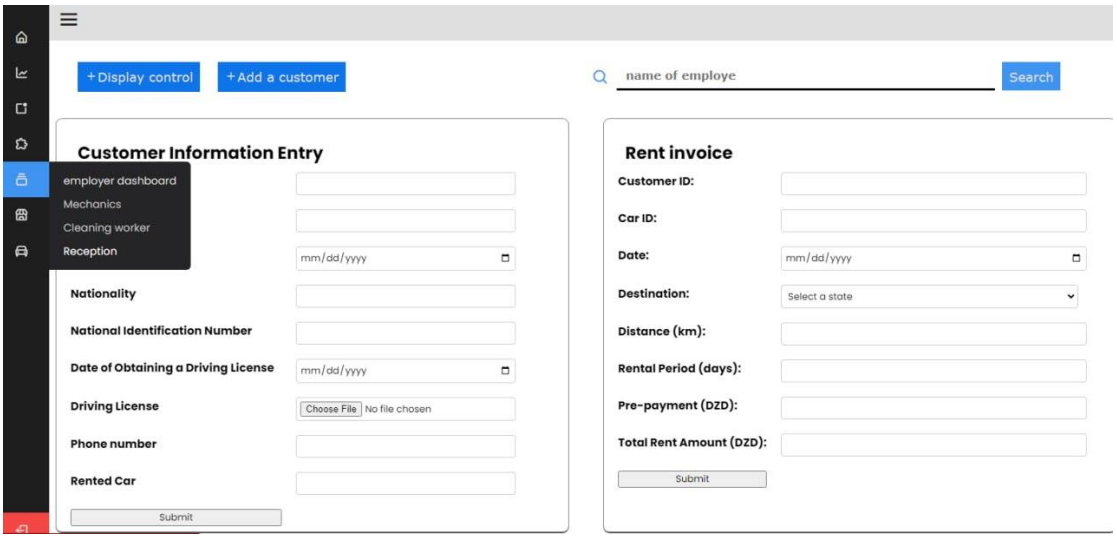

Figure 25: Customer information

3.4. Customers list

The customer's information is entered, the automobile is reserved, and they are added to the list of existing clients. See the figure (26).

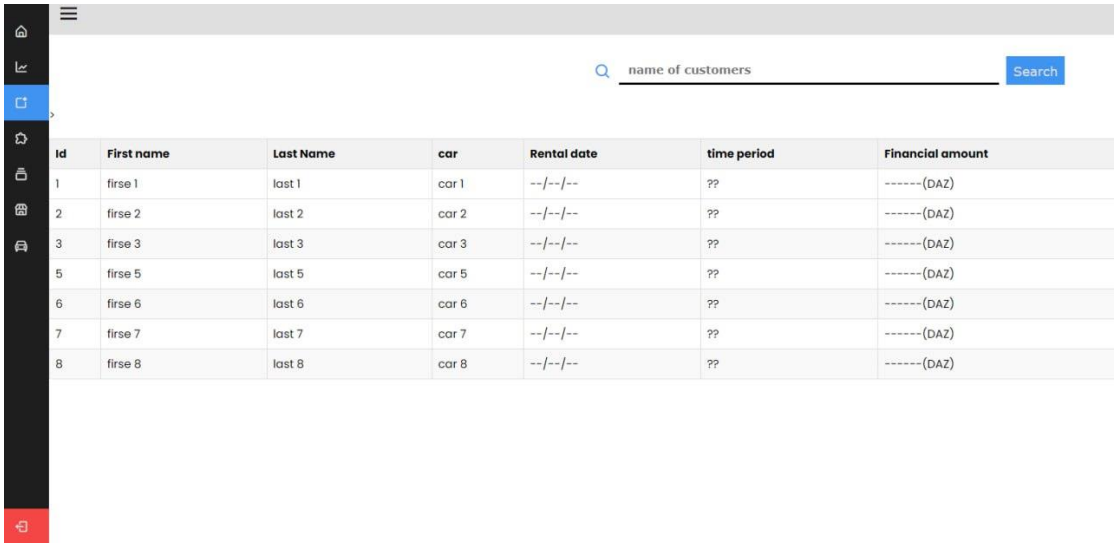

Figure 26 : customer list

3.5.Equipment interface

When the customer returns the vehicle at the conclusion of the reserve term, the technician examines it, assesses any damage, and places an order for the required parts or wash it. See the figure (27).

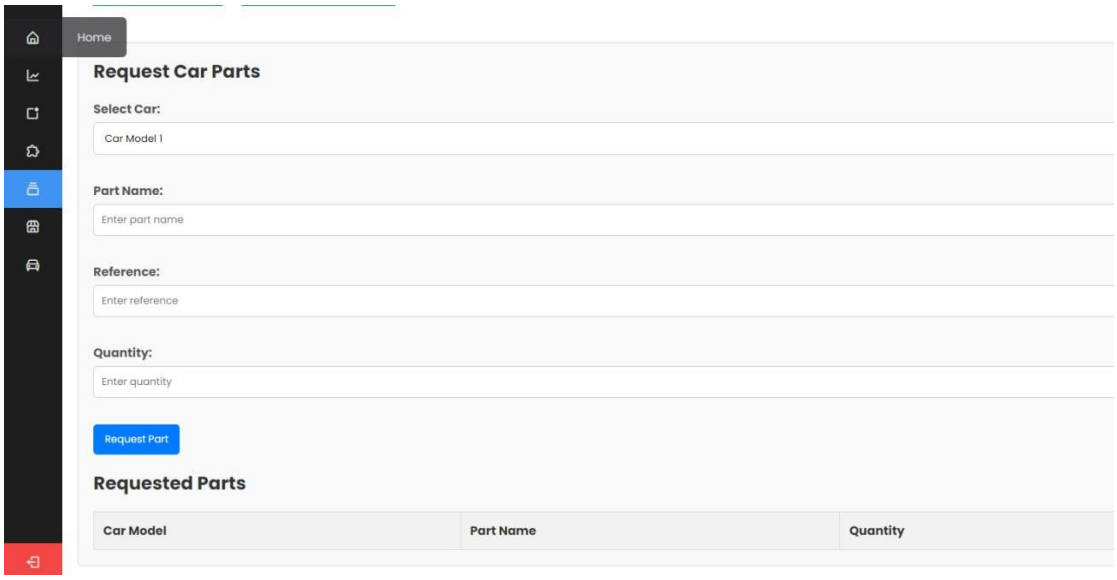

Figure 27 : Request parts for the cars

3.6. employees list

Employees have all of the manager's powers, with the exception of adding or removing employees and viewing the company's profits, which the manager or his deputy may add or remove employees. See the figure (28).

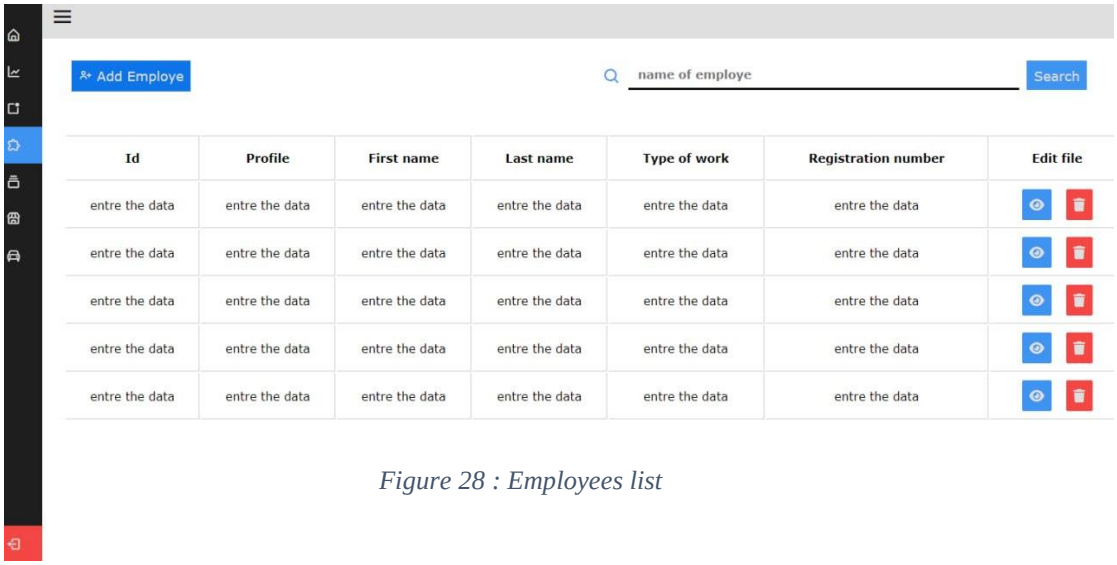

Figure 28 : Employees list

3.7. Cars list

Similar to the list of employees, there is a list of cars with two sections: those that are reserved and those that are not. See the figure (29).

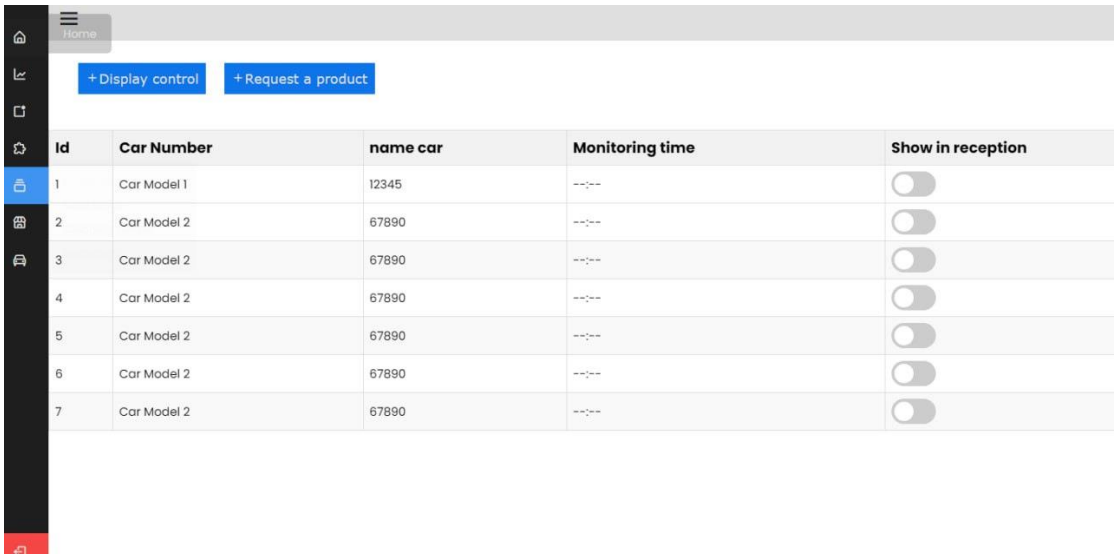

Figure 29 : Cars conditions

Conclusion

This chapter included a presentation and explanation of the most significant application interfaces, such as the offers interface, the list of employers, the automobiles, etc., as well as a discussion of the work environment embodied by the programs and devices utilized to construct our program.

General Conclusion

Thus, we reach to the end of the report cars rental agency management, where we analyzed the structure of the topic and clarified its objectives using appropriate techniques. We researched the needs of employers and employees in the car rental agency and used methods that helped us meet their needs. This program was designed according to appropriate standards. As we also seek in the future to adding the most and least rented cars during a month or year, and monthly revenues. We also seek to add anything else that may be useful to our application.

References

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[12] node js image :

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