Software design

Documentation

Assignment 1

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Group:30434

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1. Objective

The objective of this topic is to familiarize with the Model-View-Presenter architectural pattern. For information persistence, a relational database (SQL Server, MySQL, etc.) will be used.

1.1. General requirement

The general requirement for the first homework is:

- During the analysis phase, a use case diagram will be created.
- During the design phase, a class diagram will be created in accordance with the MVP architecture and SOLID principles, as well as an entity-relationship diagram corresponding to the database.
- During the implementation phase, code will be written to fulfill all the functionalities specified by the use case diagram using:
  - the class diagram design;
  - one of the following programming languages: C#, C++, Java, Python.
- During the testing phase, unit tests (testing project) corresponding to the operations of creating the database, establishing a connection to the database, creating tables, and querying tables of the database will be implemented.
- Completion of the topic will consist of submitting a directory containing:
  - A file with the UML diagrams created;
  - The database;
  - The software application;
  - Documentation (minimum of 10 pages) - a file that includes:
    - the student's name, group;
    - the statement of the problem;
    - the tools used;
    - the justification for the chosen programming language;
    - description of the UML diagrams;
    - description of the application.

1.2. Specific requirement

The requirement for the specific homework is:

Develop an application that can be used in an auto service. The client application will have 3 types of users: employee, manager, and administrator.

After authentication, employee users can perform the following operations:

- View a list of all existing vehicles in the service, sorted by brand and fuel type;
- Filter vehicles based on certain criteria: owner, brand, color, fuel type;
- CRUD operations regarding the persistence of vehicles and their owners.

After authentication, manager users can perform the following operations:

- View a list of all existing vehicles in the service, sorted by brand and fuel type;
- Filter vehicles based on certain criteria: owner, brand, color, fuel type.

After authentication, administrator users can perform the following operations:

- ❖ CRUD operations for user-related information within the application;
- ❖ View a list of all users.

2. Tools used

2.1. List of used tools

For the implementation of the application I used several tools:

- Java – for the development of the production code which is run by the application
- Java Swing – for the graphical user interface
- Gradle – for dependency management
- JUnit, Groovy and Spock – for writing the unit tests

2.2. Justification for using the selected tools

2.2.1. Java

I decided to use Java for the development of the production code in order to try to understand better how different architectural patterns and principles are applied in said programming language. During the development of this project, I learned how to implement the MVP architectural pattern and how to apply the SOLID principles in order to create classes and method which are more comprehensible and easier to understand.

2.2.2. Java Swing

I used Java Swing for the graphical user interface because I was already familiar with it and had some experience in creating different layouts of GUIs in order to present the required data in a user friendly way.

2.2.3. Gradle

I recently learned Gradle from my workplace, so I decided to try to deepen my knowledge in it and try to make a clear separation between Maven and Gradle in order to create an opinion on which one I would prefer to use day by day.

2.2.4. JUnit, Groovy and Spock

Knowing that the implementation of the application was going to be created in Java, I used JUnit to create the unit tests for the production code.

I also recently learned Groovy and Spock at my workplace. I discovered that writing tests in Groovy makes the tests more readable and are easier to understand what is a “prerequisite” for a test, what is actually tested and what is expected from a test. Also, Groovy provides more readable test names that

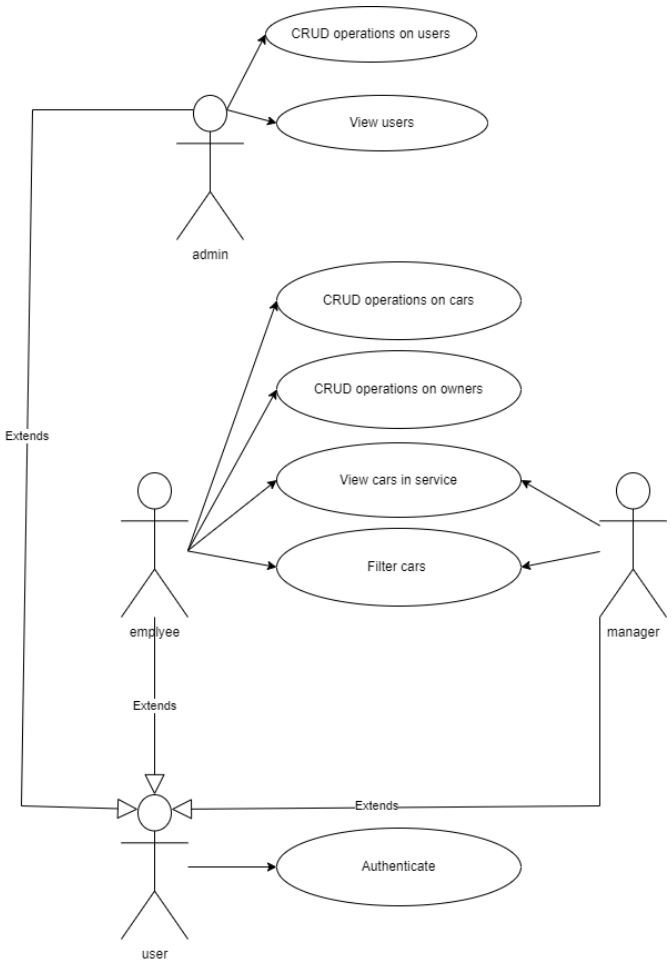
On top of that, Spock helped to remove redundant code, which would have been copy-pasted in multiple tests which tested similar functionalities. For example, when testing if a specific table is created after running a given method, the expected result should be that they are created. This test should be done for every table in the database, which would have the same structure: call method which creates a table, then check if it exists. By using the “where” from Spock, this redundancy is removed and a single test is created which will be iterated over using different parameters for functions.

3. UML diagrams

During the analysis and the design phase, the use case diagram, the class diagram and the entity-relationship diagram had to be created.

3.1. Use case diagram

The first one was the use case diagram, which was created during the analysis phase of the project.



We can see that in order to use the application, the user must first authenticate into it. After the authentication is done, based on their role, the user will be able to perform some given actions.

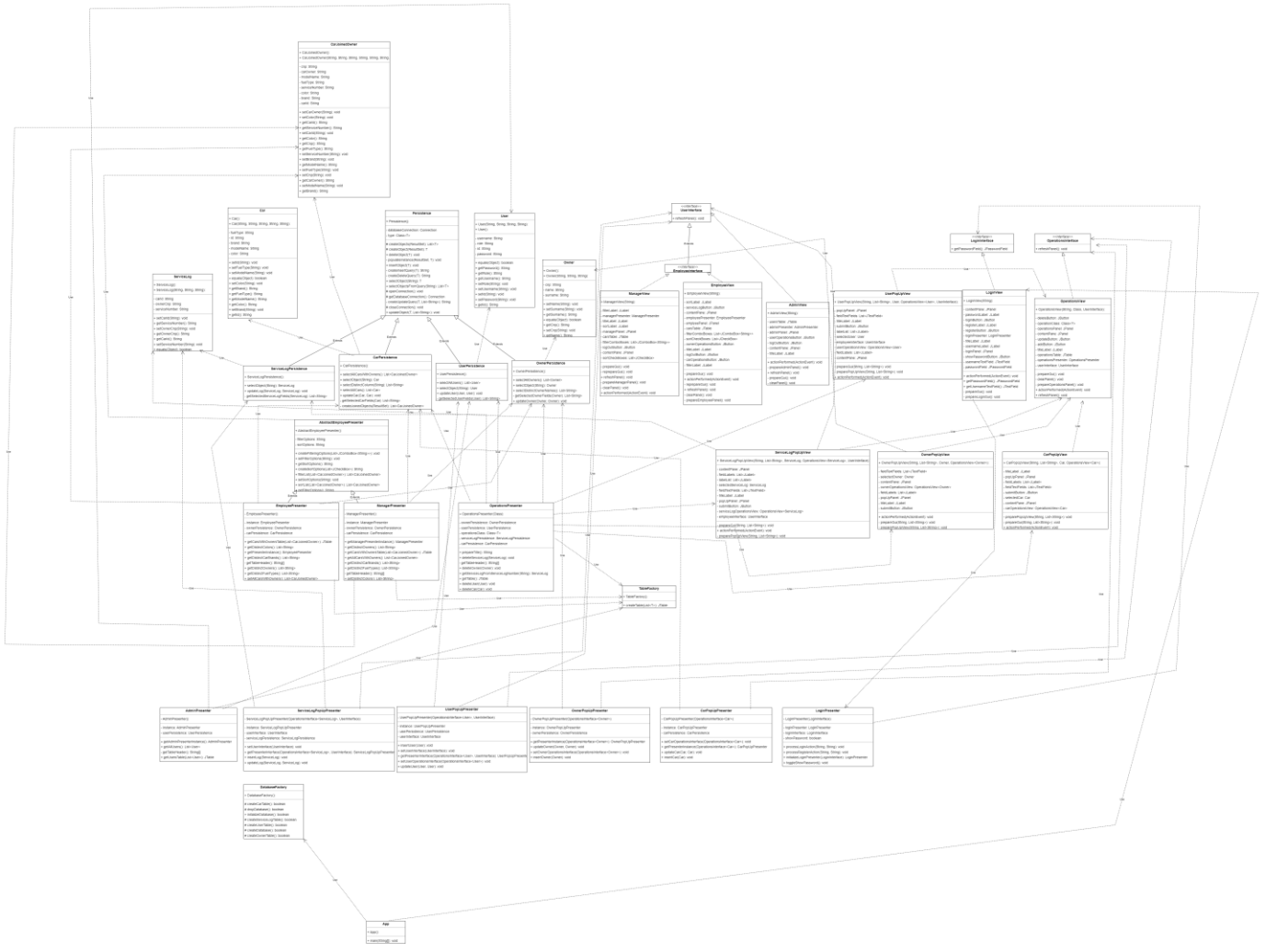
If the user is an employee, he will be able to perform Create, Read, Update and Delete operations on cars and owners of the cars, in order to create reservation in the service shop. Also, he can see the cars that are currently in the shop, sort them by brand and fuel type and filter them by owner, car brand, fuel type and color of the car.

If the user is a manager, he will only be able to see the cars that are available in the shop, sort them by brand and fuel type and filter them by owner, car brand, fuel type and color of the car.

If the user is an admin, he will be able to perform Create, Read, Update and Delete operations on the current users of the application and see the users that are currently registered into the application's database.

3.2. Class diagram

During the design phase of the project, the class diagram was created which shows the classes of the application and the relationship between them.



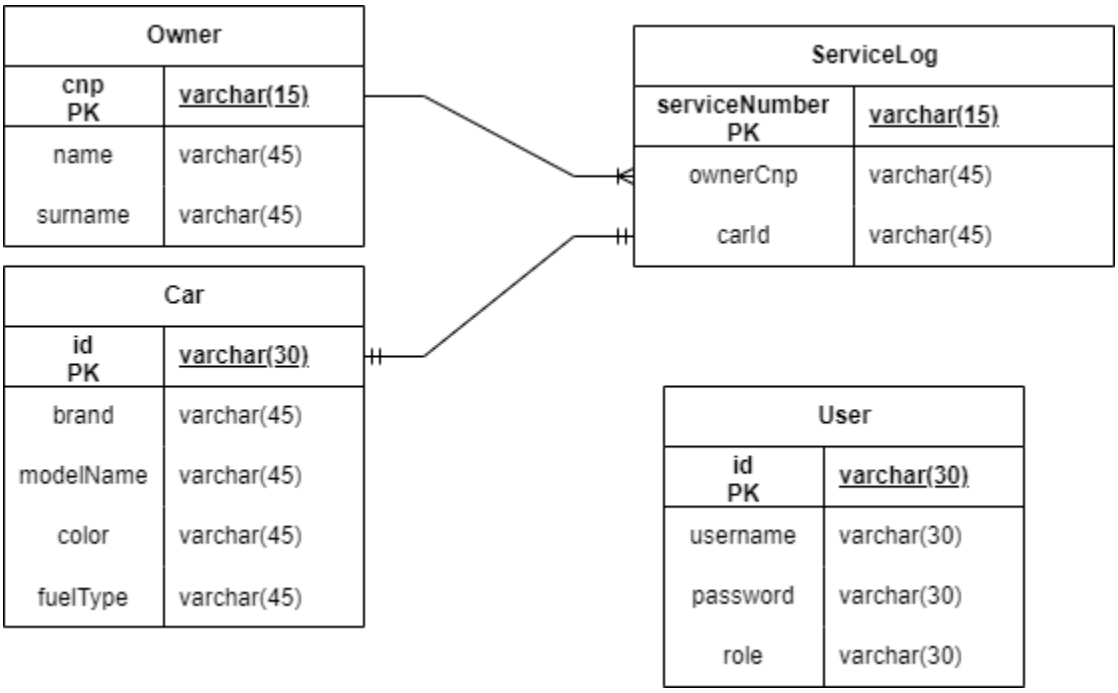
In this class diagram we can see that the MVP architectural pattern was respected, each class being part of one of the following packages: model, persistence, presenter or view. In order for the user to perform an action at a given point in time, each View class has an action listener, which identifies what action has

been performed and delegates the responsibility of resolving and fulfilling the request to a Presenter. The Presenter uses one of the Persistence classes to perform a Create/Read/Update/Delete action (if it is the case) and refreshes the view by using an Interface which is implemented by the View class.

Furthermore, every time the application starts, it will try to create a new database if doesn't currently exist. On every operation that requires the access to the database, first a connection will be established, then the operation will be performed, then the connection will be closed. This is done in order to promote the efficiency of the application.

3.3. Entity-Relationship diagram

The entity-relationship diagram was also created during the design phase of the project. It represents the structure of the database and the relationships that are present between different tables.



The User table will store information about all the users. Each user has an unique id and username, a password and a role. The role can be one of the following 3 options: "employee", "manager" or "admin".

The Owner table will store information about each owner of a car. Every owner has a unique cnp, a name and a surname.

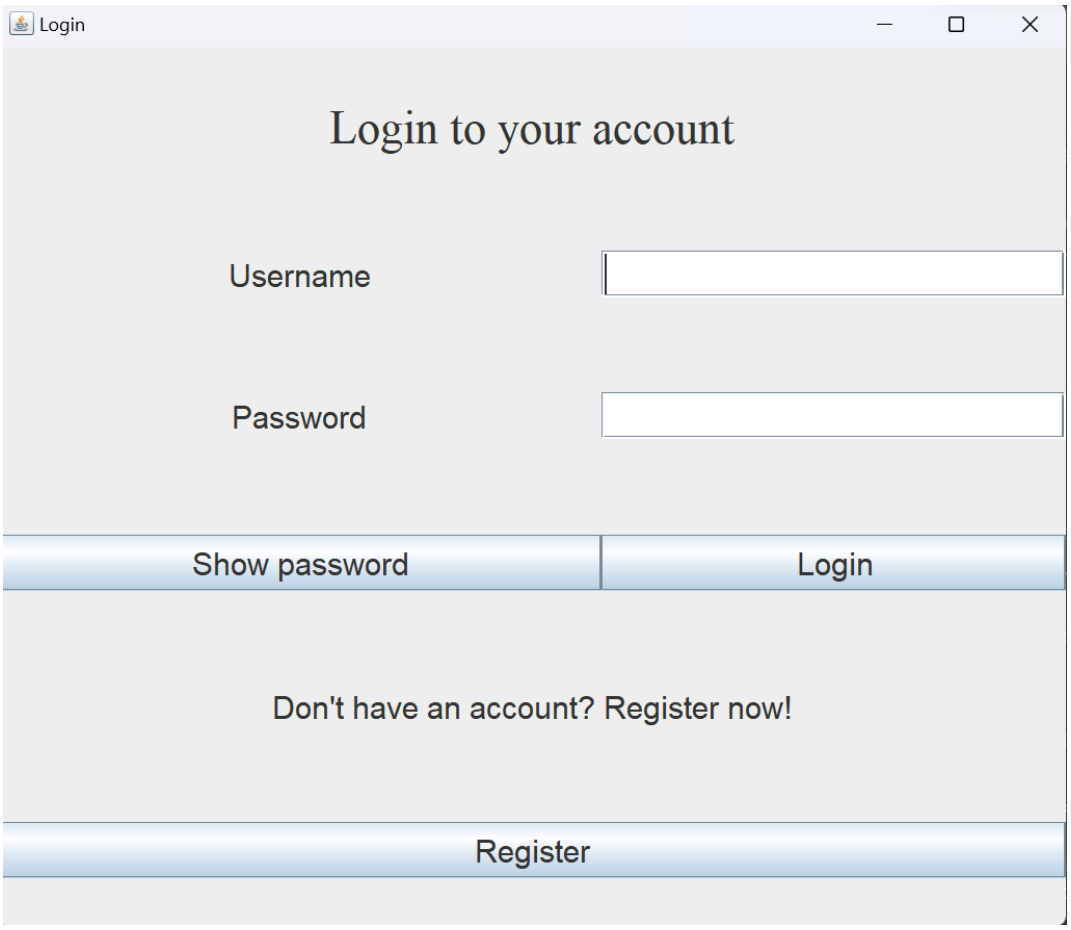
The Car table will store information about each car. Every car has a unique id, a brand, a model name, a color, and a type of fuel.

The Service Log table will store information about a car and its owner that is present in the shop. An owner can have multiple cars in the shop at once, but a unique car can be in the shop only once at a given time.

4. Implementation

4.1. Login window

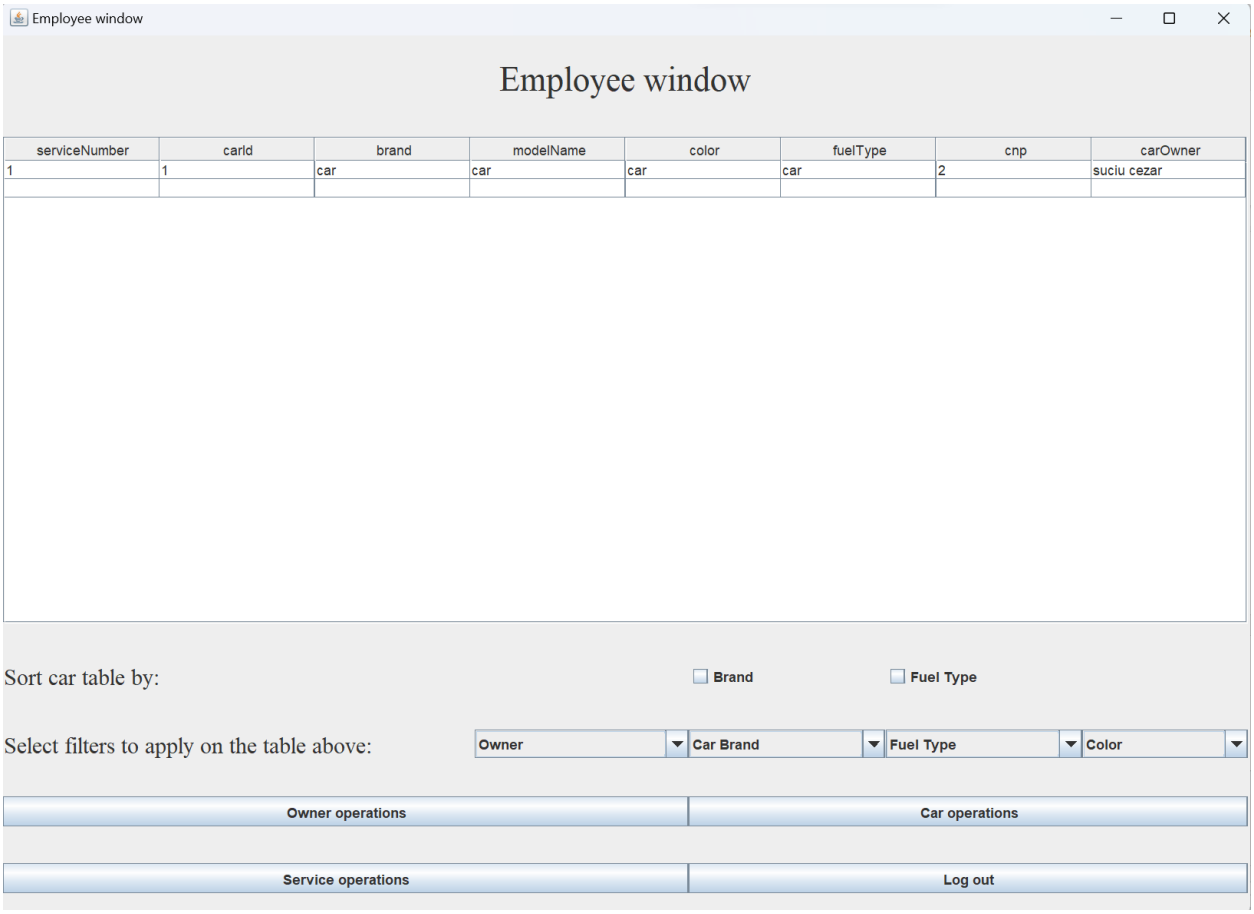
The application was implemented using multiple View classes, which are created and made visible at dynamically at runtime, based on the actions of the user. The application starts with the login view, which presents 2 text fields and a button, along with some labels that prompt the user to enter a username and password in order to login. Along these, a register button is present for users to register. When the register button is pressed, the username and password present in the text fields are taken and a new user is created. A registration will automatically give the role of “employee” to the user. The login view is presented below.



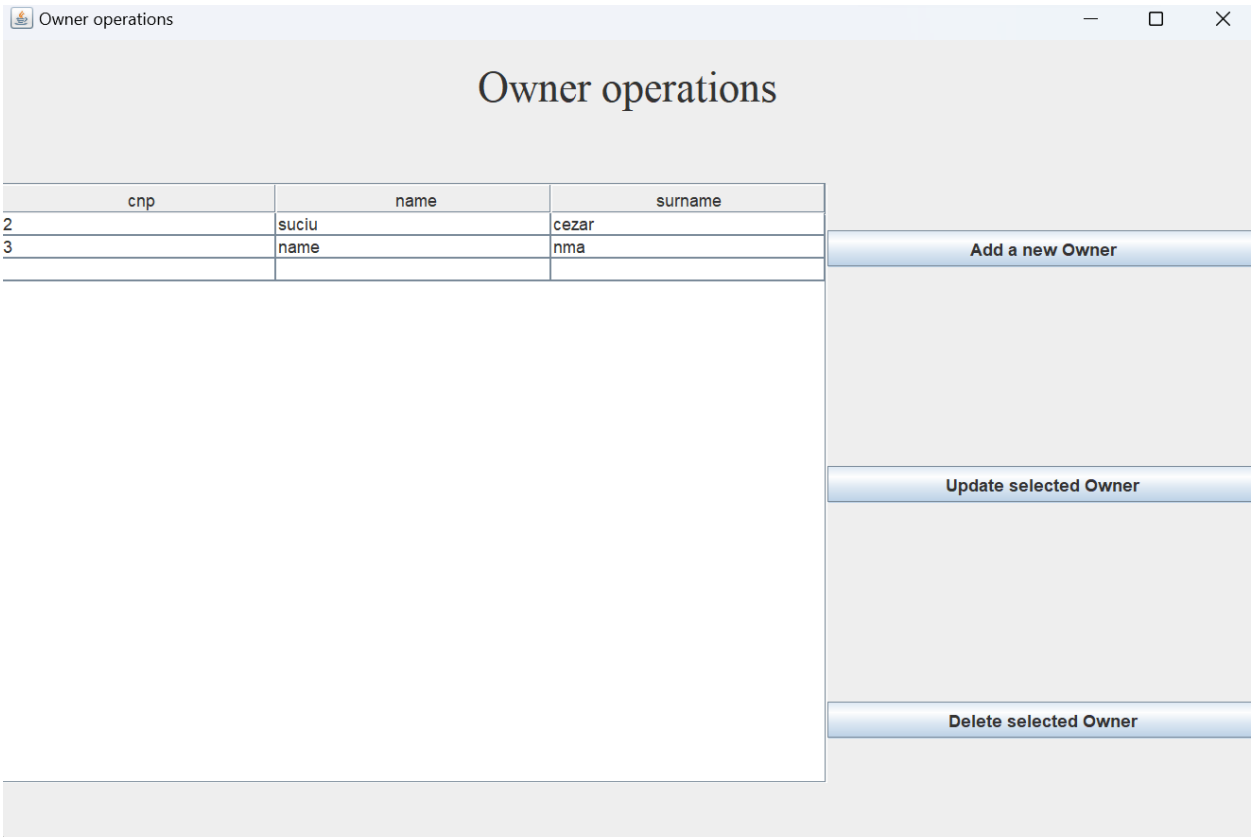
4.2. Employee window

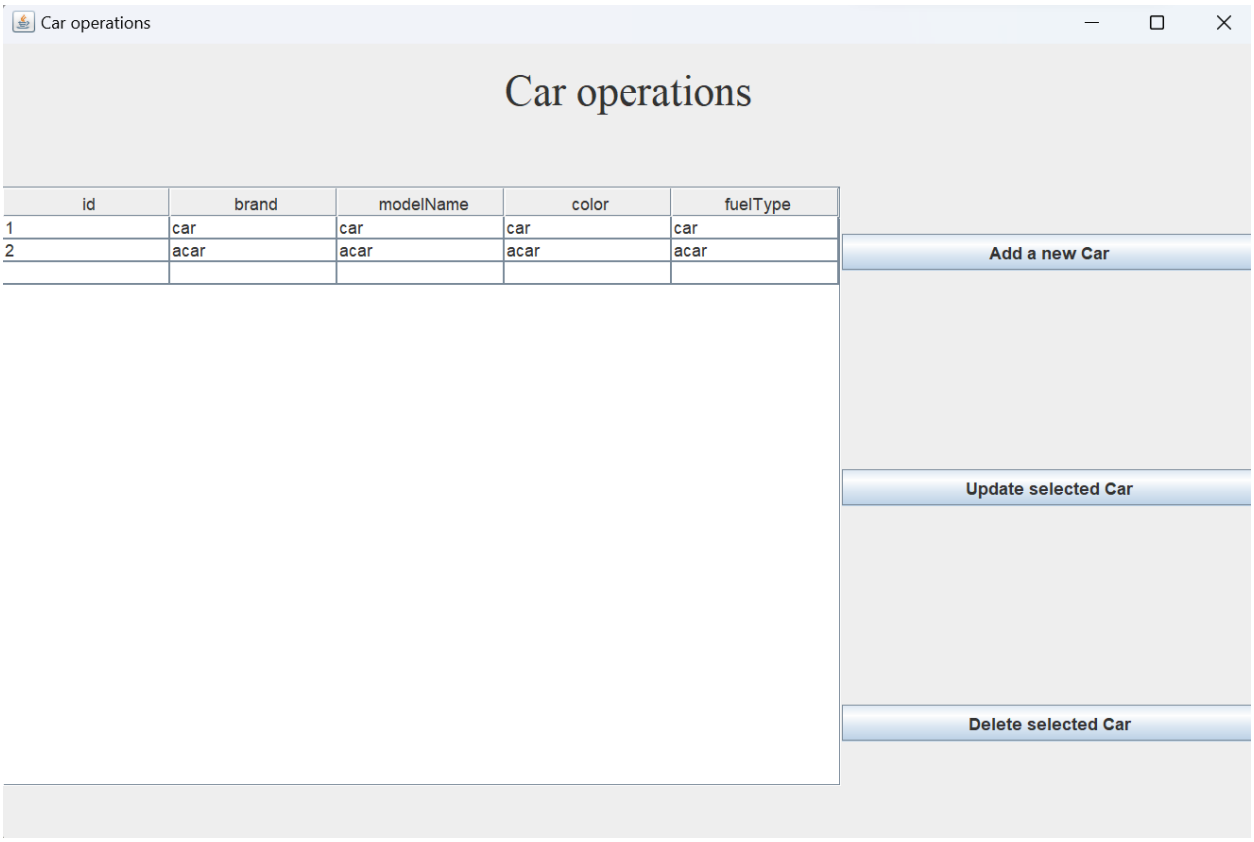
If the user logs in as an employee, a new employee view is shown and the login view disappears. In this employee view, a table is presented which contains information about all cars and their owners that are present in the shop at the current time. The records of the shown table can be sorted by brand and/or fuel type and filtered by owner, car brand, fuel type and/or color. The combo boxes which allow the user to select what he wants to filter the table by are generated dynamically from the current cars and owners present in the database. Below the filtering options, there are 4 buttons: “owner operations”, “car operations”, “service operations” and “log out”. Clicking on any button from the first 3 will open a

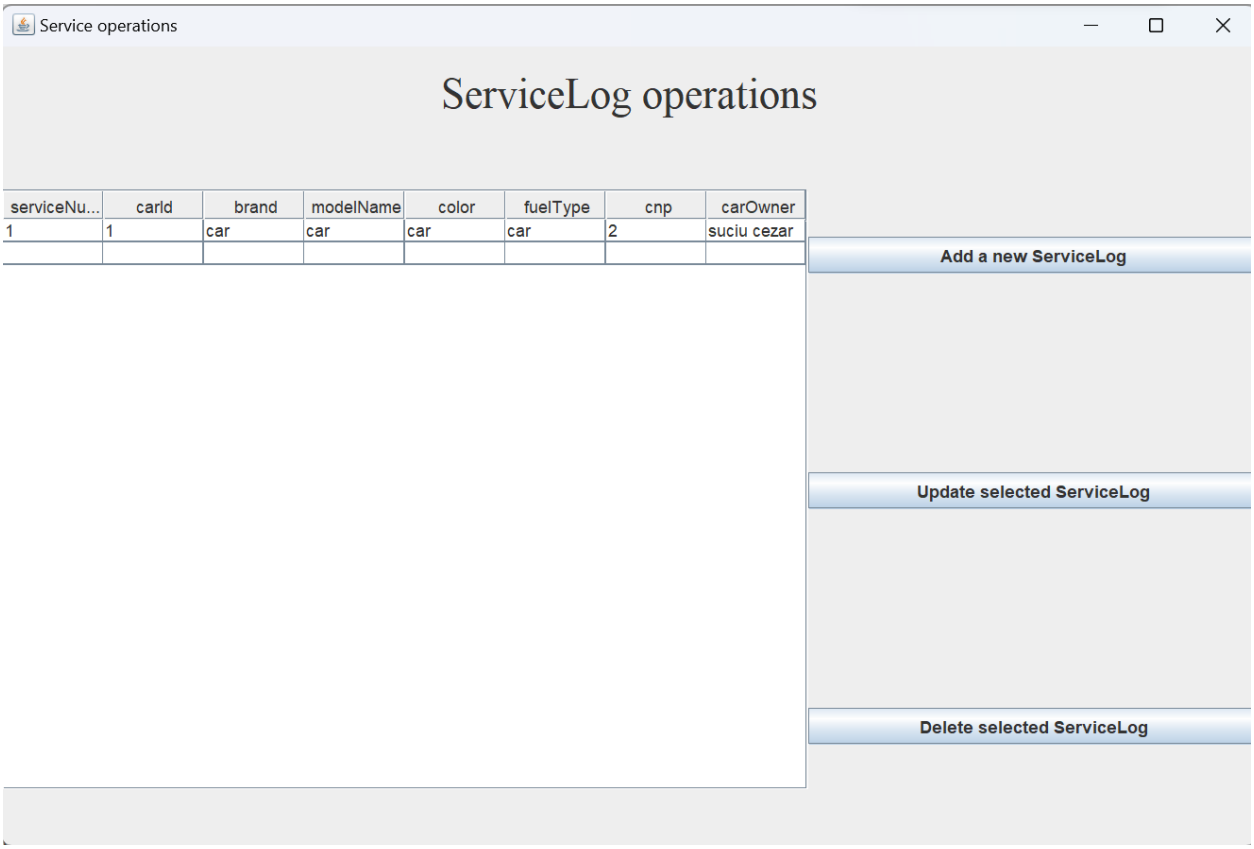
pop-up window which will allow the user to perform Create, Read, Update and Delete actions on the table described by the name of the button. So, for example if the “owner operations” button is clicked, a pop-up window will open which allows the user to perform the operations already described above on the Owner table. By clicking the “log out” button, the user will be redirected to the login window once again. The employee window is presented below:



The if the buttons “owner operations”, “car operations” and “service operations” are clicked, a operations window will be dynamically created. For example, the window generated by clicking “owner operations” contains a table that shows all the owners that are currently present in the database, as well as 3 buttons from which a new owner can be inserted, a selected owner can be edited or a selected owner can be deleted. If the first 2 buttons are clicked, a new pop-up window will be created and shown, where the user must enter values for each column of an owner, then press “submit”. The owner, car and service operations windows are presented below.

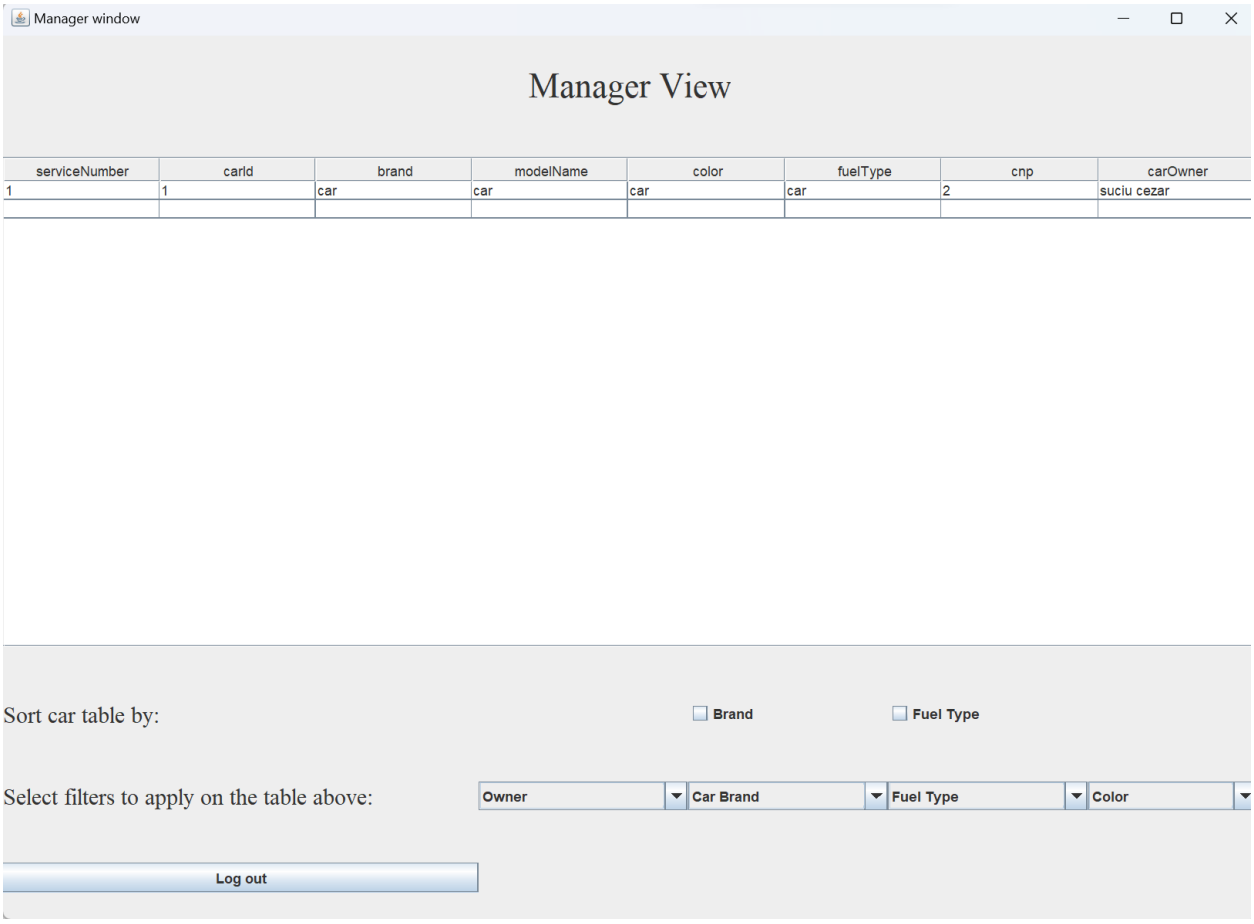

Owner operations
Owner operations
cnp
name
surname
2
suciu
cezar
3
name
nma
Add a new Owner
Update selected Owner
Delete selected Owner


Car operations
Car operations
id
brand
modelName
color
fuelType
1
car
car
car
car
2
acar
acar
acar
acar
Add a new Car
Update selected Car
Delete selected Car



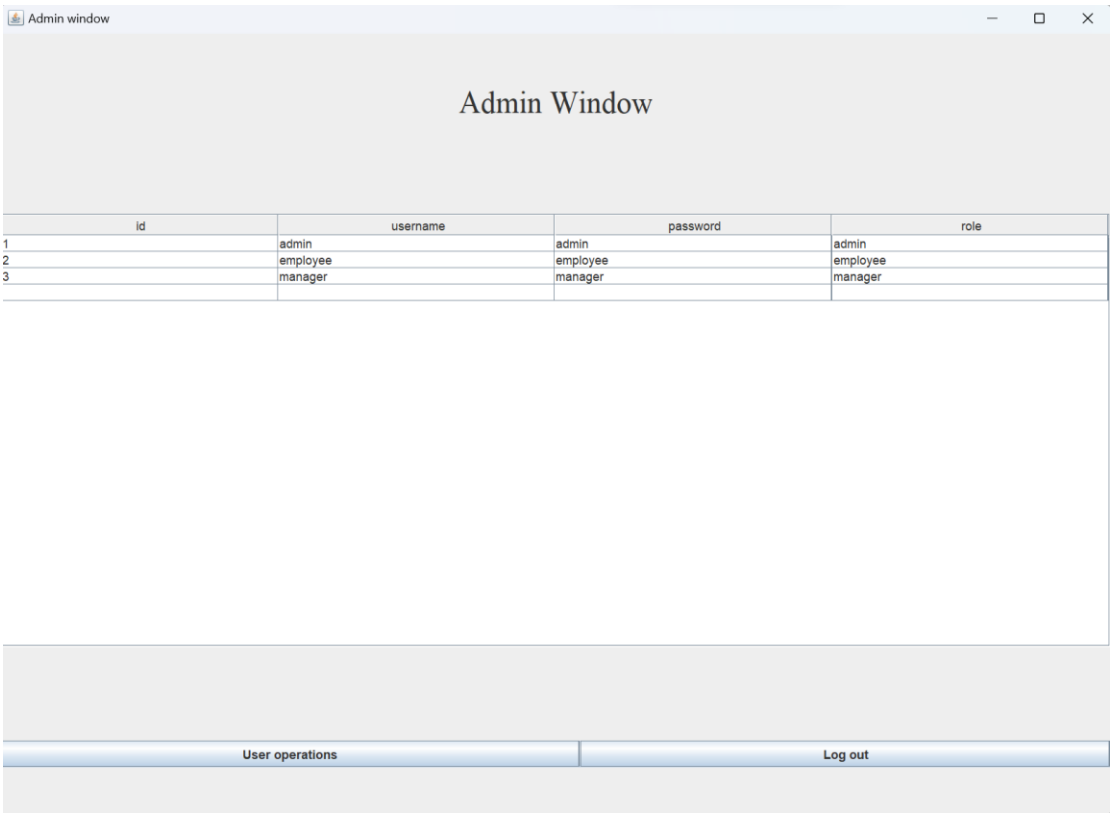
4.3. Manager window

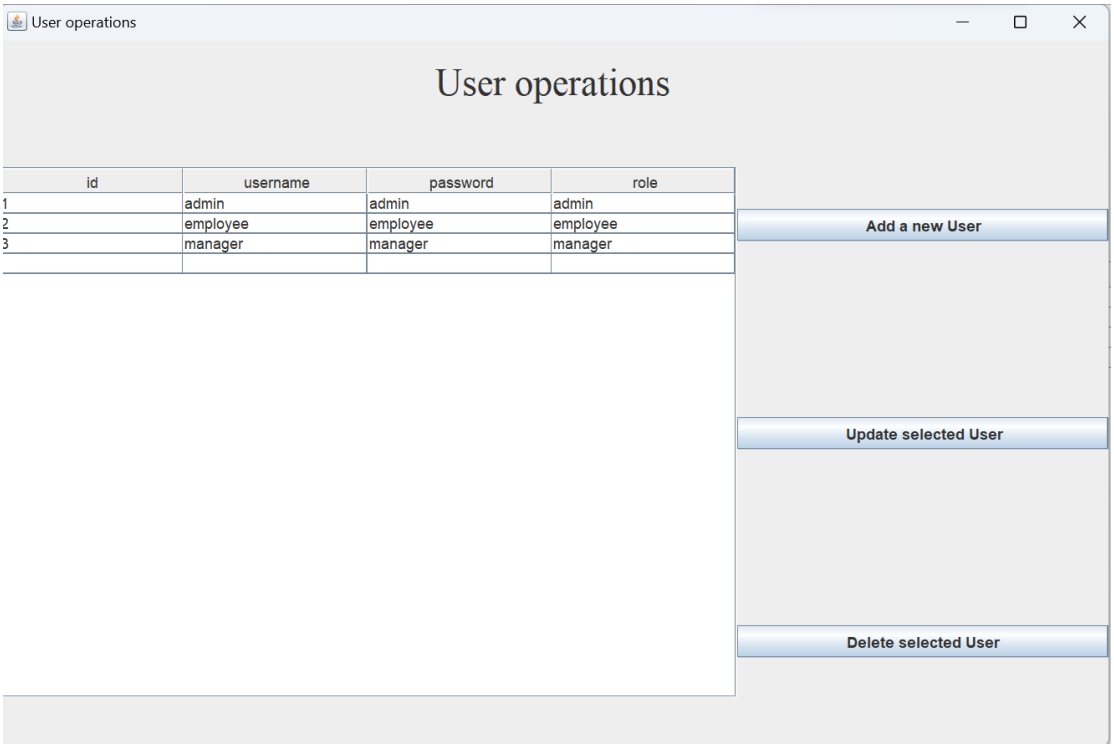
If the user logs in as a manager, a manager window will be generated which shows the same table, sorting options and filtering options as the ones in the employee window and a log out button which has the same functionality the other log out. The manager window is presented below:



4.4. Admin window

The admin contains a table which shows the users that are present in the User table in the database, a button that takes the user to the Create, Read, Update and Delete operations on users and a log out button. If the “user operations” button is clicked, a pop-up window will open which contains a table with the current users and 3 btutons: “add a new user”, “update selected user”, “delete selected user”. If the first button is clicked, a new pop-up window will open where the current admin will have to complete the text fields corresponding to each column of the user table, then click “submit”. If the second button is clicked, the selected user from the table will be updated with the fields that the current admin will complete (the same procedure as in the insert operation). If the third button is clicked, the selected user from the table will be deleted. For each action performed, the table will refresh automatically both in the admin view and in the pop-up operations view. The admin window and the pop-up window that contains the user operations are presented below:


Admin window
Admin Window
id
username
password
role
1
admin
admin
admin
2
employee
employee
employee
3
manager
manager
manager
User operations
Log out


User operations
User operations
id
username
password
role
1
admin
admin
admin
2
employee
employee
employee
3
manager
manager
manager
Add a new User
Update selected User
Delete selected User