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OOP Project – Luxury Cars

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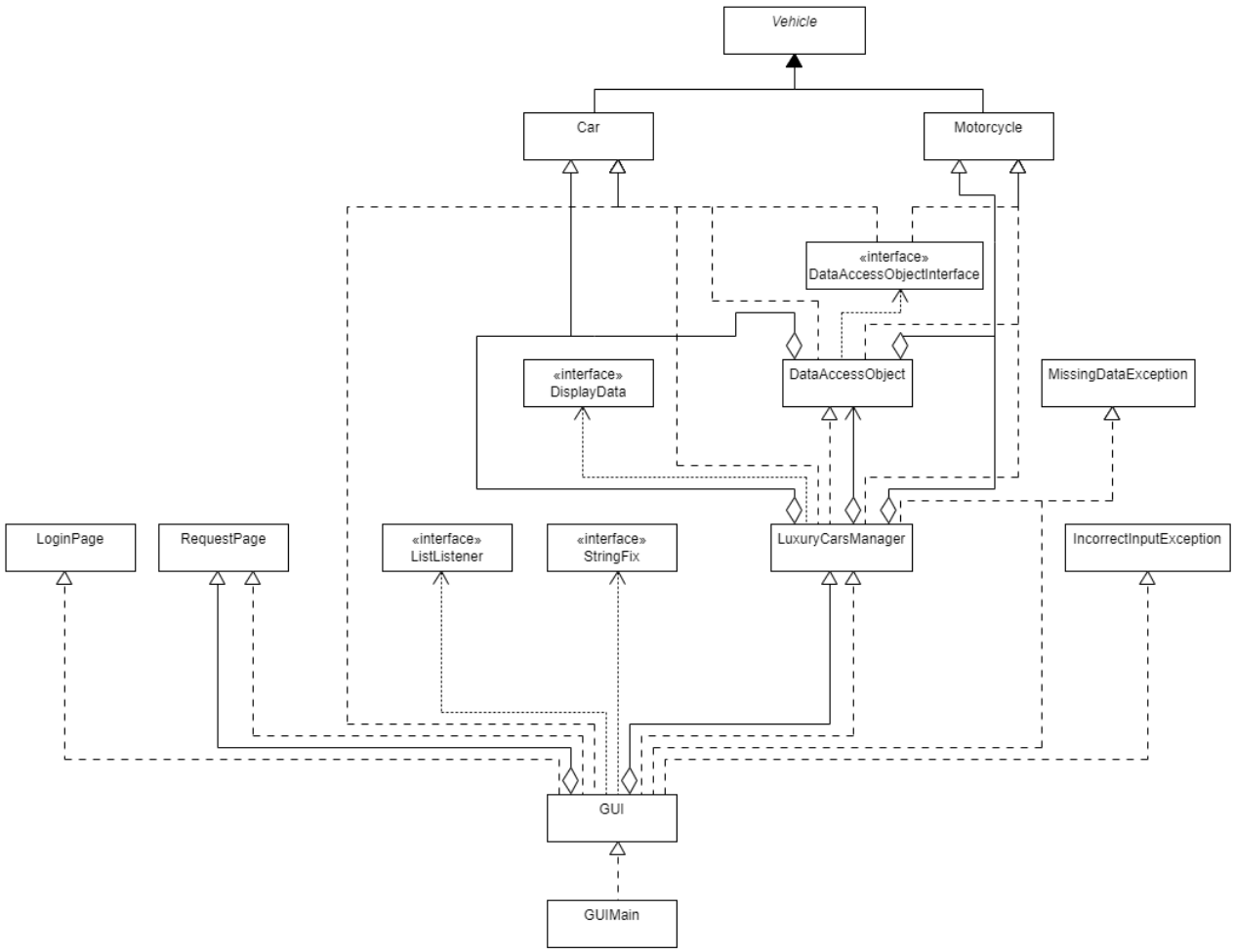
1. Project intent

Production, distribution and sale of cars is a set of processes that require a consistent organization and order. It is a massive system in which a large number of people indirectly work on the same product. The automobile sales are usually realized by a car manufacturing that makes their cars, but there are also companies that deal exclusively by selling or work closely with automakers that supply them with finished products. And therefore, it is necessary to rely on the correct implemented system. Purchase of luxury cars is usually provided for customers to scoop their dreams through different parameters or packages of equipment. In such situations, the dealer must be in direct contact with car manufacturers to ensure maximum customer satisfaction. In exceptional cases, the authorized marks and the possibility of verifying motor vehicles in specific service. It is necessary for certain variability of various brands and an adequate parameter database that describe the cars and the possibility of communicating with the manufacturer for the production of personalized product.

2. Class and dependencies diagram



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3. Completed criteria

3.1 Inheritance

As you can see on the diagram, the inheritance is present when segregating class **Car** and class **Motorcycle** from their superclass called **Vehicle.** They **inherit** all the attributes that class Vehicle possesses.

3.2 Polymorphism

In this project, polymorphism was applied when **constructing** cars, since all the cars in the program were constructed using class Car, but their branding and parameters were all **different**.

3.3 Aggregation

Aggregation was applied directly with classes **LuxuryCarsManager, Motorcycle** and **Car**, because both Motorcycle and Car have unidirectional association with LuxuryCarsManager, while being able to exist individually.

3.4 Encapsulation

Encapsulation mechanism was used for example on a class **Car**, since its parameters were declared **private** and in the program they are being accessed by special **get** and **set** methods.

3.5 Other criteria

3.5.1 DataAccessObject design pattern

DataAccessObject was used as a separate class and interface as a **mechanism to access and delete data** from current database. Their dependencies are shown in the diagram above.

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3.5.2 Observer design pattern

Observer design pattern was indirectly used when creating ActionListeners for specific buttons using method **addActionListener** with lambda expression, such as:

```
delBtn.addActionListener(event -> { // this button prompts admin to delete an item from list of cars

    ListSelectionModel selModel = myList.getSelectionModel();

    int index = selModel.getMinSelectionIndex(); // index stores an index of the item thats being deleted

    if (index >= 0) {
        modelList.remove(index);
        //cars.carData.deleteCar(cars.carData.carList.get(index));
    }
});
```

3.5.3 Custom Exception

There are 2 custom exceptions:

1. **MissingDataException** – is thrown when manipulating with incorrect vehicle object

```
try {
    throw new MissingDataException("The car is not in the database");
} catch (MissingDataException missingDataException) {
    missingDataException.printStackTrace();
}
```

2. **IncorrectInputException** – is thrown when entering a wrongful input

```
if (text == null) {
    try {
        throw new IncorrectInputException("Wrong IBAN!");
    } catch (IncorrectInputException exc) {
        exc.printStackTrace();
    }
}
```

3.5.4 Custom Handlers

Every event that occurs in this application is handled manually using **custom** listeners, as can be seen on **criteria 3.5.2**, where is an example handler for deletion button.

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3.5.5 Multithreading

Multithreading feature was implemented within the **request section** of the application, where if user requests a vehicle, the application remains **fully functional**, while another thread prepares the requested vehicle.

```
new Thread(() -> { // lambda expression to create a new thread

    try {
        Thread.sleep( millis: 5000); // delay in order to make request modeling look more believable
    } catch (InterruptedException interruptedException) {
        interruptedException.printStackTrace();
    }

    StringFix stringBrand = (str) -> str + " *"; // usage of lambda expression
    stringBrand.process(newBrand);

    cars.buildRequested(stringBrand.process(newBrand), newColor, newEngine, newGearbox, newFeatures);

    modelList.removeElement(stringBrand.process(newBrand));
    modelList.addElement(stringBrand.process(newBrand));
    reqBtn.setEnabled(true);
}).start();
```

3.5.6 Runtime type identification

Runtime type identification was used in backend class called **LuxuryCarsManager**, where it served as a runtime identifier for the vehicle data to be displayed.

```
switch (carType) {
    case "Alpine A110":
        logoPath = "\\Img\\alpineLogo.png";
        imgStream = getClass().getResourceAsStream(logoPath);
        img = ImageIO.read(imgStream);
        carLogo = new ImageIcon(new ImageIcon(img).getImage().
                getScaledInstance( width: 184,  height: 148, Image.SCALE_DEFAULT));
        break;
```

3.5.7 Nested interface

Buildable interface is a nested interface in **DisplayData** interface, where it serves as an addition for class **LuxuryCarsManager**. It is a single-method interface, whomst method builds a requested vehicle and stores it into a car list or motorcycle list accordingly.

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```
interface Buildable {
    void buildRequested(String brand, String color, String engine, String gearbox, String features);
}
```

3.5.8 Lambda expression

There are multiple lambda expressions implemented, for example method **deleteCar** in class DataAccessObject operates on a single-line statement using lambda expression in order to delete a car from its arraylist.

```
@Override
public void deleteCar(Car deletion) {
    carList.removeIf(car -> (car.getVehicleType()).equals(deletion.getVehicleType()));
}
```

3.5.9 Default method implementation

Default method implementation can be found in **DisplayData** interface, where method called **displayMissingData** defines standard behavior if it is not overriden.

```
default void displayMissingData() {
    JOptionPane.showMessageDialog( parentComponent: null,  message: "No such car in our database"
            , title: "Error", JOptionPane.INFORMATION_MESSAGE);
}
```

3.5.10 Serialization

Serialization mechanism is part of a **menubar** on top-left part of the application, where **load** and **save** items are present to ensure simplistic yet effective state **persistence**.

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4. List of most important commits

Main classes and first GUI draft:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/24d7f585ffc2f01e133b9e602a004177a5578f60

Multithreading using lambda expression:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/c363e252ffcac477fe0f2d5839b86cbf54828015

Serialization:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/35b24854bcf562cf68b58a937d9e1ea80102ecec

Project restructure, icon fixing and database:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/74b09df7b4eb0eb647bdccfd20510529bc78839d

DataAccessObject design pattern addition:

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https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/1050a70386a921e7c6375abececf325698db4229

Icons for main menu:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/c676209336d015c87fa91963fbb22bf2f4dfac20

Motorcycle request:

https://github.com/OOP-FIIT/oop-2021-uto-18-a-dakic-MarkoStahovec/commit/813c8e1a963349a467e2176200a07a14a96c4094

5. Possible improvements

If I had more time, I would remake serialization mechanism to be automatic, so user wouldn't have to load current state manually, making the most of serialization itself.