UNIVERSITY OF WESTMINSTER

INFORMATICS INSTITUTE OF TECHNOLOGY
In collaboration with
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Object Oriented Principles
5COSC007C

Coursework – Phase 4

Vehicle Rental System

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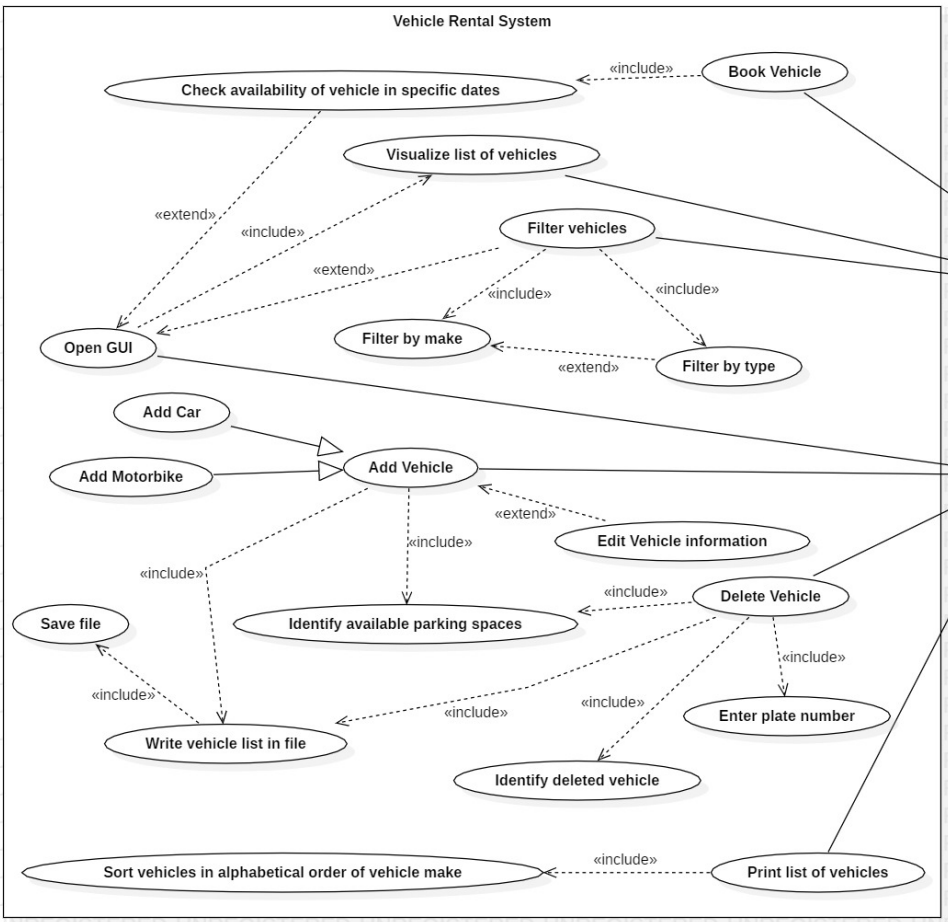
Design

1) Use Case Diagram

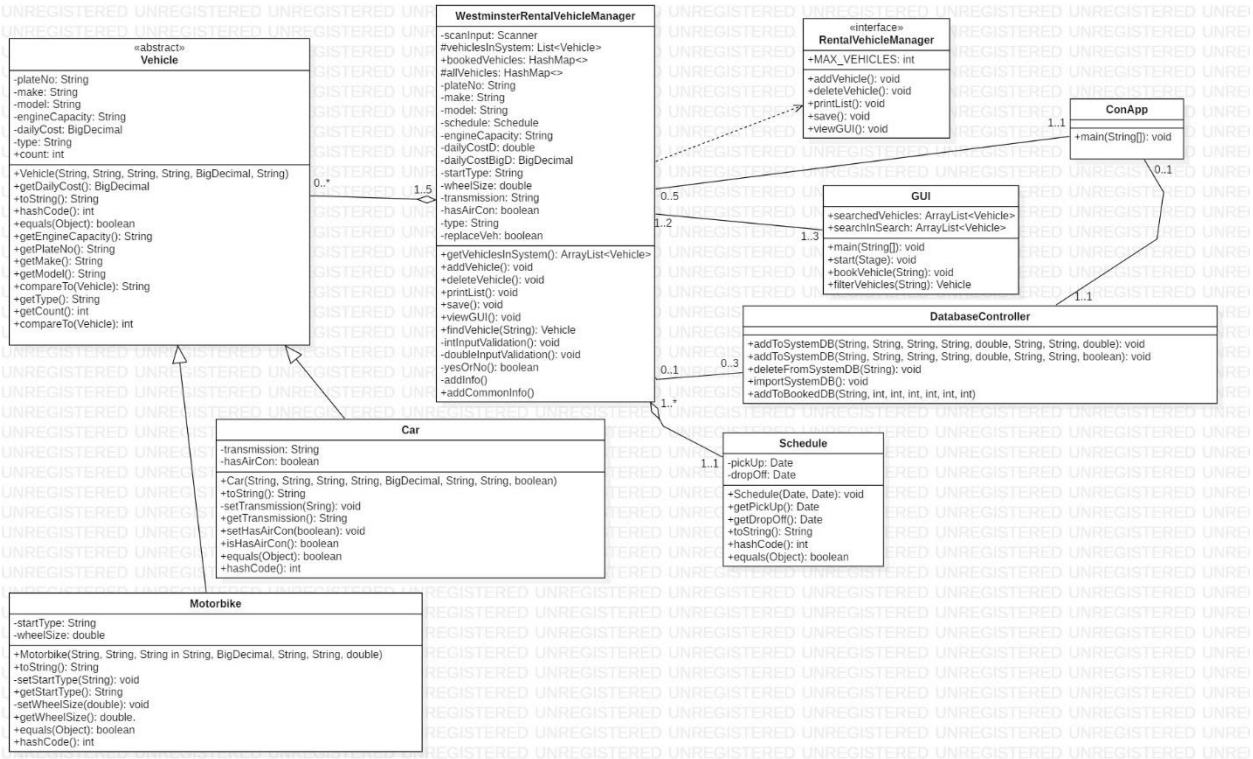
"You are required to develop a program that implements a basic vehicle rental system."
I have included the GUI section and the Console section in the same use case diagram as the assignments says that both of these are part of a single system.

***"Create a Graphical User Interface** (GUI) that can be opened selecting an option from the menu console"*
My use case diagram satisfies this condition as well.

But I have ensured that the customers can't change the information in the system by using specialization, which clearly shows that the Manager is only allowed to perform managerial operations.



2) Class Diagram



All Code + Screenshots of GUIs

build.gradle

```
plugins {
   id 'java'
}

version '1.0-SNAPSHOT'

sourceCompatibility = 1.8

repositories {
   mavenCentral()
}

dependencies {
   testCompile group: 'junit', name: 'junit', version: '4.12'
   compile 'org.mongodb:mongodb-driver-legacy:3.11.2'         //mongoDB connection driver
   compile "com.sparkjava:spark-core:2.8.0"                   //plugin for Java backend (API)
   implementation 'com.google.code.gson:gson:2.8.6'           //used to convert to JSON format

   compile "org.slf4j:slf4j-api:1.6.1"                // used to prevent SLF4J Error (Logging error -
doesn't affect program)
   compile "org.slf4j:slf4j-simple:1.6.1"

}
```

ConsoleApp

```
package lk.dinuka.VehicleRentalSystem;

import lk.dinuka.VehicleRentalSystem.Controller.API;
import lk.dinuka.VehicleRentalSystem.Controller.DatabaseController;
import lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager;

import java.util.HashMap;
import java.util.Scanner;

public class ConApp {

   private static HashMap<String, String> accessCredentials = new HashMap<>();         //used to
store for the user name & password to access the system functions
   //A hashMap is used to allow multiple user access credentials

   public static void main(String[] args) {

      accessCredentials.put("PrimaryAdmin", "welcome123");          //valid user name and
password
```

~~~
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter Login Credentials to access system");
        System.out.printf("UserName: ");
        String username = sc.nextLine();
        System.out.printf("Password: ");
        String password = sc.nextLine();
        sc.reset();                //clearing the cache of the scanner to secure username and password

        if (accessCredentials.containsKey(username) &&
password.equals(accessCredentials.get(username))) {

            int chooseOption;

            API.allowHeaders();       //allow headers in multiple responses

            DatabaseController.importSystemDB();         //importing Vehicles and Bookings saved
in database

            System.out.println("\n----All vehicles and bookings retrieved from database.----");

System.out.println("``````````````````````````````````````````````````````````````````````````````````````````````````````````
`````````````````````````````");


            do {
                System.out.println("\n\t\\~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~/");
                System.out.println("\t||````` ~~\tVehicle Rental System\t~~ `````||");
                System.out.println("\t/~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~\\");

                //display main menu
                System.out.println("\n1) Add item");
                System.out.println("2) Delete item");
                System.out.println("3) Print list of items");
                System.out.println("4) Open GUI");
                System.out.println("5) Exit program");
//            Scanner sc = new Scanner(System.in);
                System.out.print("\nEnter Option:\n>>");

                while (!sc.hasNextInt()) {          //validation for integer input
                    System.out.println("Only integer numbers are allowed! Please provide a valid
input");          //error handling message for characters other than integers
                    sc.next();                                   //removing incorrect input entered
                }

                chooseOption = sc.nextInt();

                WestminsterRentalVehicleManager managementAction = new
WestminsterRentalVehicleManager();       //new object
~~~

```
            switch (chooseOption) {
               case 1:        //add vehicle
                  managementAction.addVehicle();
                  break;

               case 2:        //delete vehicle
                  managementAction.deleteVehicle();
                  break;

               case 3:        //print list of vehicles
                  managementAction.printList();
                  break;

               case 4:        //open GUI
                  managementAction.viewGUI();
                  break;

               case 5:        //display exit message
                  System.out.println("\n\n****       +----------------------+         ****");
                  System.out.println(" Thank you for using the Vehicle Management System");
                  System.out.println("\tLooking forward to assist you in the future.");
                  System.out.println("\t\t\tExiting Program...");
                  System.out.println("                +-------+ ");
                  System.exit(0);

               default:
                  System.out.println("Invalid input. Please try again");
            }
         } while (chooseOption != 5);
      } else {
         System.out.println("> Incorrect Access Credentials were entered! <");
      }

   }
}


/*Reference:

https://stackoverflow.com/questions/7421612/slf4j-failed-to-load-class-org-slf4j-impl-staticloggerbinder

*/
```

Controller – Package

API

```
package lk.dinuka.VehicleRentalSystem.Controller;

import com.google.gson.Gson;
import com.google.gson.GsonBuilder;
import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import spark.Spark;

import java.time.LocalDate;

import static spark.Spark.*;

public class API {


   public static void getAllVehiclesToFront() {

      Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
      String vehiclesPrettyJson =
prettyGson.toJson(WestminsterRentalVehicleManager.getVehiclesInSystem());

//       System.out.println("Cars in Json Format: " + vehiclesPrettyJson);

      //GET - used to load data into GUI
      get("/hello", "application/json", (request, response) -> {
         return vehiclesPrettyJson;
      });

   }


   public static void postBookingsFromFront() {

      //get plateNo of vehicle and days, book vehicle if available and let the front end know it's
availability

      //POST - used to book
      post("/books","application/json", (request, response) -> {

         String responsePrettyJson;

         String plateNo = request.queryParams("plateNo");

         int yearPickUp =  Integer.parseInt(request.queryParams("yearPickUp"));
         int monthPickUp =  Integer.parseInt(request.queryParams("monthPickUp"));
         int dayPickUp =  Integer.parseInt(request.queryParams("dayPickUp"));

         int yearDropOff =  Integer.parseInt(request.queryParams("yearDropOff"));
```

```
        int monthDropOff =  Integer.parseInt(request.queryParams("monthDropOff"));
        int dayDropOff =  Integer.parseInt(request.queryParams("dayDropOff"));

        LocalDate pickUpDate = LocalDate.of(yearPickUp,monthPickUp,dayPickUp);
        LocalDate dropOffDate = LocalDate.of(yearDropOff,monthDropOff,dayDropOff);

        Schedule newBooking = new Schedule(pickUpDate,dropOffDate);

//          System.out.println(newBooking);

        boolean created = GUIController.createBooking(plateNo,newBooking);

        response.status(201); // 201 Created

        if (created) {     //if booking was created
           Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
           responsePrettyJson = prettyGson.toJson("successful");

           // adding new booking to the database
           DatabaseController.addToBookedDB(plateNo, yearPickUp, monthPickUp, dayPickUp,
                 yearDropOff, monthDropOff, dayDropOff);

        }else{     //if booking wasn't created (already booked)
           Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
           responsePrettyJson = prettyGson.toJson("unsuccessful");
        }

//          return created;        //true if successful
        return responsePrettyJson;
      });

   }
   public static void postAvailabilityFromFront() {

      //get plateNo of vehicle and days. check whether vehicle is available and let the front end
know it's availability

      //POST - used to book
      post("/checks","application/json", (request, response) -> {

         String responsePrettyJson;

         String plateNo = request.queryParams("plateNo");

         int yearPickUp =  Integer.parseInt(request.queryParams("yearPickUp"));
         int monthPickUp =  Integer.parseInt(request.queryParams("monthPickUp"));
         int dayPickUp =  Integer.parseInt(request.queryParams("dayPickUp"));

         int yearDropOff =  Integer.parseInt(request.queryParams("yearDropOff"));
```

```
        int monthDropOff =  Integer.parseInt(request.queryParams("monthDropOff"));
        int dayDropOff =  Integer.parseInt(request.queryParams("dayDropOff"));

        LocalDate pickUpDate = LocalDate.of(yearPickUp,monthPickUp,dayPickUp);
        LocalDate dropOffDate = LocalDate.of(yearDropOff,monthDropOff,dayDropOff);

        Schedule newBooking = new Schedule(pickUpDate,dropOffDate);

//          System.out.println(newBooking);

        boolean created = GUIController.checkAvailabilityOfVeh(plateNo,newBooking);

        response.status(201); // 201 Created

        if (created) {     //if booking was created
           Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
           responsePrettyJson = prettyGson.toJson("successful");
        }else{     //if booking wasn't created (already booked)
           Gson prettyGson = new GsonBuilder().setPrettyPrinting().create();
           responsePrettyJson = prettyGson.toJson("unsuccessful");
        }

//          return created;        //true if successful
        return responsePrettyJson;
      });

    }



    public static void allowHeaders() {
      Spark.staticFiles.location("/assets");
      Spark.staticFiles.header("Access-Control-Allow-Origin", "*");

      options("/*", (req, res) -> {
        String accessControlRequestHeaders = req.headers("Access-Control-Request-Headers");
        if (accessControlRequestHeaders != null) {
          res.header("Access-Control-Allow-Headers", accessControlRequestHeaders);
        }

        String accessControlRequestMethod = req.headers("Access-Control-Request-Method");
        if (accessControlRequestMethod != null) {
          res.header("Access-Control-Allow-Methods", accessControlRequestMethod);
        }

        return "OK";
      });
```

```
        before((req, res) -> {
            res.header("Access-Control-Allow-Origin", "*");
            res.header("Access-Control-Allow-Headers", "*");
            res.type("application/json");
        });

    }
}


/*
References:

https://github.com/perwendel/spark
http://sparkjava.com/documentation#response-transformer

JSON and java objects
https://github.com/google/gson
https://www.baeldung.com/spark-framework-rest-api

https://gist.github.com/saeidzebardast/e375b7d17be3e0f4dddf#gistcomment-2704256

https://technology.finra.org/code/serialize-deserialize-interfaces-in-java.html

https://crunchify.com/in-java-how-to-convert-arraylist-to-jsonobject/

Make http requests from browser
https://github.com/axios/axios

https://gist.github.com/akexorcist/ea93ee47d39cf94e77802bc39c46589b

*/
```

DatabaseController

```
package lk.dinuka.VehicleRentalSystem.Controller;

import com.mongodb.MongoClientURI;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;
import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import org.bson.Document;

import java.math.BigDecimal;
import java.time.LocalDate;
import java.util.ArrayList;

public class DatabaseController {

   public static void addToSystemDB(String plateNo, String make, String model, String
engineCapacity, double dailyCost, String type, String startType, double wheelSize) {
      //Adding a Motorbike to the Collection

      MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
      com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
      MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

      //Access collection
      MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

      //create a document
      Document newVehicle = new Document("Plate No", plateNo)
            .append("Make", make)
            .append("Model", model)
            .append("Engine Capacity", engineCapacity)
            .append("Daily Cost", dailyCost)
            .append("Type", type)
            .append("Start Type", startType)
            .append("Wheel Size", wheelSize);

      //insert the document
      collection.insertOne(newVehicle);
   }
```

```
   public static void addToSystemDB(String plateNo, String make, String model, String
engineCapacity, double dailyCost, String type, String transmission, boolean hasAirCon) {
      //Adding a car to the Collection

      MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
      com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
      MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

      //Access collection
      MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

      //create a document
      Document newVehicle = new Document("Plate No", plateNo)
            .append("Make", make)
            .append("Model", model)
            .append("Engine Capacity", engineCapacity)
            .append("Daily Cost", dailyCost)
            .append("Type", type)
            .append("Transmission", transmission)
            .append("Air Con", hasAirCon);

      //insert the document
      collection.insertOne(newVehicle);
   }


   public static void deleteFromSystemDB(String plateNo) {     //Deleting an item from the
Collection

      MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
      com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
      MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

      //Access collection
      MongoCollection<Document> collection = database.getCollection("VehiclesInSystem");

      collection.deleteOne(Filters.eq("Plate No", plateNo));
   }

   public static void importSystemDB() {   //Importing stored data in db to application (From
VehiclesInSystem & BookedVehicles)

      MongoClientURI uri = new MongoClientURI(
            "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
```

```
        com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
        MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");


        //importing from VehiclesInSystem collection (For allVehicles HashMap & vehiclesInSystem
ArrayList)
        //Access collection
        MongoCollection<Document> savedCollection =
database.getCollection("VehiclesInSystem");

        for(Document selectedDoc : savedCollection.find()){
            String plateNo = (String)selectedDoc.get("Plate No");
            String make = (String) selectedDoc.get("Make");
            String model = (String) selectedDoc.get("Model");
            String engineCapacity = (String) selectedDoc.get("Engine Capacity");
            double dailyCostD = (double) selectedDoc.get("Daily Cost");
            String type = (String) selectedDoc.get("Type");

            BigDecimal dailyCostBigD = BigDecimal.valueOf(dailyCostD);    //converting double to
BigDecimal, to use for calculations


            if(type.equals("Car")){
                String transmission = (String) selectedDoc.get("Transmission");
                boolean hasAirCon = (boolean) selectedDoc.get("Air Con");

                Vehicle storedCar = new
Car(plateNo,make,model,engineCapacity,dailyCostBigD,type,transmission,hasAirCon);
                WestminsterRentalVehicleManager.allVehicles.put(plateNo,storedCar);
                WestminsterRentalVehicleManager.vehiclesInSystem.add(storedCar);
//                System.out.println(storedCar);          //to check whether Car was added

            }else if(type.equals("Motorbike")){
                String startType = (String) selectedDoc.get("Start Type");
                double wheelSize = (double) selectedDoc.get("Wheel Size");

                Vehicle storedBike = new
Motorbike(plateNo,make,model,engineCapacity,dailyCostBigD,type,startType,wheelSize);
                WestminsterRentalVehicleManager.allVehicles.put(plateNo,storedBike);
                WestminsterRentalVehicleManager.vehiclesInSystem.add(storedBike);
//                System.out.println(storedBike);          //to check whether Motorbike was added
            }

        }


        //================
        //importing from BookedVehicles collection (For bookedVehicles HashMap)
```

```
    MongoCollection<Document> bookedCollection =
database.getCollection("BookedVehicles");


    for(Document selectedDoc : bookedCollection.find()){
      String plateNo = (String)selectedDoc.get("Plate No");

      Document pickUpObject = (Document) selectedDoc.get("pick up");
      Document dropOffObject = (Document) selectedDoc.get("drop off");


      //breaking down date document to create date using Schedule constructor
      //pick up date
      int yearUp = pickUpObject.getInteger("year");
      int monthUp = pickUpObject.getInteger("month");
      int dayUp = pickUpObject.getInteger("day");
      //drop off date
      int yearDown = dropOffObject.getInteger("year");
      int monthDown = dropOffObject.getInteger("month");
      int dayDown = dropOffObject.getInteger("day");


      LocalDate pickUpDate = LocalDate.of(yearUp,monthUp,dayUp);
      LocalDate dropOffDate = LocalDate.of(yearDown,monthDown,dayDown);


      Schedule bookedSchedule = new Schedule(pickUpDate,dropOffDate);


      if (WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNo)){
        ArrayList bookedDates =
WestminsterRentalVehicleManager.bookedVehicles.get(plateNo);
        bookedDates.add(bookedSchedule);
        WestminsterRentalVehicleManager.bookedVehicles.put(plateNo,bookedDates);
      }else{

        ArrayList bookedDate = new ArrayList();
        bookedDate.add(bookedSchedule);
        WestminsterRentalVehicleManager.bookedVehicles.put(plateNo,bookedDate);
      }

    }


  }


  public static void addToBookedDB(String plateNo, int yearUp, int monthUp, int dayUp, int
yearDown, int monthDown, int dayDown) {
```

```
        MongoClientURI uri = new MongoClientURI(
                "mongodb+srv://cw_user:123098@cluster0-
gxfyy.gcp.mongodb.net/test?retryWrites=true&w=majority");
        com.mongodb.MongoClient mongoClient = new com.mongodb.MongoClient(uri);
        MongoDatabase database = mongoClient.getDatabase("VehicleRentalSystem");

        //Access collection
        MongoCollection<Document> collection = database.getCollection("BookedVehicles");

        //if already existing, delete document and add new document----------

        //create a document
        Document newSchedule = new Document("Plate No", plateNo)
                .append("pick up", new Document("year", yearUp)          //document inside document
                        .append("month", monthUp)
                        .append("day", dayUp))
                .append("drop off", new Document("year", yearDown)          //document inside
document
                        .append("month", monthDown)
                        .append("day", dayDown));

        //insert the document
        collection.insertOne(newSchedule);

    }
}

/*
References:
https://www.tutorialspoint.com/mongodb/mongodb_java
        https://mongodb.github.io/mongo-java-driver/3.4/driver/getting-started/quick-start/
        https://mongodb.github.io/mongo-java-driver/3.4/driver/getting-started/installation/
        https://mongodb.github.io/mongo-java-driver/
        https://github.com/mongodb/mongo-java-driver/tree/master

Importing MongoDB documents to Java ArrayList
https://stackoverflow.com/questions/19435621/extract-field-value-from-mongodb-
basicdbobject?rq=1
*/
```

GUIController

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Schedule;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;

import java.math.BigDecimal;
import java.time.LocalDate;
import java.time.Period;
import java.util.ArrayList;
import java.util.List;

import static
lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager.bookedVehicles;


public class GUIController {

   public static boolean createBooking(Vehicle chosenVeh, Schedule newBooking ) {
      //used to create a booking as required and add booking info into the system

      List<Schedule> bookedVehicleDates = new ArrayList<>();     //used to record pick up & drop
off dates of a vehicle
      //Only used to store the dates into the bookedVehicles HashMap

      boolean availability = checkAvailabilityOfVeh(chosenVeh, newBooking);   //checking
whether vehicle is available for booking


      System.out.println();
      System.out.println("---checked availability---");
      System.out.println();

      if (availability) {
         System.out.println("Vehicle is available for booking");

         if (bookedVehicles.containsKey(chosenVeh.getPlateNo())) {
            bookedVehicleDates = bookedVehicles.get(chosenVeh.getPlateNo());          //getting
recorded bookings into temporary list
         }
         bookedVehicleDates.add(newBooking);     //adding the newly booked dates to the list of
bookings.

         WestminsterRentalVehicleManager.bookedVehicles.put(chosenVeh.getPlateNo(),
(ArrayList) bookedVehicleDates);      //adding all booked vehicles to bookedVehicles HashMap

         System.out.println(WestminsterRentalVehicleManager.bookedVehicles);        //checking
whether required booking was entered into the system
         return true;
```

```
    } else {
        System.out.println("Vehicle isn't available for booking during the requested time
period.");
        //vehicle isn't available to be book
        return false;
    }
  }


  //``````~~~~~~~~~~~~~~~~~~~~``````


  public static boolean checkAvailabilityOfVeh(Vehicle chosenVeh, Schedule newBooking ) {
    //used to check for the availability of a chosen vehicle

    String plateNoOfChosen = chosenVeh.getPlateNo();       //The plate number of the chosen
vehicle


    if (!WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNoOfChosen)) {
        return true;       //vehicle is not booked
    } else {

        List<Schedule> bookedVehicleDates = new ArrayList<>();    //used to record pick up &
drop off dates of a vehicle
        bookedVehicleDates = bookedVehicles.get(chosenVeh.getPlateNo());          //getting
recorded bookings into temporary list
        //Only used to get each of the dates from the bookedVehicles HashMap Values


        int totalBookings = bookedVehicles.get(plateNoOfChosen).size();
        int passedChecks = 0;

        for (int i = 0; i < totalBookings; i++) {

            boolean checkPickUpBefore = LocalDate.from(newBooking.getPickUp()).isBefore(
//pick up before booked pickup
                    bookedVehicleDates.get(i).getPickUp());
            boolean checkDropOffBefore = LocalDate.from(newBooking.getDropOff()).isBefore(
//drop off before booked pick up
                    bookedVehicleDates.get(i).getPickUp());

            boolean checkPickUpAfter = LocalDate.from(newBooking.getPickUp()).isAfter(
//pick up after booked drop off
                    bookedVehicleDates.get(i).getDropOff());
            boolean checkDropOffAfter = LocalDate.from(newBooking.getDropOff()).isAfter(
//drop off after booked drop off
                    bookedVehicleDates.get(i).getDropOff());
```

```
            if ((checkPickUpBefore && checkDropOffBefore) || (checkPickUpAfter &&
checkDropOffAfter)) {
                // if both requested pick up and drop off are either before the booked pick up date
or after the
                // booked drop off date, the vehicle is available for requested period

                passedChecks += 1;

            }
            //if false for at least one, can't book
        }

        //-------------------

//          if (totalBookings>0){
//              return passedChecks == totalBookings;          //if all the bookings don't interfere with
the requested time -> true
//
//          } else{
//              return true;
        //since this else block will run only if there has been at least one previous entry, the
above verification isn't required
        return passedChecks == totalBookings;          //if all the bookings don't interfere with the
requested time -> true

    }
  }


  public static BigDecimal getCalculatedRent(BigDecimal dailyCost, Schedule newBooking) {
//      have calculation of total cost here

    BigDecimal totalCost = BigDecimal.valueOf(0);

    Period period =
Period.between(newBooking.getPickUp(),newBooking.getDropOff());//difference between the
number of days
    int noOfDays = period.getDays();

    if (noOfDays > 0) {
        return dailyCost.multiply(BigDecimal.valueOf(noOfDays));    //dailyCost*noOfDays
    }
    return totalCost;

  }
```

```
    //----------------------------->>>>
    //Booking methods for Angular GUI
    public static boolean createBooking(String plateNo, Schedule newBooking ) {
        //used to create a booking as required and add booking info into the system

        List<Schedule> bookedVehicleDates = new ArrayList<>();     //used to record pick up & drop
off dates of a vehicle
        //Only used to store the dates into the bookedVehicles HashMap

        boolean availability = checkAvailabilityOfVeh(plateNo, newBooking);   //checking whether
vehicle is available for booking

        if (availability) {
//            System.out.println("Vehicle is available for booking");

            if (bookedVehicles.containsKey(plateNo)) {
                bookedVehicleDates = bookedVehicles.get(plateNo);           //getting recorded
bookings into temporary list
            }
            bookedVehicleDates.add(newBooking);     //adding the newly booked dates to the list of
bookings.

            WestminsterRentalVehicleManager.bookedVehicles.put(plateNo, (ArrayList)
bookedVehicleDates);       //adding all booked vehicles to bookedVehicles HashMap

            return true;
        } else {
            //vehicle isn't available to be book
            return false;
        }
    }


    //``````~~~~~~~~~~~~~~~~~~~~~~``````


    public static boolean checkAvailabilityOfVeh(String plateNo, Schedule newBooking ) {
        //used to check for the availability of a chosen vehicle

        String plateNoOfChosen = plateNo;       //The plate number of the chosen vehicle


        if (!WestminsterRentalVehicleManager.bookedVehicles.containsKey(plateNoOfChosen)) {
            return true;       //vehicle is not booked
        } else {
```

```
        List<Schedule> bookedVehicleDates = new ArrayList<>();    //used to record pick up &
drop off dates of a vehicle
        bookedVehicleDates = bookedVehicles.get(plateNoOfChosen);          //getting recorded
bookings into temporary list
        //Only used to get each of the dates from the bookedVehicles HashMap Values


        int totalBookings = bookedVehicles.get(plateNoOfChosen).size();
        int passedChecks = 0;

        for (int i = 0; i < totalBookings; i++) {

            boolean checkPickUpBefore = LocalDate.from(newBooking.getPickUp()).isBefore(
//pick up before booked pickup
                    bookedVehicleDates.get(i).getPickUp());
            boolean checkDropOffBefore = LocalDate.from(newBooking.getDropOff()).isBefore(
//drop off before booked pick up
                    bookedVehicleDates.get(i).getPickUp());

            boolean checkPickUpAfter = LocalDate.from(newBooking.getPickUp()).isAfter(
//pick up after booked drop off
                    bookedVehicleDates.get(i).getDropOff());
            boolean checkDropOffAfter = LocalDate.from(newBooking.getDropOff()).isAfter(
//drop off after booked drop off
                    bookedVehicleDates.get(i).getDropOff());


            if ((checkPickUpBefore && checkDropOffBefore) || (checkPickUpAfter &&
checkDropOffAfter)) {
                // if both requested pick up and drop off are either before the booked pick up date
or after the
                // booked drop off date, the vehicle is available for requested period

                passedChecks += 1;

            }
            //if false for at least one, can't book
        }

        //since this else block will run only if there has been at least one previous entry, the
above verification isn't required
        return passedChecks == totalBookings;          //if all the bookings don't interfere with the
requested time -> true

    }
  }

}
```

/*
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Current Date & Time
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https://docs.oracle.com/javase/1.5.0/docs/api/java/text/SimpleDateFormat.html#month
https://www.javatpoint.com/java-get-current-date

Java8DateTimeExamples.java
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*/

WestminsterRentalVehicleManager

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.RentalVehicleManager;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import lk.dinuka.VehicleRentalSystem.View.GUI;

import java.io.*;
import java.math.BigDecimal;
import java.nio.file.DirectoryNotEmptyException;
import java.nio.file.Files;
import java.nio.file.NoSuchFileException;
import java.nio.file.Paths;
import java.util.*;

public class WestminsterRentalVehicleManager implements RentalVehicleManager {

   private static Scanner scanInput = new Scanner(System.in);

   protected static HashMap<String, Vehicle> allVehicles = new HashMap<>();        //used to
check whether the plate No already exists in the system
   protected static List<Vehicle> vehiclesInSystem = new ArrayList<>();      //used for sorting and
printing.    protected: making sure that customers can't modify the vehicles in the system
   public static HashMap<String, ArrayList> bookedVehicles = new HashMap<>();     //used to
record booked vehicles   (plateNo, ArrayList of Schedules)

   public static List<Vehicle> getVehiclesInSystem() {        //accessed in GUI
      return vehiclesInSystem;
   }

   public static HashMap<String, Vehicle> getAllVehicles() {
      return allVehicles;
   }

   private static String plateNo;
   private static String make;
   private static String model;
   private static String engineCapacity;
   private static double dailyCostD;
   private static BigDecimal dailyCostBigD;
   private static String startType;
   private static double wheelSize;
   private static String transmission;
   private static boolean hasAirCon;
   private static String type;
```

```
   private static boolean replaceVeh;         //used to check whether vehicle data is being added
or edited


   @Override
   public void addVehicle() {            //add vehicle into system

      //Pointless the getting the inputs in the console because edit option is in the add option
(will have to repeat code)

      if (Vehicle.getCount() <= MAX_VEHICLES) {       //checking whether the vehicles existing in
the system has occupied all the available parking lots

         int typeSelection;
         do {
            System.out.println("\nChoose the type of Vehicle to be added:");
            System.out.println("1) Car\n2) Motorbike");
            System.out.print(">");
            intInputValidation();
            typeSelection = scanInput.nextInt();
            scanInput.nextLine();            //to consume the rest of the line

         } while (!(typeSelection == 1 || typeSelection == 2));


         System.out.println("\nEnter Plate No:");
         System.out.print(">");
         plateNo = scanInput.nextLine();

         if (allVehicles.containsKey(plateNo)) {
            System.out.println("This Plate No. exists in the system.");
            System.out.println();         //to keep space for clarity

            replaceVeh = false;

            printListForEdit();        //display information of vehicle

            System.out.println();         //to keep space for clarity
            System.out.println("Do u want to edit information related to this vehicle?");
            System.out.print(">");

            boolean edit = yesOrNo();

            if (edit) {

               replaceVeh = true;

               //remove vehicle from db
               DatabaseController.deleteFromSystemDB(plateNo);
```

```
            addInfo(typeSelection);          //add information related to a Vehicle of identified
plateNo.

            deleteFile();     //deleting existing file
            save();    //saving info in file

            API.getAllVehiclesToFront();            //update vehicles in front end


          } else {
            System.out.println();     //keeps space and goes back to main menu
          }
        } else {

          addInfo(typeSelection);          //add information related to a Vehicle of identified
plateNo.

          save();    //saving info in file

          API.getAllVehiclesToFront();            //update vehicles in front end

        }


    } else {
      System.out.println("There are no available spaces. 50 vehicles have been added!");
    }
  }

  @Override
  public void deleteVehicle() {              //delete vehicle by entering plate no. of vehicle
    System.out.println("Enter the plate number of the vehicle that u desire to delete:");
    System.out.print(">");          //get plateNo from user to choose vehicle to be deleted
    String searchNo = scanInput.nextLine();

    if (allVehicles.containsKey(searchNo)) {
      Vehicle vehicleToBeDeleted = allVehicles.get(searchNo);

      type = vehicleToBeDeleted.getType();

      System.out.println("\nA " + type + " has been deleted from the system.");
      System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());     //displaying information of deleted vehicle

      vehiclesInSystem.remove(vehicleToBeDeleted);
      allVehicles.remove(searchNo);
      Vehicle.count -= 1;        //decreasing the number of vehicles from the system by one
```

```
            //Deleting from noSQL Database
            DatabaseController.deleteFromSystemDB(searchNo);

            System.out.println("There are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left in the garage.");

            save();    //save changes to file

            API.getAllVehiclesToFront();              //update vehicles in front end

        } else {
            System.out.println("There's no vehicle related to the Plate No: " + searchNo);
        }
    }


    @Override
    public void printList() {      //prints list of vehicles in the system

        Collections.sort(vehiclesInSystem);    //sort vehicles alphabetically, according to make


        // print the plate number, the type of vehicle (car/ van/ motorbike).

        String leftAlignFormat = "| %-15s | %-12s |%n";

        System.out.format("+-----------------+--------------+%n");
        System.out.format("|   Plate ID      |   Type       |%n");
        System.out.format("+-----------------+--------------+%n");

        for (Vehicle item : vehiclesInSystem) {
            if (item instanceof Car) {
                System.out.format(leftAlignFormat, item.getPlateNo(), "Car");
            } else if (item instanceof Motorbike) {
                System.out.format(leftAlignFormat, item.getPlateNo(), "Motorbike");
            }
        }
        System.out.println("+--------------------------------+");
    }

    @Override
    public void save() {       //saves the information of vehicles entered into the system
        //Rewrite the file every time a change is made.

        deleteFile();      //delete existing file

        try {      //creating the file
            File myFile = new File("allVehicles.txt");
            myFile.createNewFile();
```

```
//              System.out.println("\nFile created: " + myFile.getName());
          FileWriter soldFile = new FileWriter("allVehicles.txt", true);


          soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
------+-----------+-------------+--------+----------------+------------+%n"));
          soldFile.write(String.format("|   Plate ID      |   Make       |   Model     | Engine Capacity|
Daily Cost(£) |   Type    | transmission | AirCon | Start type     | Wheel Size |%n"));
          soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
------+-----------+-------------+--------+----------------+------------+%n"));
//              soldFile.write(System.getProperty("line.separator"));      //line break


          String leftAlignFormat2 = "| %-15s | %-13s | %-12s | %-14s | %-13s | %-9s | %-12s | %-
6s | %-15s | %-10s |%n";


          //writing into the file
          for (Vehicle veh : vehiclesInSystem) {
             if (veh instanceof Motorbike) {
                soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
                      veh.getDailyCost(), veh.getType(), "     -    ", "   -  ", ((Motorbike)
veh).getStartType(), ((Motorbike) veh).getWheelSize()));
             } else {
                soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
                      veh.getDailyCost(), veh.getType(), ((Car) veh).getTransmission(), ((Car)
veh).isHasAirCon(), "      -      ", "     -    "));
             }
             soldFile.write(System.getProperty("line.separator"));      //line break
          }
          soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
------+-----------+-------------+--------+----------------+------------+%n"));

          soldFile.close();

       } catch (IOException e) {
          System.out.println("\nAn error occurred.");
          e.printStackTrace();
       }
    }

    @Override
    public void viewGUI() {        //opens a chosen GUI
       int guiSelection;

       do {
```

```
    System.out.println("\nChoose the required GUI:");
    System.out.println("1) Angular\n2) JavaFX");
    System.out.print(">");
    intInputValidation();
    guiSelection = scanInput.nextInt();
    scanInput.nextLine();           //to consume the rest of the line

} while (!(guiSelection == 1 || guiSelection == 2));


if (guiSelection == 1) {          // Angular GUI

    API.getAllVehiclesToFront();            //send vehicles to front end
    API.postBookingsFromFront();              //handle booking
    API.postAvailabilityFromFront();          //handle availability


    //Open Angular GUI in browser
    ProcessBuilder builder = new ProcessBuilder("explorer.exe", "http://localhost:4200/");

    builder.redirectErrorStream(true);

    Process p = null;
    try {
        p = builder.start();
    } catch (IOException e) {
        e.printStackTrace();
    }
    BufferedReader r = new BufferedReader(new InputStreamReader(p.getInputStream()));
    String line;
    while (true) {
        try {
            line = r.readLine();
            if (line == null) {
                break;
            }
            System.out.println(line);

        } catch (IOException e) {
            e.printStackTrace();
        }
    }

} else {                        //JavaFX GUI

    GUI.main(null);      //used to open javafx application

}
```

```
  }


//   ---- repeated methods ----

   private static void addInfo(int typeSelection) {         //method to add information related to a Vehicle of identified plateNo.

      if (replaceVeh) {
         vehiclesInSystem.remove(allVehicles.get(plateNo));            //removing vehicle from ArrayList, if editing it's information
      }

      if (typeSelection == 1) {      //new Car chosen
         addCommonInfo();

         type = "Car";

         System.out.println("\nEnter the type of transmission:");
         System.out.print(">");
         transmission = scanInput.nextLine();


         System.out.println("\nDoes this car have A/C?");
         System.out.print(">");

         hasAirCon = yesOrNo();


         Vehicle newCar = new Car(plateNo, make, model, engineCapacity, dailyCostBigD, type, transmission, hasAirCon);

         allVehicles.put(plateNo, newCar);          //adding a car into the allVehicles hashMap
         vehiclesInSystem.add(newCar);

         //adding new Car to noSQL database
         DatabaseController.addToSystemDB(plateNo, make, model, engineCapacity, dailyCostD, type, transmission, hasAirCon);

         System.out.println(newCar);       //displaying added vehicle

      } else if (typeSelection == 2) {        //new Motorbike chosen
         addCommonInfo();

         type = "Motorbike";

         System.out.println("\nEnter start type:");
         System.out.print(">");
```

```
            startType = scanInput.nextLine();

            System.out.println("\nEnter wheel size:");
            System.out.print(">");
            doubleInputValidation();
            wheelSize = scanInput.nextDouble();
            scanInput.nextLine();          //to consume the rest of the line


            Vehicle newBike = new Motorbike(plateNo, make, model, engineCapacity, dailyCostBigD,
type, startType, wheelSize);

            allVehicles.put(plateNo, newBike);          //adding a motorbike into the allVehicles
hashMap
            vehiclesInSystem.add(newBike);

            //adding new Bike to noSQL database
            DatabaseController.addToSystemDB(plateNo, make, model, engineCapacity, dailyCostD,
type, startType, wheelSize);

            System.out.println(newBike);       //displaying added vehicle
        }

        System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");

    }


    private static void addCommonInfo() {      //common information related to Car & Motorbike
in addVehicle


        System.out.println("\nEnter Make:");
        System.out.print(">");
        make = scanInput.nextLine();

        System.out.println("\nEnter Model:");
        System.out.print(">");
        model = scanInput.nextLine();


        System.out.println("\nEnter Engine Capacity (in CC):");
        System.out.print(">");
        engineCapacity = scanInput.nextLine();

        System.out.println("\nEnter Daily cost (in £):");
        System.out.print(">$");
        doubleInputValidation();
```

```
      dailyCostD = scanInput.nextDouble();

      dailyCostBigD = BigDecimal.valueOf(dailyCostD);     //converting double to BigDecimal, to
use for calculations


      scanInput.nextLine();            //to consume the rest of the line

   }


   public static void printListForEdit() {
      //print information of vehicle when asked whether to edit
      System.out.println("Make: " + allVehicles.get(plateNo).getMake());
      System.out.println("Model: " + allVehicles.get(plateNo).getModel());
      System.out.println("Engine Capacity: " + allVehicles.get(plateNo).getEngineCapacity());
      System.out.println("Daily Cost (in £): " + allVehicles.get(plateNo).getDailyCost());
      System.out.println("Type: " + allVehicles.get(plateNo).getType());

      if (allVehicles.get(plateNo) instanceof Car) {
         System.out.println("Transmission: " + ((Car) allVehicles.get(plateNo)).getTransmission());
         System.out.println("Has Air Conditioning: " + ((Car)
allVehicles.get(plateNo)).isHasAirCon());
      } else {
         System.out.println("Start Type: " + ((Motorbike)
allVehicles.get(plateNo)).getStartType());
         System.out.println("Wheel Size: " + ((Motorbike)
allVehicles.get(plateNo)).getWheelSize());
      }
   }


   private static boolean yesOrNo() {          //gets yes/ no input

      while (!scanInput.hasNextBoolean()) {                              //check whether this works
as expected!!!!!!!!!!
         String inputYN = scanInput.nextLine().toLowerCase();
         if (inputYN.equals("y") || inputYN.equals("yes")) {
            return true;
         } else if (inputYN.equals("n") || inputYN.equals("no")) {
            return false;
         } else {
            System.out.println("Invalid input. Please try again.");
            System.out.print(">");
         }
      }
      return false;          //won't reach this point (added to get rid of the missing return
statement error)
   }
```

```
   private static void intInputValidation() {                //validating integer input

      while (!scanInput.hasNextInt()) {
         System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
         scanInput.next();                                   //removing incorrect input entered
      }
   }

   private static void doubleInputValidation() {              //validating double input

      while (!scanInput.hasNextDouble()) {
         System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
         scanInput.next();                                   //removing incorrect input entered
      }
   }


   private static void deleteFile() {      //deleting file, if exists (When vehicle is added/ deleted/
edited)
      try {
         Files.deleteIfExists(Paths.get("C:\\Users\\Dell XPS15\\Documents\\IIT
Work\\L5\\OOP\\Coursework 01\\OOP-CW\\OOP-CW+\\allVehicles.txt"));
      } catch (NoSuchFileException e) {
         System.out.println("No such file/directory exists");
      } catch (DirectoryNotEmptyException e) {
         System.out.println("Directory is not empty.");
      } catch (IOException e) {
         System.out.println("Invalid permissions.");
      }
   }
}


/*
References:

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Selling date/time
https://www.javatpoint.com/java-get-current-date

Search for object in ArrayList
https://stackoverflow.com/questions/17526608/how-to-find-an-object-in-an-arraylist-by-property
*/

Model

RentalVehicleManager

```
package lk.dinuka.VehicleRentalSystem.Model;

public interface RentalVehicleManager {
   //constants
   int MAX_VEHICLES = 50;


   //methods
   void addVehicle();
   void deleteVehicle();
   void printList();
   void save();
   void viewGUI();

}
```

Vehicle

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public abstract class Vehicle implements Comparable<Vehicle> {
   private String plateNo;
   private String make;
   private String model;
   private String engineCapacity;
   private BigDecimal dailyCost;
   private String type;

   public static int count = 0;

   public Vehicle(String plateNo, String make, String model, String engineCapacity, BigDecimal
dailyCost, String type) {
      this.plateNo = plateNo;
      this.make = make;
      this.model = model;
      this.engineCapacity = engineCapacity;
      this.dailyCost = dailyCost;
      this.type = type;

      count++;
   }

   @Override
   public String toString() {
      return "Vehicle{" +
            "plateNo='" + plateNo + '\'' +
            ", make='" + make + '\'' +
            ", model='" + model + '\'' +
            ", engineCapacity='" + engineCapacity + '\'' +
            ", dailyCost=" + dailyCost +
            ", type='" + type + '\'' +
            '}';
   }

   public static int getCount() {
      return count;
   }

   public String getPlateNo() {
      return plateNo;
   }
```

```
    public String getMake() {
        return make;
    }

    public String getModel() {
        return model;
    }

    public String getEngineCapacity() {
        return engineCapacity;
    }

    public BigDecimal getDailyCost() {
        return dailyCost;
    }

    public String getType() {
        return type;
    }


    @Override
    public boolean equals(Object o) {
        if (this == o) return true;
        if (o == null || getClass() != o.getClass()) return false;
        Vehicle vehicle = (Vehicle) o;
        return Objects.equals(plateNo, vehicle.plateNo) &&
                Objects.equals(make, vehicle.make) &&
                Objects.equals(model, vehicle.model) &&
                Objects.equals(engineCapacity, vehicle.engineCapacity) &&
                Objects.equals(dailyCost, vehicle.dailyCost) &&
                Objects.equals(type, vehicle.type);
    }

    @Override
    public int hashCode() {
        return Objects.hash(plateNo, make, model, engineCapacity, dailyCost, type);
    }

    @Override
    public int compareTo(Vehicle obj) {
        return this.make.compareTo(obj.getMake());     //used for sorting vehicle alphabetically
according to make
    }
}



/*
```

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https://beginnersbook.com/2013/12/java-arraylist-of-object-sort-example-comparable-and-comparator/

*/

Schedule

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.time.LocalDate;
import java.util.Objects;

public class Schedule {
   private LocalDate pickUp;
   private LocalDate dropOff;

   public Schedule(LocalDate pick, LocalDate drop) {
      this.pickUp = pick;
      this.dropOff = drop;
   }

   public LocalDate getPickUp() {
      return pickUp;
   }


   public LocalDate getDropOff() {
      return dropOff;
   }


//    public String getTime() {
//       return time;
//    }

//    public void setTime() {     //getting time at which the booking was made
//
//       Calendar cal = Calendar.getInstance();
//       SimpleDateFormat sdf = new SimpleDateFormat("HH:mm:ss");
////       String h1 =  sdf.format(cal.getTime()) ;
//
//       this.time = sdf.format(cal.getTime());
//    }

   @Override
   public boolean equals(Object o) {
      if (this == o) return true;
      if (o == null || getClass() != o.getClass()) return false;
      Schedule schedule = (Schedule) o;
      return Objects.equals(pickUp, schedule.pickUp) &&
            Objects.equals(dropOff, schedule.dropOff);
   }

   @Override
```

```
    public int hashCode() {
        return Objects.hash(pickUp, dropOff);
    }

    @Override
    public String toString() {
        return "Schedule{" +
                "pickUp=" + pickUp +
                ", dropOff=" + dropOff +
                '}';
    }

}


/*
References:

Java 8 DateTime
https://gist.github.com/mscharhag/9195718

Current time
https://stackoverflow.com/questions/833768/java-code-for-getting-current-time
https://docs.oracle.com/javase/1.5.0/docs/api/java/text/SimpleDateFormat.html#month
https://www.javatpoint.com/java-get-current-date

 */
```

Car

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public class Car extends Vehicle {

   private String transmission;
   private boolean hasAirCon;

   public Car(String plateNo, String make, String model, String engineCapacity, BigDecimal
dailyCost, String type, String transmission, boolean hasAirCon) {
      super(plateNo, make, model, engineCapacity, dailyCost, type);
      this.transmission = transmission;              //making sure that this extra info is added when
creating a new Car object
      this.hasAirCon = hasAirCon;
   }

   public String getTransmission() {
      return transmission;
   }

   public void setTransmission(String transmission) {
      this.transmission = transmission;
   }

   public boolean isHasAirCon() {
      return hasAirCon;
   }

   public void setHasAirCon(boolean hasAirCon) {
      this.hasAirCon = hasAirCon;
   }

   @Override
   public String toString() {
      return super.toString() + " {" +
            "transmission='" + transmission + '\'' +
            ", hasAirCon=" + hasAirCon +
            '}';
   }

   @Override
   public boolean equals(Object o) {
      if (this == o) return true;
      if (o == null || getClass() != o.getClass()) return false;
      if (!super.equals(o)) return false;
```

```
        Car car = (Car) o;
        return hasAirCon == car.hasAirCon &&
                Objects.equals(transmission, car.transmission);
    }

    @Override
    public int hashCode() {
        return Objects.hash(super.hashCode(), transmission, hasAirCon);
    }
}
```

Motorbike

```
package lk.dinuka.VehicleRentalSystem.Model;

import java.math.BigDecimal;
import java.util.Objects;

public class Motorbike extends Vehicle {

   private String startType;      //Kick Start or Electric Start
   private double wheelSize;

   public Motorbike(String plateNo, String make, String model, String engineCapacity,
BigDecimal dailyCost, String type, String startType, double wheelSize) {
      super(plateNo, make, model, engineCapacity, dailyCost,type);
      this.startType = startType;              //making sure that this extra info is added when
creating a new Motorbike object
      this.wheelSize = wheelSize;
   }

   public String getStartType() {
      return startType;
   }

   public void setStartType(String startType) {
      this.startType = startType;
   }

   public double getWheelSize() {
      return wheelSize;
   }

   public void setWheelSize(double wheelSize) {
      this.wheelSize = wheelSize;
   }

   @Override
   public String toString() {
      return super.toString() + " " +
            "startType='" + startType + '\'' +
            ", wheelSize=" + wheelSize +
            '}';
   }

   @Override
   public boolean equals(Object o) {
      if (this == o) return true;
      if (o == null || getClass() != o.getClass()) return false;
      if (!super.equals(o)) return false;
      Motorbike motorbike = (Motorbike) o;
```

```
        return Double.compare(motorbike.wheelSize, wheelSize) == 0 &&
                Objects.equals(startType, motorbike.startType);
    }

    @Override
    public int hashCode() {
        return Objects.hash(super.hashCode(), startType, wheelSize);
    }
}
```

View

GUI

```
package lk.dinuka.VehicleRentalSystem.View;


import javafx.application.Application;
import javafx.event.ActionEvent;
import javafx.event.EventHandler;
import javafx.geometry.Insets;
import javafx.scene.Scene;
import javafx.scene.control.*;
import javafx.scene.control.cell.PropertyValueFactory;
import javafx.scene.layout.HBox;
import javafx.scene.layout.VBox;
import javafx.scene.paint.Color;
import javafx.scene.text.Text;
import javafx.stage.Stage;
import lk.dinuka.VehicleRentalSystem.Controller.DatabaseController;
import lk.dinuka.VehicleRentalSystem.Controller.GUIController;
import lk.dinuka.VehicleRentalSystem.Controller.WestminsterRentalVehicleManager;
import lk.dinuka.VehicleRentalSystem.Model.*;

import java.util.ArrayList;

public class GUI extends Application {
   public static void main(String[] args) {
      launch(args);
   }

   private static ArrayList<Vehicle> searchedVehicles = new ArrayList<>();        //used to pass in
searched vehicles into the table
   private static ArrayList<Vehicle> searchInSearch = new ArrayList<>();      //used to filter
search by Vehicle type


   //------------------------------------------------------//

   @Override
   public void start(Stage primaryStage) throws Exception {
//       Platform.setImplicitExit(false);
      primaryStage.setTitle("List of vehicles in system");

      TableView tableOfVehicles = new TableView();

      //Creating columns to be added to the table
      TableColumn<String, Vehicle> plateNoColumn = new TableColumn<>("Plate No");
      plateNoColumn.setCellValueFactory(new PropertyValueFactory<>("plateNo"));

      TableColumn<String, Vehicle> makeColumn = new TableColumn<>("Make");
```

```
        makeColumn.setCellValueFactory(new PropertyValueFactory<>("make"));

        TableColumn<String, Vehicle> modelColumn = new TableColumn<>("Model");
        modelColumn.setCellValueFactory(new PropertyValueFactory<>("model"));

        TableColumn<String, Vehicle> engineCapacityColumn = new TableColumn<>("Engine
Capacity(CC)");
        engineCapacityColumn.setCellValueFactory(new
PropertyValueFactory<>("engineCapacity"));
        engineCapacityColumn.setMinWidth(130);

        TableColumn<String, Vehicle> dailyCostColumn = new TableColumn<>("Daily Cost(£)");
        dailyCostColumn.setCellValueFactory(new PropertyValueFactory<>("dailyCost"));
        dailyCostColumn.setMinWidth(110);

        TableColumn<String, Vehicle> typeColumn = new TableColumn<>("Type");
        typeColumn.setCellValueFactory(new PropertyValueFactory<>("type"));

        TableColumn<String, Vehicle> transmissionColumn = new TableColumn<>("Transmission");
        transmissionColumn.setCellValueFactory(new PropertyValueFactory<>("transmission"));
        transmissionColumn.setMinWidth(130);

        TableColumn<String, Vehicle> hasAirConColumn = new TableColumn<>("Has Air
Conditioning");
        hasAirConColumn.setCellValueFactory(new PropertyValueFactory<>("hasAirCon"));
        hasAirConColumn.setMinWidth(180);

        TableColumn<String, Vehicle> startTypeColumn = new TableColumn<>("Start Type");
        startTypeColumn.setCellValueFactory(new PropertyValueFactory<>("startType"));
        startTypeColumn.setMinWidth(120);

        TableColumn<String, Vehicle> wheelSizeColumn = new TableColumn<>("Wheel Size");
        wheelSizeColumn.setCellValueFactory(new PropertyValueFactory<>("wheelSize"));
        wheelSizeColumn.setMinWidth(130);


        tableOfVehicles.getColumns().addAll(plateNoColumn, makeColumn, modelColumn,
engineCapacityColumn, dailyCostColumn,
                typeColumn, transmissionColumn, hasAirConColumn, startTypeColumn,
wheelSizeColumn);          //adding all the columns to the table


tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//adding all the vehicles in the available
        // in the vehiclesInSystem ArrayList


        searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//to get filter by vehicle type to work before searching for a Make
```

```
        //-------------------------------------------------

        HBox searchSection = new HBox();
        searchSection.setMinWidth(220);
        searchSection.getChildren().add(new Label("Search Make:"));

        TextField makeSearch = new TextField();
        searchSection.getChildren().add(makeSearch);

        Button searchClick = new Button("Search");
        searchSection.getChildren().add(searchClick);
        Button resetClick = new Button("Reset");
        searchSection.getChildren().add(resetClick);


//      VBox filterSection = new VBox(new Label("Filter By"));

        HBox filterType = new HBox(new Label("Filter Type:"));
        Button filterCarClick = new Button("Cars");
        filterType.getChildren().add(filterCarClick);
        Button filterBikeClick = new Button("Motorbikes");
        filterType.getChildren().add(filterBikeClick);

        filterType.setPadding(new Insets(10, 0, 0, 0));

//      HBox filterEngineCap = new HBox(new Label("Engine Capacity:"));


        filterType.setMinWidth(200);
//      filterSection.getChildren().addAll(filterType);

        VBox allSearchFilter = new VBox(searchSection, filterType);
        allSearchFilter.setPadding(new Insets(20, 0, 20, 20));

        //-------------------------------------------------

        VBox bookingSection = new VBox();

        HBox allDates = new HBox();

        //pick up date entry section
        HBox pickUpDateSec = new HBox(new Label("Pick Up:"));


        // ---------------->>>>>>>
        DatePicker pickDatePicker = new DatePicker();

//      pickUpDateSec.getChildren().addAll(dayPickUp, monthPickUp, yearPickUp);
```

```
        pickUpDateSec.getChildren().addAll(pickDatePicker);

        //drop off date entry section
        HBox dropOffDateSec = new HBox();
        Label dropOffLabel = new Label("Drop Off:");


        // ---------------->>>>>>>
        DatePicker dropDatePicker = new DatePicker();
//      dropOffDateSec.getChildren().addAll(dropOffLabel, dayDropOff, monthDropOff,
yearDropOff);
        dropOffDateSec.getChildren().addAll(dropOffLabel, dropDatePicker);


        Button availabilityCheck = new Button("Check Availability");

        allDates.setSpacing(10.0);

        Button bookOnClick = new Button("Book");
//      bookOnClick.setAlignment(right);

        Text checkBookedStatus = new Text();
        Text bookStatusText = new Text();
        Text displayTotalCost = new Text();


        VBox buttonsForBooking = new VBox();
        buttonsForBooking.getChildren().addAll(availabilityCheck, bookOnClick);
        buttonsForBooking.setSpacing(5.0);

        allDates.getChildren().addAll(pickUpDateSec, dropOffDateSec, buttonsForBooking);

        bookingSection.getChildren().addAll(allDates, checkBookedStatus, bookStatusText,
displayTotalCost);

        bookingSection.setPadding(new Insets(20, 0, 20, 20));


        //-------------------------------------------------


        VBox parent = new VBox(allSearchFilter, tableOfVehicles, bookingSection);
        Scene newScene = new Scene(parent);
        primaryStage.setScene(newScene);
        primaryStage.show();
        primaryStage.setAlwaysOnTop(true);        //open the application on top of intelliJ

        //---------------//-----------------//--------------------//----------------------//
```

```
    //Button actions

    searchClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when search
button is clicked

        @Override
        public void handle(ActionEvent event) {

            String vehMakeSearch = makeSearch.getText();       //getting Make to be searched

            searchedVehicles.clear();          //clearing previous search results from ArrayList

            for (Vehicle searchVeh : WestminsterRentalVehicleManager.getVehiclesInSystem()) {
                if (searchVeh.getMake().equals(vehMakeSearch)) {
                    searchedVehicles.add(searchVeh);      //adding vehicles that have matching makes
as searched into ArrayList
                }
            }
//              System.out.println(searchedVehicles);      //to check

            tableOfVehicles.getItems().clear();     //clearing table
            tableOfVehicles.getItems().addAll(searchedVehicles);

        }
    });


    resetClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when reset
button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchedVehicles.clear();      //resetting search to all Vehicles
            searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());

            tableOfVehicles.getItems().clear();     //reseting display to all Vehicles

tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());

            makeSearch.setText("");
        }
    });


    filterCarClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when Filter
Cars button is clicked

        @Override
```

```
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Car) {
                    searchInSearch.add(searchVeh);      //adding vehicles that are of Type Car into
ArrayList
                }
            }
//              System.out.println(searchInSearch);      //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });


    filterBikeClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when Filter
Motorbikes button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Motorbike) {
                    searchInSearch.add(searchVeh);      //adding vehicles that are of Type Car into
ArrayList
                }
            }
//              System.out.println(searchInSearch);      //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });


    //-------------------------------------------------


    availabilityCheck.setOnAction(new EventHandler<ActionEvent>() {          //actions when
Availability check button is clicked

        @Override
```

```
        public void handle(ActionEvent event) {

            try {
                if (tableOfVehicles.getSelectionModel().getSelectedItem() != null) {

                    Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();       //selected vehicle's information

//                    System.out.println(chosenVeh);      //to check whether expected vehicle was
chosen

                    Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());


                    boolean availability = GUIController.checkAvailabilityOfVeh(chosenVeh,
newBooking);

                    if (availability) {  //vehicle available
                        checkBookedStatus.setFill(Color.GREEN);
//                    System.out.println("Vehicle is available for booking.");
                        checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");


                    } else {
                        checkBookedStatus.setFill(Color.RED);
//                    System.out.println("Vehicle isn't available for booking during requested time
period.");
                        checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");
                    }
                } else {
                    checkBookedStatus.setFill(Color.DARKGRAY);
                    checkBookedStatus.setText("Please select a vehicle to book.");

                    bookStatusText.setText("");           //clearing old booking details
                    displayTotalCost.setText("");
                }
            } catch (NumberFormatException e) {
                checkBookedStatus.setFill(Color.DARKGRAY);
                checkBookedStatus.setText("Please enter a valid date in Integer Numbers.");
            }
        }
    });


    bookOnClick.setOnAction(new EventHandler<ActionEvent>() {         //actions when Book
button is clicked
```

```
        @Override
        public void handle(ActionEvent event) {

           try {
              if (tableOfVehicles.getSelectionModel().getSelectedItem() != null) {
                 //getting selected vehicle's information
                 Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();       //selected vehicle's information
                 //down-casted from Object type to Vehicle type
                 System.out.println(chosenVeh);      //to check whether expected vehicle was
chosen

                 Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

                 boolean booked = GUIController.createBooking(chosenVeh, newBooking);

                 if (booked) {

                    checkBookedStatus.setFill(Color.GREEN);
//                  System.out.println("Vehicle is available for booking.");
                    checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");


                    bookStatusText.setText("Booked vehicle with Plate No: " +
chosenVeh.getPlateNo() + " from " +
                          newBooking.getPickUp() + " to " + newBooking.getDropOff());

                    displayTotalCost.setText("Total Cost: £" +
GUIController.getCalculatedRent(chosenVeh.getDailyCost(), newBooking));




                    int yearPickUpInput = pickDatePicker.getValue().getYear();
                    int monthPickUpInput = pickDatePicker.getValue().getMonthValue();
                    int dayPickUpInput = pickDatePicker.getValue().getDayOfMonth();

                    int yearDropOffInput = pickDatePicker.getValue().getYear();
                    int monthDropOffInput = pickDatePicker.getValue().getMonthValue();
                    int dayDropOffInput = pickDatePicker.getValue().getDayOfMonth();

                    //addToBookedDB here
                    DatabaseController.addToBookedDB(chosenVeh.getPlateNo(), yearPickUpInput,
monthPickUpInput, dayPickUpInput,
                          yearDropOffInput, monthDropOffInput, dayDropOffInput);
```

```
                } else {
                    //notify the user that the vehicle isn't available for rent during the chosen time
period.
                    checkBookedStatus.setFill(Color.RED);
//                  System.out.println("Vehicle isn't available for booking during requested time
period.");
                    checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");

                    bookStatusText.setText("");
                    displayTotalCost.setText("");
                }
            } else {
                checkBookedStatus.setFill(Color.DARKGRAY);
                checkBookedStatus.setText("Please select a vehicle to book.");

            }
        } catch (NumberFormatException e) {
            checkBookedStatus.setFill(Color.DARKGRAY);
            checkBookedStatus.setText("Please enter a valid date in Integer Numbers.");
        }

    }
});

  }
}
```

/*
References:

https://stackoverflow.com/questions/14169240/getting-integer-values-from-textfield

How to get information of selected row in javafx tableview
https://stackoverflow.com/questions/17388866/getting-selected-item-from-a-javafx-tableview

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http://tutorials.jenkov.com/javafx/datepicker.html

Error handling in GUI
https://stackoverflow.com/questions/18711896/how-can-i-prevent-java-lang-numberformatexception-for-input-string-n-a

https://docs.oracle.com/javafx/2/layout/size_align.htm

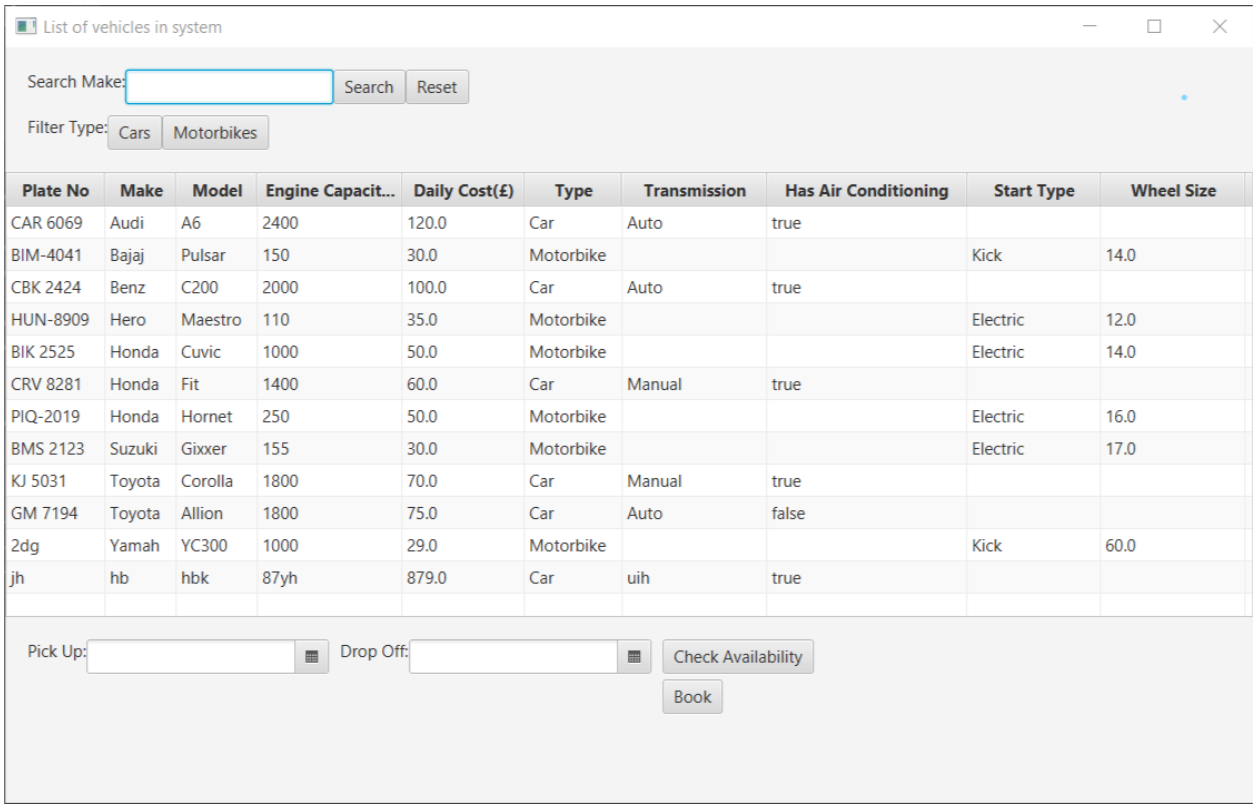
Multithreading for GUI
https://code-examples.net/en/q/173180e
https://stackoverflow.com/questions/24320014/how-to-call-launch-more-than-once-in-java?noredirect=1&lq=1

https://stackoverflow.com/questions/32355335/on-javafx-how-to-hide-stage-without-disposing-it-and-closing-the-application/32356741

*/

Screenshots – JavaFX GUI

Visualize the list of vehicles



Code

```
   @Override
   public void start(Stage primaryStage) throws Exception {
//       Platform.setImplicitExit(false);
        primaryStage.setTitle("List of vehicles in system");

        TableView tableOfVehicles = new TableView();

        //Creating columns to be added to the table
        TableColumn<String, Vehicle> plateNoColumn = new TableColumn<>("Plate No");
        plateNoColumn.setCellValueFactory(new PropertyValueFactory<>("plateNo"));

        TableColumn<String, Vehicle> makeColumn = new TableColumn<>("Make");
        makeColumn.setCellValueFactory(new PropertyValueFactory<>("make"));

        TableColumn<String, Vehicle> modelColumn = new TableColumn<>("Model");
        modelColumn.setCellValueFactory(new PropertyValueFactory<>("model"));

        TableColumn<String, Vehicle> availabilityColumn = new TableColumn<>("Availability");
        availabilityColumn.setCellValueFactory(new PropertyValueFactory<>("availability"));
        availabilityColumn.setMinWidth(100);

        TableColumn<String, Vehicle> engineCapacityColumn = new TableColumn<>("Engine
Capacity");
```

```
        engineCapacityColumn.setCellValueFactory(new
PropertyValueFactory<>("engineCapacity"));
        engineCapacityColumn.setMinWidth(130);

        TableColumn<String, Vehicle> dailyCostColumn = new TableColumn<>("Daily Cost");
        dailyCostColumn.setCellValueFactory(new PropertyValueFactory<>("dailyCost"));
        dailyCostColumn.setMinWidth(110);

        TableColumn<String, Vehicle> typeColumn = new TableColumn<>("Type");
        typeColumn.setCellValueFactory(new PropertyValueFactory<>("type"));

        TableColumn<String, Vehicle> transmissionColumn = new TableColumn<>("Transmission");
        transmissionColumn.setCellValueFactory(new PropertyValueFactory<>("transmission"));
        transmissionColumn.setMinWidth(130);

        TableColumn<String, Vehicle> hasAirConColumn = new TableColumn<>("Has Air
Conditioning");
        hasAirConColumn.setCellValueFactory(new PropertyValueFactory<>("hasAirCon"));
        hasAirConColumn.setMinWidth(180);

        TableColumn<String, Vehicle> startTypeColumn = new TableColumn<>("Start Type");
        startTypeColumn.setCellValueFactory(new PropertyValueFactory<>("startType"));
        startTypeColumn.setMinWidth(120);

        TableColumn<String, Vehicle> wheelSizeColumn = new TableColumn<>("Wheel Size");
        wheelSizeColumn.setCellValueFactory(new PropertyValueFactory<>("wheelSize"));
        wheelSizeColumn.setMinWidth(130);


        tableOfVehicles.getColumns().addAll(plateNoColumn, makeColumn, modelColumn,
availabilityColumn, engineCapacityColumn, dailyCostColumn,
                typeColumn, transmissionColumn, hasAirConColumn, startTypeColumn,
wheelSizeColumn);          //adding all the columns to the table


tableOfVehicles.getItems().addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//adding all the vehicles in the available
        // in the vehiclesInSystem ArrayList

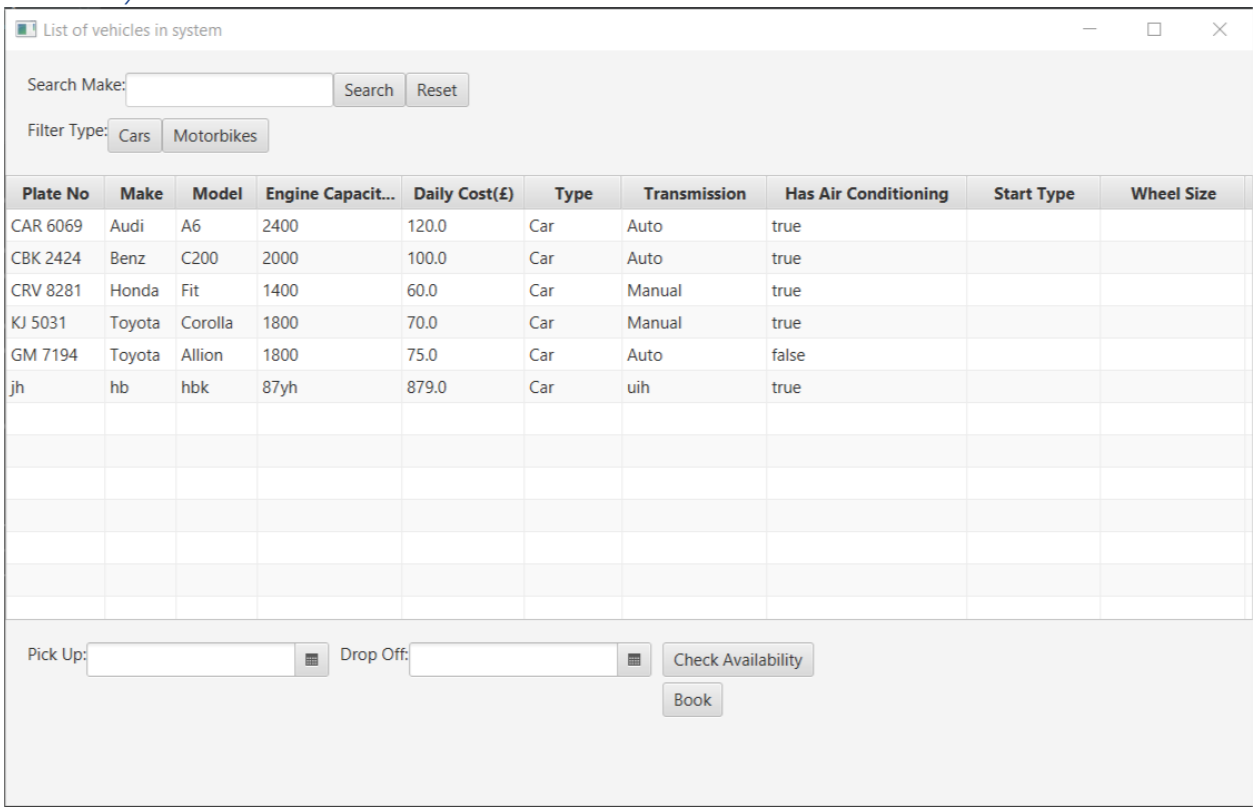

        searchedVehicles.addAll(WestminsterRentalVehicleManager.getVehiclesInSystem());
//to get filter by vehicle type to work before searching for a Make
```

Explanation of the functionality

When the GUI is opened, the list of all vehicles is displayed as shown above.

Filter vehicles by type

Filtered by cars



Code

```
    filterCarClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when Filter Cars button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Car) {
                    searchInSearch.add(searchVeh);      //adding vehicles that are of Type Car into ArrayList
                }
            }
//              System.out.println(searchInSearch);      //to check

            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });
```

```
    filterBikeClick.setOnAction(new EventHandler<ActionEvent>() {        //actions when Filter
Motorbikes button is clicked

        @Override
        public void handle(ActionEvent event) {

            searchInSearch.clear();

            for (Vehicle searchVeh : searchedVehicles) {
                if (searchVeh instanceof Motorbike) {
                    searchInSearch.add(searchVeh);      //adding vehicles that are of Type Car into
ArrayList
                }
            }
//              System.out.println(searchInSearch);      //to check

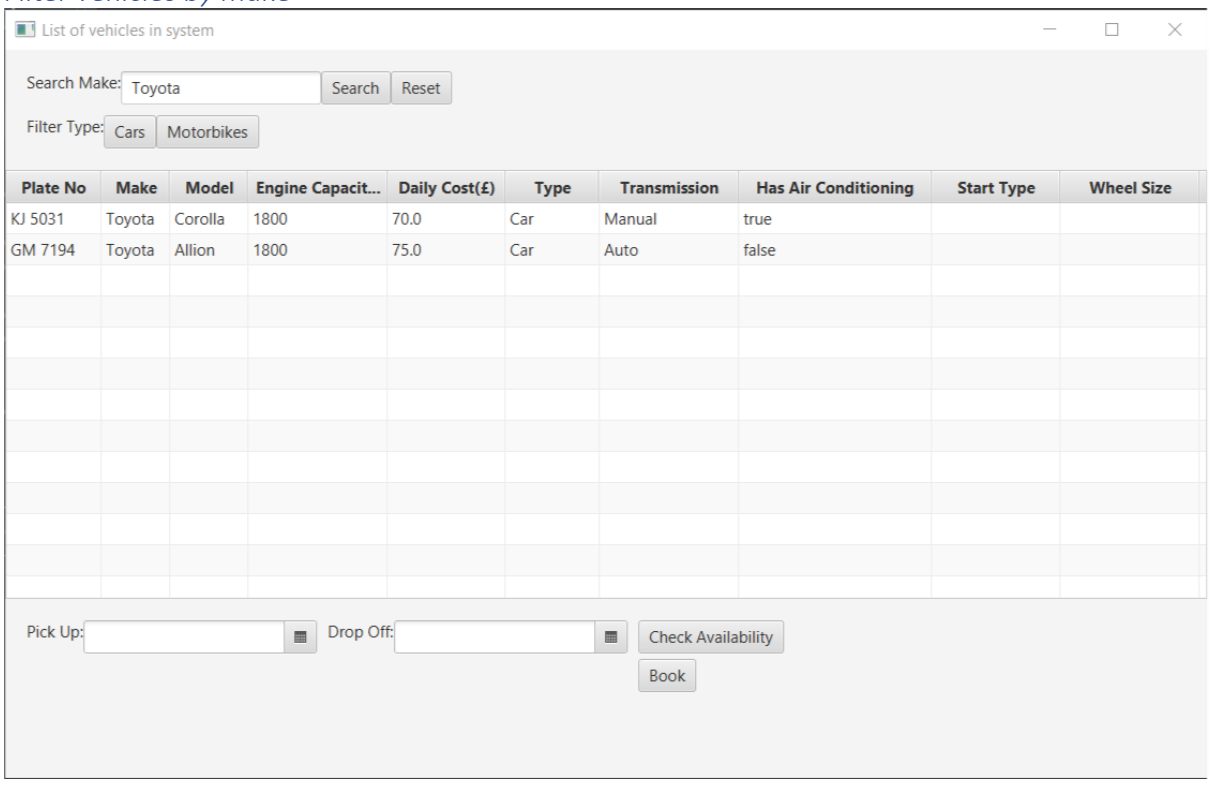
            tableOfVehicles.getItems().clear();    //clearing table
            tableOfVehicles.getItems().addAll(searchInSearch);

        }
    });
```

Explanation of the functionality

When the "Filter Type: Cars" button is clicked, all the cars in the system are displayed in the table. Similarly, it works for Motorbikes as well.

Filter vehicles by make



Code

```
    searchClick.setOnAction(new EventHandler<ActionEvent>() {          //actions when search
button is clicked

          @Override
          public void handle(ActionEvent event) {

             String vehMakeSearch = makeSearch.getText();       //getting Make to be searched

             searchedVehicles.clear();          //clearing previous search results from ArrayList

             for (Vehicle searchVeh : WestminsterRentalVehicleManager.getVehiclesInSystem()) {
                if (searchVeh.getMake().equals(vehMakeSearch)) {
                   searchedVehicles.add(searchVeh);      //adding vehicles that have matching makes
as searched into ArrayList
                }
             }
//              System.out.println(searchedVehicles);      //to check

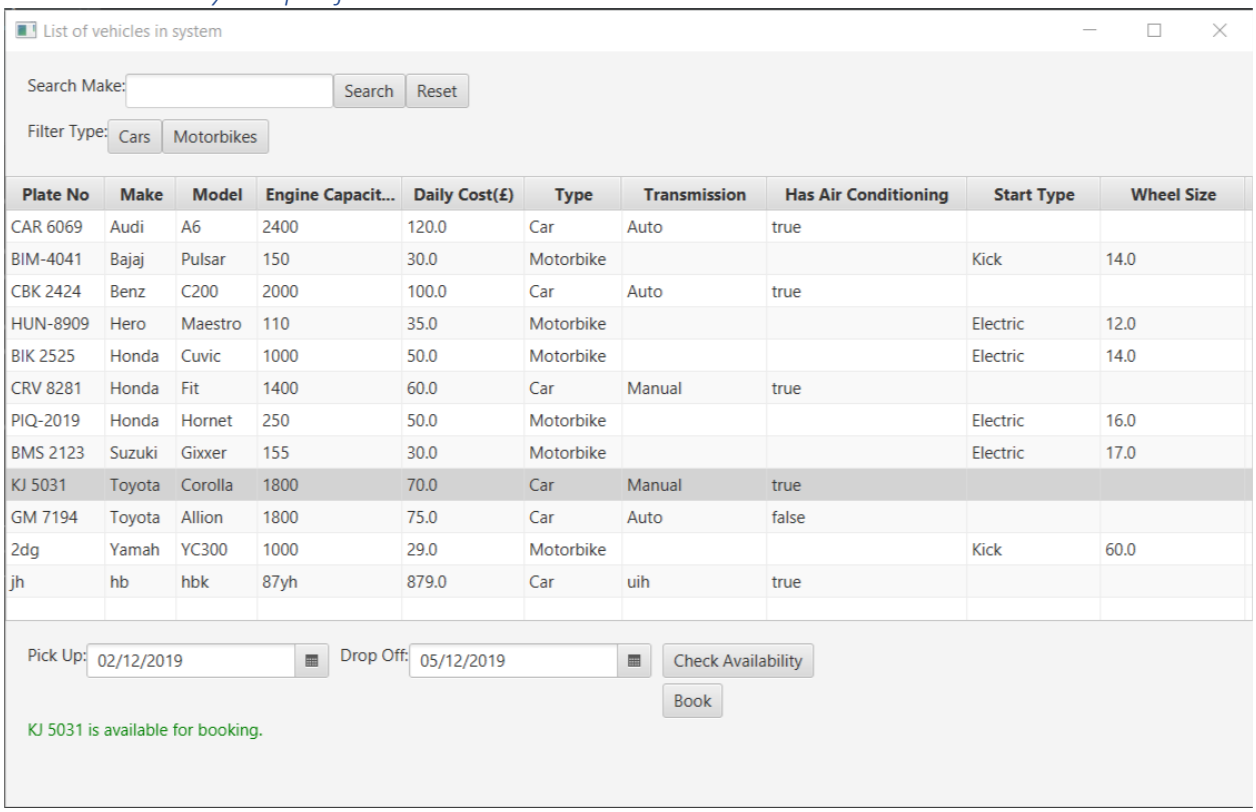
             tableOfVehicles.getItems().clear();     //clearing table
             tableOfVehicles.getItems().addAll(searchedVehicles);

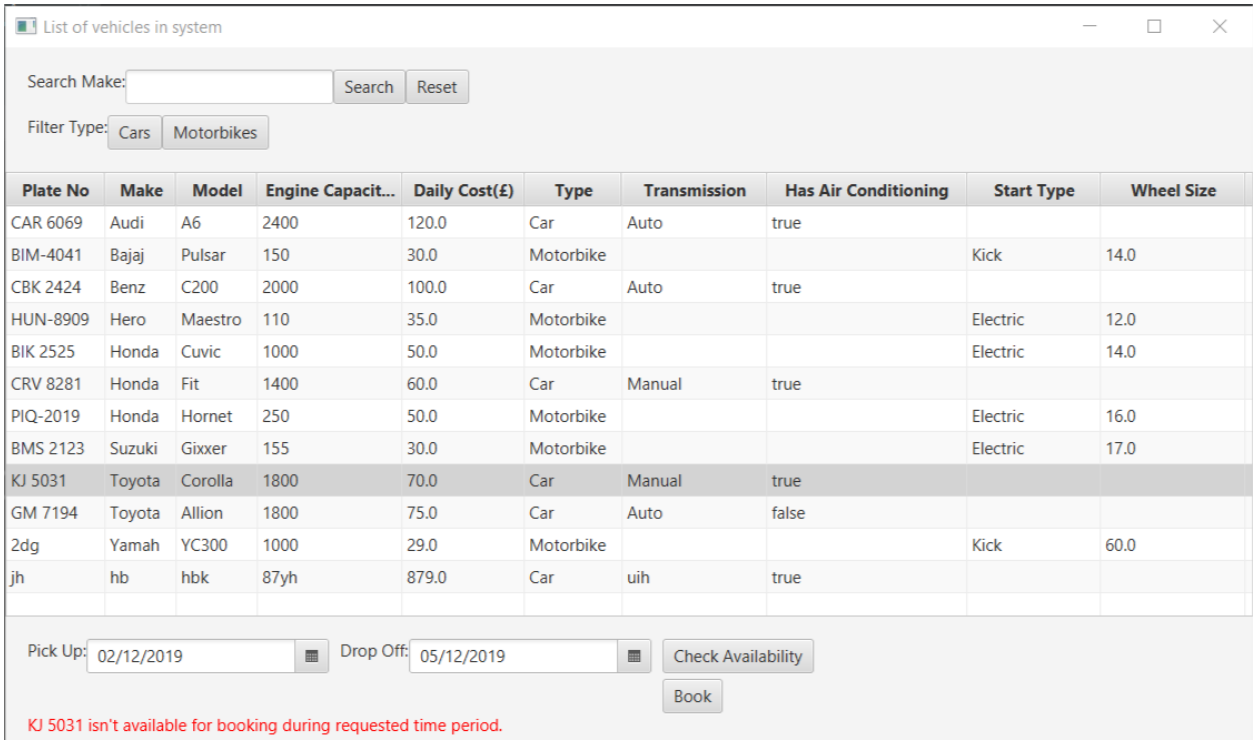
          }
       });
```

Explanation of the functionality

When the required make is typed in and search using the search box, all vehicles related to the searched Make is displayed.
When researched is clicked all Filters and search results are removed, displaying all the vehicles available in the system.

Check availability on specific dates





Code

```
availabilityCheck.setOnAction(new EventHandler<ActionEvent>() {        //actions when Availability check button is clicked

    @Override
    public void handle(ActionEvent event) {
```

```
            try {
               if (tableOfVehicles.getSelectionModel().getSelectedItem() != null &&
                     pickDatePicker.getValue() != null &&
                     dropDatePicker.getValue() != null){

                  Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();       //selected vehicle's information

//                   System.out.println(chosenVeh);      //to check whether expected vehicle was
chosen

                  Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());


                  boolean availability = GUIController.checkAvailabilityOfVeh(chosenVeh,
newBooking);

                  if (availability) {  //vehicle available
                     checkBookedStatus.setFill(Color.GREEN);
//                   System.out.println("Vehicle is available for booking.");
                     checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");

                     bookStatusText.setText("");           //clearing old booking details
                     displayTotalCost.setText("");

                  } else {
                     checkBookedStatus.setFill(Color.RED);
//                   System.out.println("Vehicle isn't available for booking during requested time
period.");
                     checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");

                     bookStatusText.setText("");           //clearing old booking details
                     displayTotalCost.setText("");

                  }
               } else{
                  checkBookedStatus.setFill(Color.DARKGRAY);
                  checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");

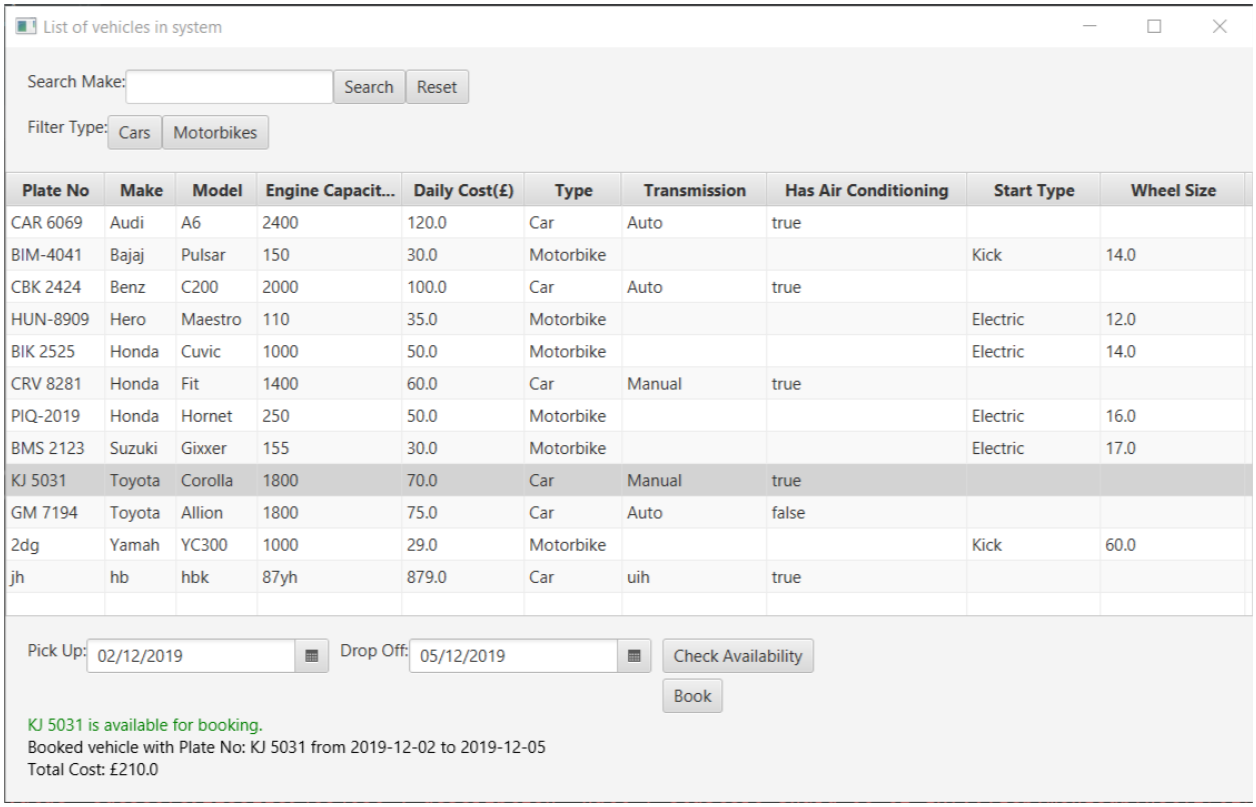
                  bookStatusText.setText("");           //clearing old booking details
                  displayTotalCost.setText("");
               }
            } catch (NullPointerException e) {
               checkBookedStatus.setFill(Color.DARKGRAY);
```

```
            checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");
            }
        }
    });
```

Explanation of the functionality

When “Check Availability” is clicked after a vehicle is selected and pick up & drop off dates are specified, the system will let the user know whether the chosen vehicles is available or not during the requested time period. This is checked when “Book Vehicle” is clicked as well.

Book vehicle



Code

```
    bookOnClick.setOnAction(new EventHandler<ActionEvent>() {        //actions when Book
button is clicked

        @Override
        public void handle(ActionEvent event) {

          try {
            if (tableOfVehicles.getSelectionModel().getSelectedItem() != null &&
                pickDatePicker.getValue() != null &&
                dropDatePicker.getValue() != null) {
              //getting selected vehicle's information
```

```
            Vehicle chosenVeh = (Vehicle)
tableOfVehicles.getSelectionModel().getSelectedItem();       //selected vehicle's information
            //down-casted from Object type to Vehicle type
            System.out.println(chosenVeh);      //to check whether expected vehicle was
chosen

            Schedule newBooking = new Schedule(pickDatePicker.getValue(),
dropDatePicker.getValue());

            boolean booked = GUIController.createBooking(chosenVeh, newBooking);

            if (booked) {

               checkBookedStatus.setFill(Color.GREEN);
//             System.out.println("Vehicle is available for booking.");
               checkBookedStatus.setText(chosenVeh.getPlateNo() + " is available for
booking.");


               bookStatusText.setText("Booked vehicle with Plate No: " +
chosenVeh.getPlateNo() + " from " +
                     newBooking.getPickUp() + " to " + newBooking.getDropOff());

               displayTotalCost.setText("Total Cost: £" +
GUIController.getCalculatedRent(chosenVeh.getDailyCost(), newBooking));


               int yearPickUpInput = pickDatePicker.getValue().getYear();
               int monthPickUpInput = pickDatePicker.getValue().getMonthValue();
               int dayPickUpInput = pickDatePicker.getValue().getDayOfMonth();

               int yearDropOffInput = pickDatePicker.getValue().getYear();
               int monthDropOffInput = pickDatePicker.getValue().getMonthValue();
               int dayDropOffInput = pickDatePicker.getValue().getDayOfMonth();

               //addToBookedDB here
               DatabaseController.addToBookedDB(chosenVeh.getPlateNo(), yearPickUpInput,
monthPickUpInput, dayPickUpInput,
                     yearDropOffInput, monthDropOffInput, dayDropOffInput);


            } else {
               //notify the user that the vehicle isn't available for rent during the chosen time
period.
               checkBookedStatus.setFill(Color.RED);
//             System.out.println("Vehicle isn't available for booking during requested time
period.");
               checkBookedStatus.setText(chosenVeh.getPlateNo() + " isn't available for
booking during requested time period.");
```

```
                bookStatusText.setText("");
                displayTotalCost.setText("");
            }
        } else {
            checkBookedStatus.setFill(Color.DARKGRAY);
            checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");

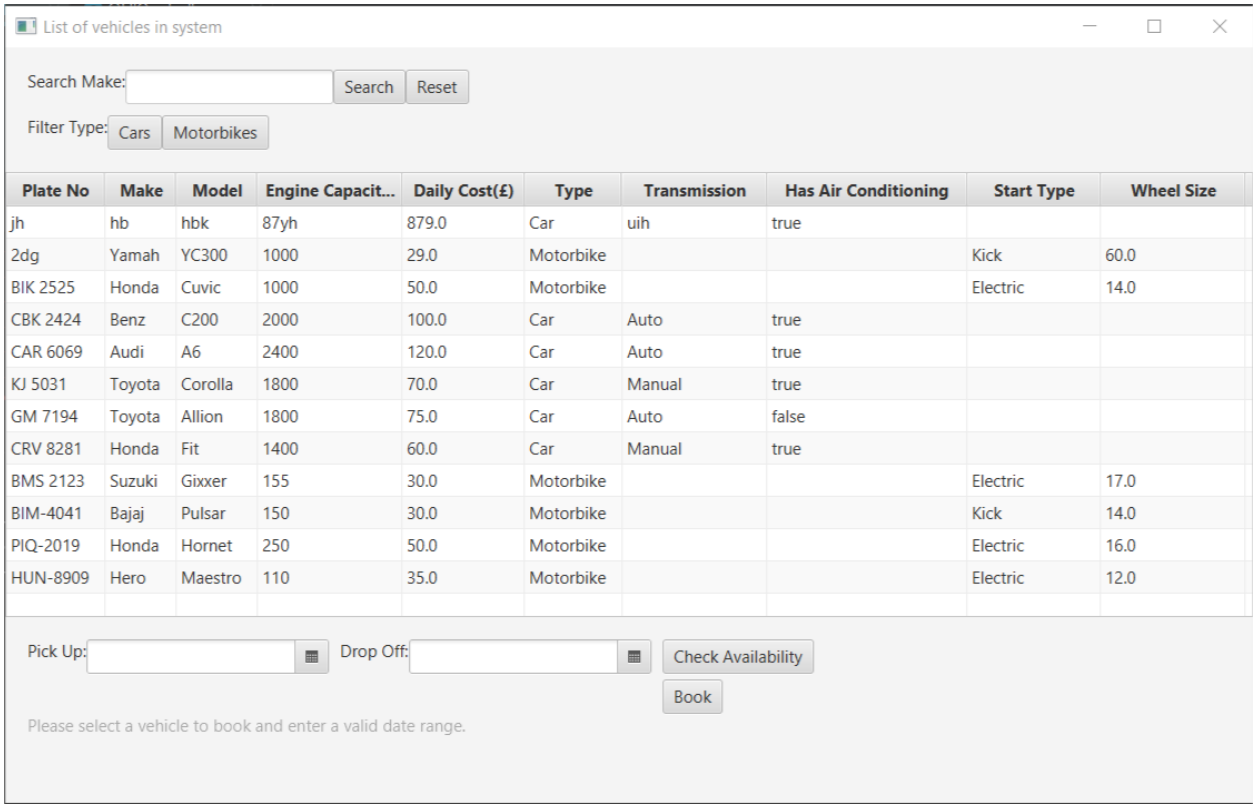
        }
    } catch (NullPointerException e) {
        checkBookedStatus.setFill(Color.DARKGRAY);
        checkBookedStatus.setText("Please select a vehicle to book and enter a valid date
range.");
    }

  }
});
```

Explanation of the functionality

When 'Book' button is clicked, the system will perform a similar check like "Check Availability" and let the user know that the vehicle was booked for the requested time period.
The total cost will also be displayed below.

Required inputs not given – Error Handling



Angular GUI

app.component.html

```
<mat-toolbar color="primary">
 <mat-toolbar-row class="header">
  <span>Westminster Vehicle Rental Store</span>
 </mat-toolbar-row>
</mat-toolbar>

<div class="fullContainer">
 <div class = "subHeader">
  <mat-form-field>
   <input matInput (keyup)="applyFilter($event.target.value)" placeholder="Filter">
  </mat-form-field>

  <div class="bookingSection">
     <mat-form-field>
      <input matInput [matDatepicker]="picker1" placeholder="Pick-Up Date"
[(ngModel)]="pickUpDate" [min]="today">
      <mat-datepicker-toggle matSuffix [for]="picker1"></mat-datepicker-toggle>
      <mat-datepicker #picker1></mat-datepicker>
     </mat-form-field>
     <mat-form-field>
      <input matInput [matDatepicker]="picker2" placeholder="Drop-Off Date"
[(ngModel)]="dropOffDate" [min]="pickUpDate">
      <mat-datepicker-toggle matSuffix [for]="picker2"></mat-datepicker-toggle>
      <mat-datepicker #picker2></mat-datepicker>
     </mat-form-field>


     <button mat-button (click)="checkAvailability()">Check Availability</button>
     <button mat-raised-button (click)="bookVehicle()">Book Vehicle</button>
  </div>
</div>

 <div class="tableContainer mat-elevation-z8">
  <table mat-table [dataSource]="dataSource">

    <!--- Note that these columns can be defined in any order.
         The actual rendered columns are set as a property on the row definition" -->


    <ng-container matColumnDef="plateNo">
     <th mat-header-cell *matHeaderCellDef> Plate No. </th>
     <td mat-cell *matCellDef="let element"> {{element.plateNo}} </td>
    </ng-container>

    <ng-container matColumnDef="make">
     <th mat-header-cell *matHeaderCellDef> Make </th>
     <td mat-cell *matCellDef="let element"> {{element.make}} </td>
```

```
    </ng-container>

    <ng-container matColumnDef="model">
      <th mat-header-cell *matHeaderCellDef> Model </th>
      <td mat-cell *matCellDef="let element"> {{element.model}} </td>
    </ng-container>

    <ng-container matColumnDef="engineCapacity">
      <th mat-header-cell *matHeaderCellDef> Engine Capacity(CC) </th>
      <td mat-cell *matCellDef="let element"> {{element.engineCapacity}} </td>
    </ng-container>

    <ng-container matColumnDef="dailyCost">
      <th mat-header-cell *matHeaderCellDef> Daily Cost(£) </th>
      <td mat-cell *matCellDef="let element"> {{element.dailyCost}} </td>
    </ng-container>

    <ng-container matColumnDef="type">
      <th mat-header-cell *matHeaderCellDef> Type </th>
      <td mat-cell *matCellDef="let element"> {{element.type}} </td>
    </ng-container>

    <ng-container matColumnDef="transmission">
      <th mat-header-cell *matHeaderCellDef> Transmission </th>
      <td mat-cell *matCellDef="let element"> {{element.transmission}} </td>
    </ng-container>

    <ng-container matColumnDef="hasAirCon">
      <th mat-header-cell *matHeaderCellDef> Has Air Conditioning </th>
      <td mat-cell *matCellDef="let element"> {{element.hasAirCon}} </td>
    </ng-container>

    <ng-container matColumnDef="startType">
      <th mat-header-cell *matHeaderCellDef> Start Type </th>
      <td mat-cell *matCellDef="let element"> {{element.startType}} </td>
    </ng-container>

    <ng-container matColumnDef="wheelSize">
      <th mat-header-cell *matHeaderCellDef> Wheel Size </th>
      <td mat-cell *matCellDef="let element"> {{element.wheelSize}} </td>
    </ng-container>

    <tr mat-header-row *matHeaderRowDef="displayedColumns sticky: true"></tr>
    <tr mat-row *matRowDef="let row; columns: displayedColumns;" (click) =
"rowClicked(row)" [ngClass]="{'highlight': selectedRowIndex == row.plateNo}">
      <!-- if equal, the colour of the row will be changed -->
    </tr>
  </table>
 </div>
```

```
</div>

<router-outlet></router-outlet>
```

app.component.ts

```
import { Component, OnInit } from '@angular/core';
import {VehicleService} from '../app/services/vehicle.service';
import {MatTableDataSource} from '@angular/material';
import axios from 'axios';
import {stringify} from 'query-string';
import {MatSnackBar} from '@angular/material/snack-bar';

// ------------------------------------

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.scss']
})


export class AppComponent implements OnInit {

  title = 'ng-GUI';
  heading: string;

  getAllVehicles: any;
  allVehicles: any[];

  selectedRowIndex = -1;
  chosenPlateNo: string;

  today = new Date();          // used to get current date
  pickUpDate: any;
  dropOffDate: any;

  displayPickUpDate: any;
  displayDropOffDate: any;

  responseBook: any;
  responseCheck: any = '';

  completeMessage: any;

  bookingURL: any = 'http://localhost:4567/books';
  checkingURL: any = 'http://localhost:4567/checks';


// ---------------
  // tslint:disable-next-line: max-line-length
  displayedColumns: string[] = ['plateNo', 'make', 'model', 'engineCapacity', 'dailyCost', 'type',
'transmission', 'hasAirCon', 'startType', 'wheelSize'];
  dataSource;
```

```
// ---------------

  constructor(private vehicleService: VehicleService,
              private snackBar: MatSnackBar) { }     // creating an instance of the service


  ngOnInit() {
    this.heading = 'Vehicle List';

    this.getAllVehicles = this.getServiceData();
    // console.log(this.getAllVehicles);

  }

  getServiceData() {       // get data
    this.vehicleService.getData().subscribe(   // requesting service for information received from
the backend
      data => {
        // console.log(data);    // what to do with the received data
        // const jsonInfo = JSON.parse(data);
        this.allVehicles  = data;
        this.dataSource = new MatTableDataSource(this.allVehicles);
        console.log(this.allVehicles);
      }
    );
  }

  postBookingData() {     // post plate no & booking data to backend, to book vehicle

    const data = { plateNo: this.chosenPlateNo,
                   yearPickUp: this.pickUpDate.getFullYear(),
                   monthPickUp: this.pickUpDate.getMonth() + 1,    // months are from 0-11
                   dayPickUp: this.pickUpDate.getDate(),
                   yearDropOff: this.dropOffDate.getFullYear(),
                   monthDropOff: this.dropOffDate.getMonth() + 1,    // months are from 0-11
                   dayDropOff: this.dropOffDate.getDate()
                  };

    axios.post(this.bookingURL, stringify(data) , {
      headers: {
        'Content-Type': 'application/x-www-form-urlencoded'
      }
    }
    )
    .then((response) => {
      // console.log(response.data);
      this.responseBook = response.data;

      this.openSnackBarBooking('Close');
```

```
  })
  .catch((error) => {
    console.log(error);
  });

//   const url = this.bookingURL;
//   const data = { plateNo: this.chosenPlateNo,
//                  yearPickUp: this.pickUpDate.getFullYear(),
//                  monthPickUp: this.pickUpDate.getMonth(),
//                  dayPickUp: this.pickUpDate.getDate(),
//                  yearDropOff: this.dropOffDate.getFullYear(),
//                  monthDropOff: this.dropOffDate.getMonth(),
//                  dayDropOff: this.dropOffDate.getDate()
//                 };
//   console.log(data);      // all the data is getting added into data here
//   try {
//   const response = await fetch(url, {
//     method: 'POST', // or 'PUT'
//     body: qs.JSON.stringify(data), // data can be `string` or {object}!
//     headers: {
//       'Content-Type': 'application/x-www-form-urlencoded'
//     }
//   });

//   const json = await response.json();     // not receiving response at front end
//   console.log(json);
//   console.log('Success:', JSON.stringify(json));
// } catch (error) {
//   console.error('Error:', error);
// }
  // this.vehicleService
  //   .addBooking(this.chosenPlateNo);
    // .subscribe(booking => this.bookings.push(booking));
// }
}

postCheckingData() {     // post plate no & booking data to backend, to check availability

  const data = { plateNo: this.chosenPlateNo,
                 yearPickUp: this.pickUpDate.getFullYear(),
                 monthPickUp: this.pickUpDate.getMonth() + 1,    // months are from 0-11
                 dayPickUp: this.pickUpDate.getDate(),
                 yearDropOff: this.dropOffDate.getFullYear(),
                 monthDropOff: this.dropOffDate.getMonth() + 1,    // months are from 0-11
                 dayDropOff: this.dropOffDate.getDate()
                };

  axios.post(this.checkingURL, stringify(data) , {
    headers: {
```

```
      'Content-Type': 'application/x-www-form-urlencoded'
    }
   }
   )
   .then((response) => {
    console.log(response.data);
    this.responseCheck = response.data;

    this.openSnackBarAvailability('Close');

   })
   .catch((error) => {
    console.log(error);
   });
  }


  bookVehicle() {
   console.log('book vehicle');

   try {
    this.postBookingData();    // call post method to book vehicle
   } catch {
    this.snackBar.open('Make sure that you have chosen the required vehicle and entered the
pick up & drop off dates!', 'Close', {
      duration: 10000,
      panelClass: ['error-snackbar']
    });
   }
  }

  checkAvailability() {
   console.log('check availability of vehicle');

   try {
    this.postCheckingData();    // call post method to check availability
   } catch {
    this.snackBar.open('Make sure that you have chosen the required vehicle and entered the
pick up & drop off dates!', 'Close', {
      duration: 10000,
      panelClass: ['error-snackbar']
    });
   }
  }

  // -------------  for table filter function
  applyFilter(filterValue: string) {
   this.dataSource.filter = filterValue.trim().toLowerCase();
  }
```

```
 rowClicked(row: any): void {
  console.log(row);
  this.chosenPlateNo = row.plateNo;
  console.log(this.chosenPlateNo);

  this.selectedRowIndex = row.plateNo;
 }


 openSnackBarBooking(action: string) {     // content to display when a vehicle is requested to be booked
  if (this.responseCheck === 'successful') {

    const options = { weekday: 'long', year: 'numeric', month: 'long', day: 'numeric' };
    this.displayPickUpDate = this.pickUpDate.toLocaleDateString('en-US', options);
    this.displayDropOffDate = this.dropOffDate.toLocaleDateString('en-US', options);

    const dateRange = ' was booked from '.concat(this.displayPickUpDate).concat(' to ', this.displayDropOffDate);
    this.completeMessage = 'The vehicle with Plate No: '.concat(this.chosenPlateNo).concat(dateRange);
    console.log(this.completeMessage);

    this.snackBar.open(this.completeMessage, action, {
      duration: 15000,
      panelClass: ['success-snackbar']
    });

  } else {
    const chosenVehicle = 'The vehicle with Plate No: '.concat(this.chosenPlateNo);
    this.completeMessage = chosenVehicle.concat(' isn\'t available for booking during the requested time period.');
    this.snackBar.open(this.completeMessage, action, {
      duration: 10000,
    });
  }
 }


 openSnackBarAvailability(action: string) {     // content to display when the availability of a vehicle is checked
  if (this.responseCheck === 'successful') {

    const options = { weekday: 'long', year: 'numeric', month: 'long', day: 'numeric' };
    this.displayPickUpDate = this.pickUpDate.toLocaleDateString('en-US', options);
    this.displayDropOffDate = this.dropOffDate.toLocaleDateString('en-US', options);
```

```
    const dateRange = ' is available for booking from '.concat(this.displayPickUpDate).concat(' to
', this.displayDropOffDate);
    this.completeMessage = 'The vehicle with Plate No:
'.concat(this.chosenPlateNo).concat(dateRange);
    console.log(this.completeMessage);

    this.snackBar.open(this.completeMessage, action, {
      duration: 15000,
      panelClass: ['success-snackbar']
    });
  } else {
    const chosenVehicle = 'The vehicle with Plate No: '.concat(this.chosenPlateNo);
    this.completeMessage = chosenVehicle.concat(' isn\'t available for booking during the
requested time period.');
    this.snackBar.open(this.completeMessage, action, {
      duration: 10000,
    });
  }
 }

}

/*References:

https://www.w3schools.com/angular/angular_tables.asp
https://stackoverflow.com/questions/34973654/angularjs-create-a-table-from-an-array


https://stackoverflow.com/questions/22209117/create-table-from-json-data-with-angularjs-
and-ng-repeat/22209337


https://material.angular.io/components/table/overview


Booking confirmation - Snack bar
https://material.angular.io/components/snack-bar/overview
https://stackoverflow.com/questions/56389290/angular-material-snackbar-change-color

Calendar Date input
https://material.angular.io/components/datepicker/overview

Button
https://material.angular.io/components/button/overview

mat table selection
https://stackblitz.com/edit/mat-table-row-click-event
https://stackoverflow.com/questions/52759637/how-to-get-the-selected-row-values-in-table-
in-angular
```

matDatePicker
https://angular-material-nw1brd.stackblitz.io/
https://stackoverflow.com/questions/54828459/angular-material-date-picker-min-and-max-date-validation-messages

https://www.devglan.com/angular/angular-data-table-example

JS Date
https://www.w3schools.com/js/js_date_methods.asp
https://stackoverflow.com/questions/3552461/how-to-format-a-javascript-date

https://www.tutorialspoint.com/typescript/typescript_string_concat.htm

Typescript passing functions
https://stackoverflow.com/questions/47813442/could-not-able-to-access-property-of-angular-component-inside-it

*/

vehicle.service.ts

```
import { Injectable } from '@angular/core';
import {HttpClient, HttpEvent, HttpRequest} from '@angular/common/http';
import {Observable} from 'rxjs';
// import {catchError} from 'rxjs/operators';
import axios from 'axios';


@Injectable({
  providedIn: 'root'
})

export class VehicleService {


  // get endpoint
  endpointURL: any =  'http://localhost:4567/hello';      // back-end URL
  // service makes an HTTP call to the backend
  // bookingURL: any = 'http://localhost:4567/books';

  constructor(private http: HttpClient) { }
  getData(): Observable<any> {
    return this.http.get(this.endpointURL);     // getting JSON from the backend
  }

// POST

}

/*Reference:

https://angular.io/guide/http

*/
```

styles.scss

```
html, body { height: 100%; }
body {
  margin: 0;
  font-family: Roboto, "Helvetica Neue", sans-serif;
  background: lavender;
}


.error-snackbar {
  color: lightcoral;
}

.success-snackbar{
  color: lightgreen;
}
```

app.component.scss

```
.header{
  font-family: Roboto,"Helvetica Neue Light","Helvetica Neue",Helvetica,Arial,"Lucida
Grande",sans-serif;
  font-weight: 300;
  // margin: 0;
  padding: 28px 15px;
  font-size: 20px;
  color: #fff;
}

.subHeader{
  background: linear-gradient( to top,lavender,white 40%);
}

table {
    width: 100%;
    // margin: auto;
    cursor:pointer;
  }

.tableContainer{
  width: 95%;
  margin: auto;
  max-height: 80vh;
  overflow:auto;

}

/* width */
.tableContainer::-webkit-scrollbar {
  width: 8px;
}
/* Track */
.tableContainer::-webkit-scrollbar-track {
  background: #f1f1f1;
}

/* Handle */
.tableContainer::-webkit-scrollbar-thumb {
  background: rgb(172, 172, 172);
  border-radius: 15px;
}

/* Handle on hover */
::-webkit-scrollbar-thumb:hover {
  background: rgba(85, 85, 85, 0.767);
}
```

```
.bookingSection{
  float: right;
}

.fullContainer{
  width:97%;
  margin:auto;
}

.highlight{
  background: rgb(197, 229, 231);
  transition: 0.25s;

}


/*Reference:

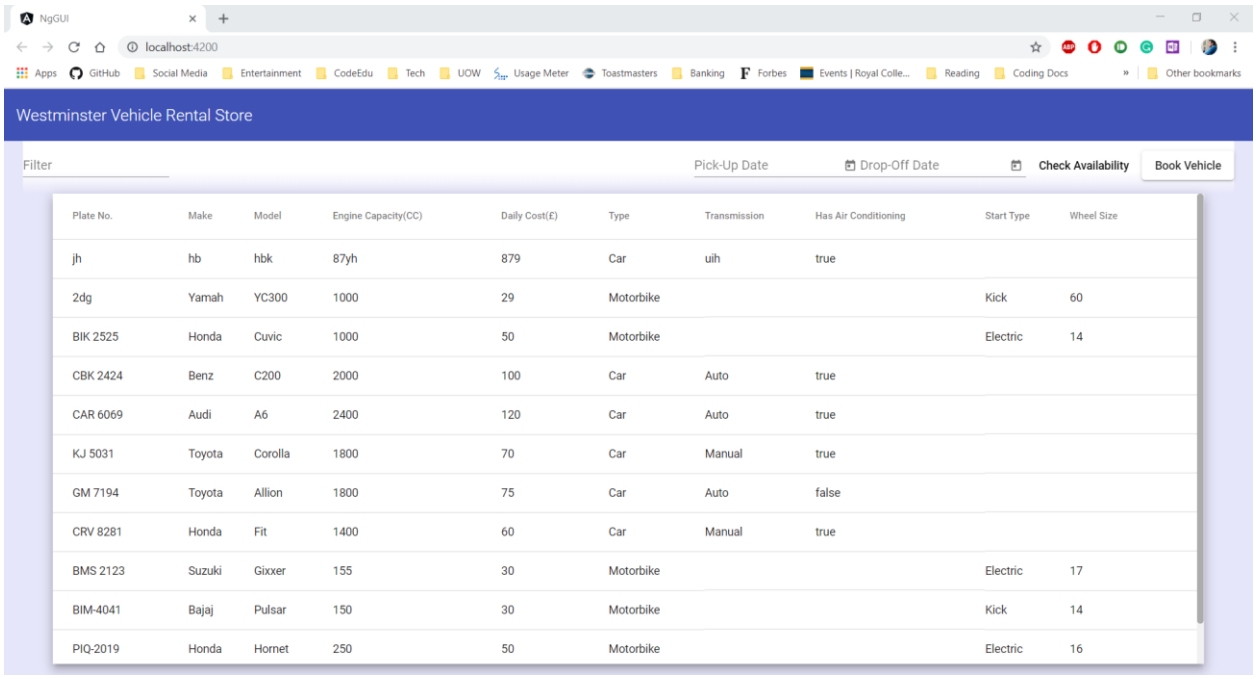
CSS custom scrollbar
https://www.w3schools.com/howto/howto_css_custom_scrollbar.asp

Change colour of table row on selection
https://stackoverflow.com/questions/45417248/angular-4-material-table-highlight-a-row

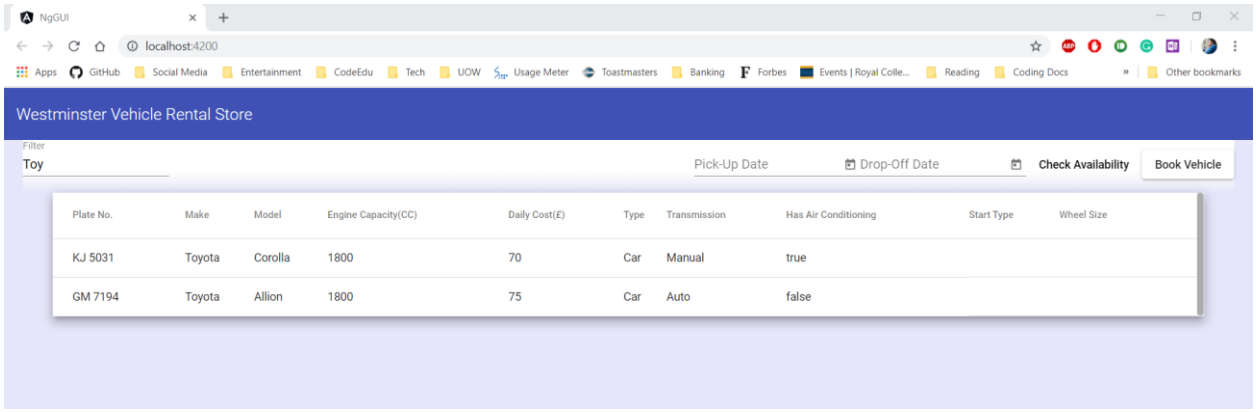
Toolbar/ Header
https://material.angular.io/components/toolbar/examples

*/
```

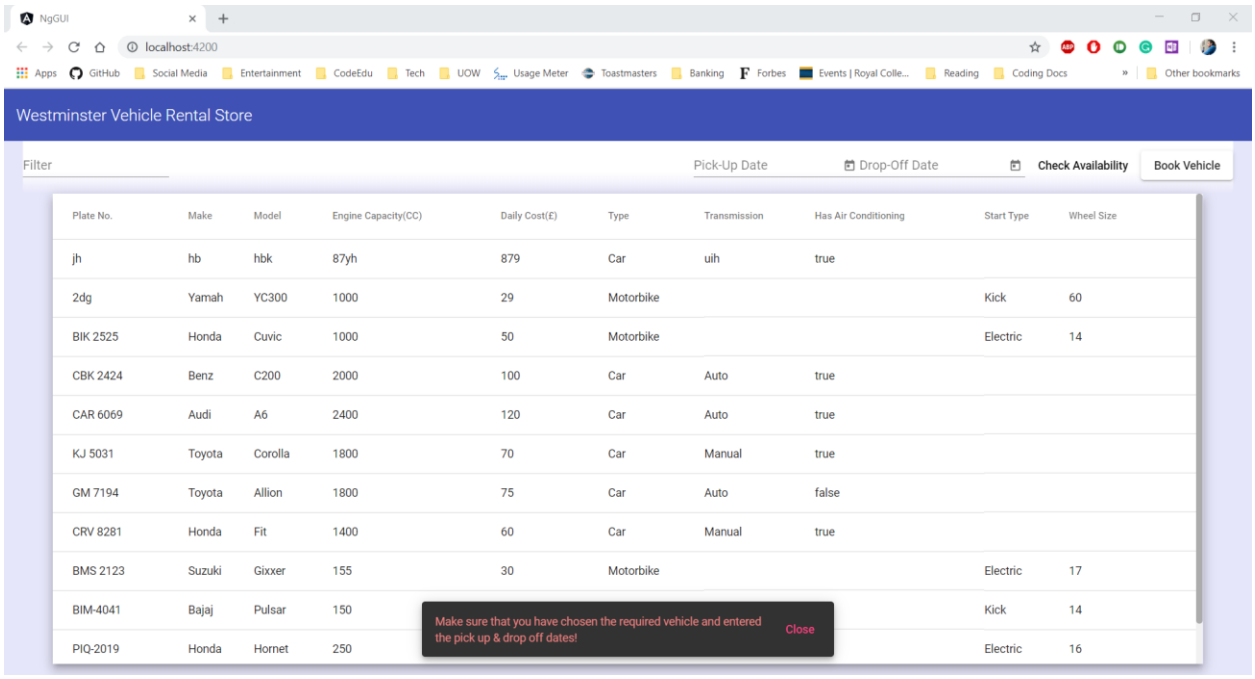
Screenshots – Angular GUI



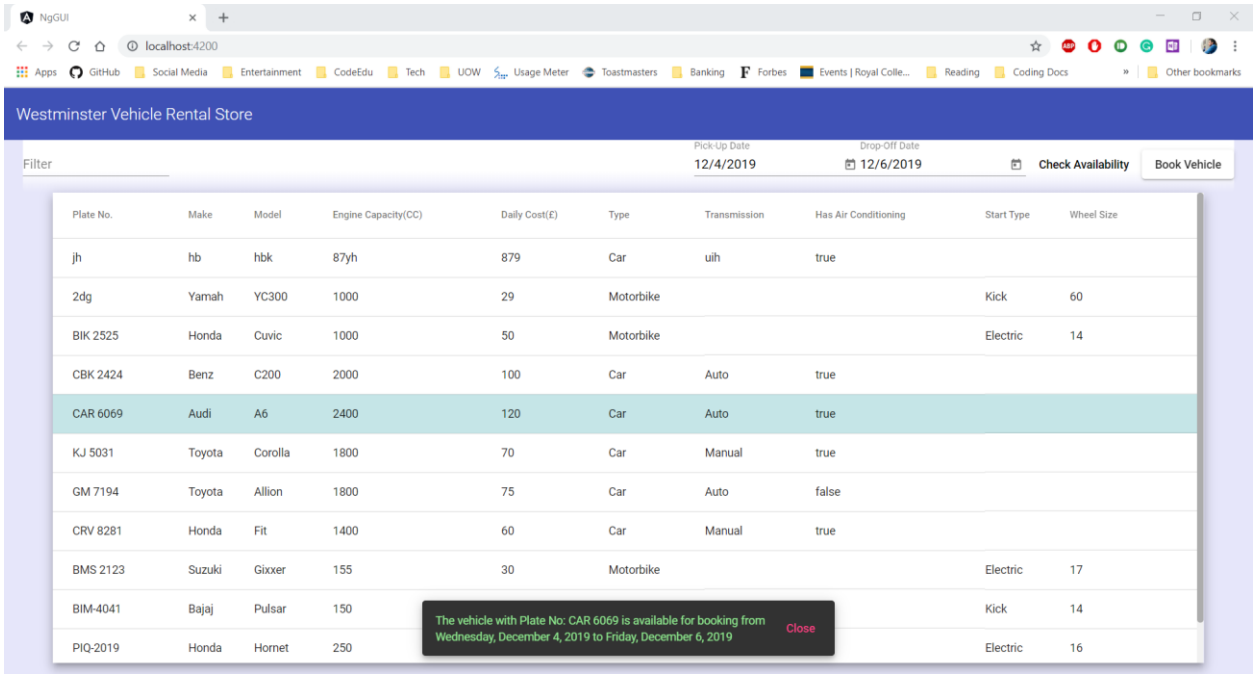
Filtering Function – Works for all fields



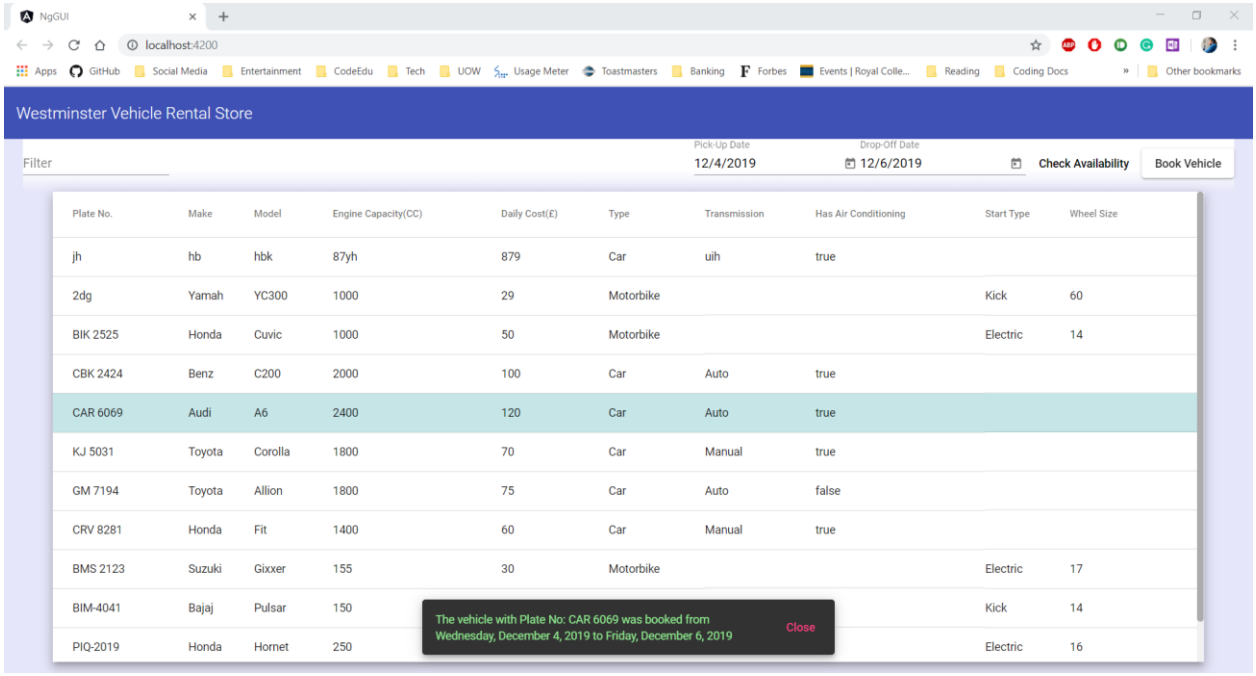
Check whether all required information has been added before making a request to the API.



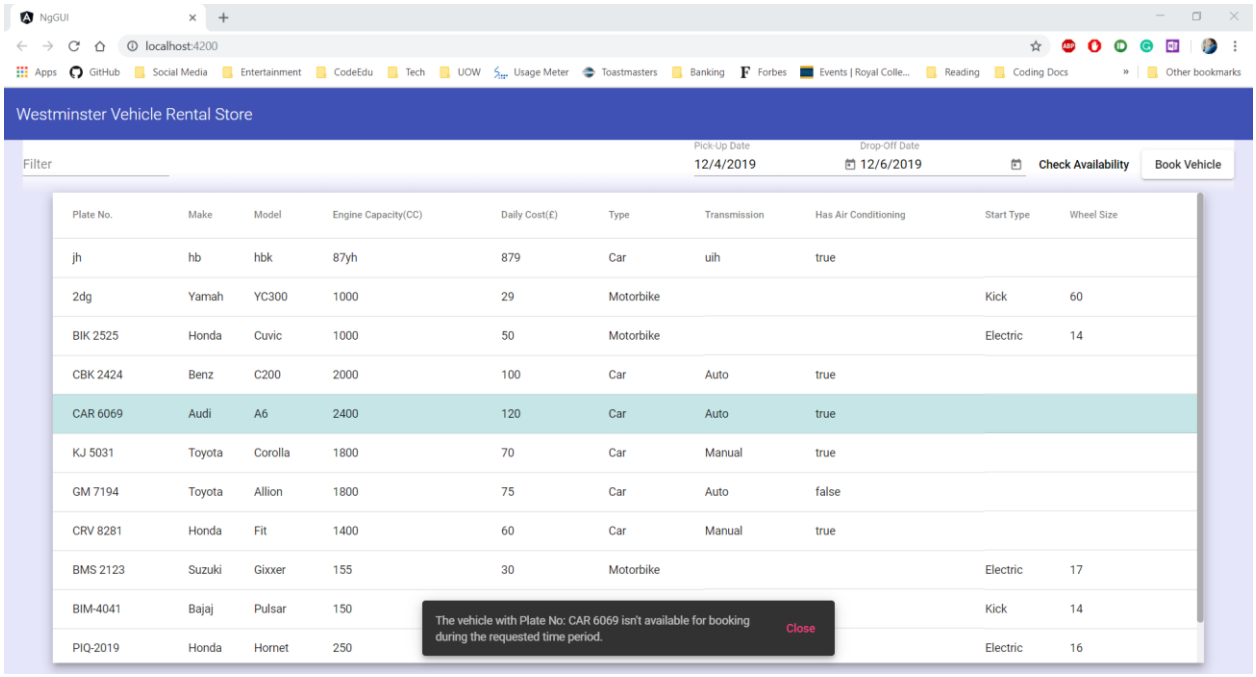
Checking for availability to book a vehicle during a required time period (When “Check Availability” button is clicked).



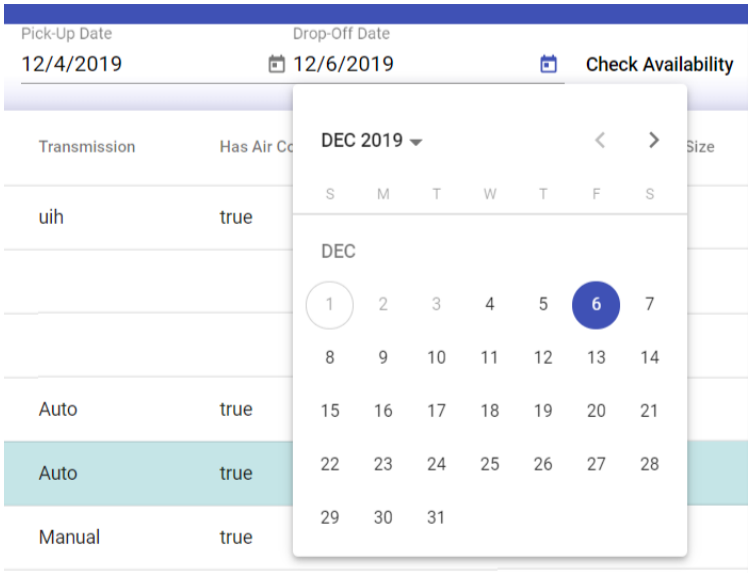
Booking a vehicle and letting the user know the exact booking details. (When “Book Vehicle” button is clicked).



Letting the user know that the vehicle is unavailable for booking during the requested time period (When “Book Vehicle”/ “Check Availability” button is clicked).



Restrictions for date input, to get valid date ranges
(Pick-Up date is available only from the current date, drop-off date is available on from the pick-up date onwards).
Ease of date selection using a date picker.



Testing

Test Plan

Test Case ID	Test Case	Input	Expected Output
1	Add vehicle (Car)	1	Request user to choose whether to add a car or a motorbike
		1	Prompt user with information relevant for a car
		Enter all prompted information	Add vehicle to system.
2	Add vehicle (Motorbike)	1	Request user to choose whether to add a car or a motorbike
		2	Prompt user with information relevant for a motorbike
		Enter all prompted information	Add vehicle to system.
3	Edit vehicle (Car/ Motorbike)	1	Prompt user with information relevant for a motorbike
		1 OR 2	Prompt user for Plate No. of the vehicle
		Enter plate number that's already in the system (BIK 2525)	Display message to user that, "This Plate No exists in the system." Display the information of the vehicle with the entered Plate No. Prompt user, "Do u want to edit information related to this vehicle?"
		Y OR yes OR Yes OR y	Prompt all information relevant to vehicle type chosen
		Enter all prompted information	Remove old vehicle information from the system. Add new vehicle information to the system.
4	Edit vehicle (Car/ Motorbike)	1	Prompt user with information relevant for a motorbike
		1 OR 2	Prompt user for Plate No. of the vehicle
		Enter plate number that's already in the system (BIK 2525)	Display message to user that, "This Plate No exists in the system." Display the information of the vehicle with the entered Plate No. Prompt user, "Do u want to edit information related to this vehicle?"
		N OR No or no OR n	Display the main menu with its options.

			Prompt for selection of option
5	Delete vehicle - available	2	Prompt user for the Plate No. of the vehicle required to be deleted.
		Enter plate number that's already in the system (BIK 2525)	Display the type of vehicle that was deleted (car/ motorbike) Print the details of the vehicle that was deleted. Display the remaining parking slots left in the garage. Remove vehicle from system.
6	Delete vehicle - unavailable	2	Prompt user for the Plate No. of the vehicle required to be deleted.
		Enter plate number that's not in the system (fg)	Display, "There's no vehicle related to the Plate No: fg" Re prompt main menu.
7	Print List of vehicles	3	Sort the list of vehicles in alphabetical order of make. Print all the plateIDs and types of all the vehicles in the system.
8	Open GUI	4	Prompt user to enter required GUI (Angular / JavaFX)
		1	Open Angular GUI in the default web browser.
9	Open GUI	4	Prompt user to enter required GUI (Angular / JavaFX)
		2	Open JavaFX GUI in a new window.
10	Exit program with exit message	5	Display exit message and exit console application.
		20	Display message for invalid input & re prompt menu
		-5	
		f	Display, "Only integer numbers are allowed! Please provide a valid input". Re prompt menu
		@	
11	Write/ Save vehicle stock list into a file after any changes.	Add vehicle	Write vehicle information into a file.
		Edit vehicle information	Edit vehicle information in the file.

		Delete vehicle	Delete vehicle information from the file.
12	Validate integer input	4	Get out of validation loop. Continue with rest of the program functions.
		d	Display, "Only integer numbers are allowed! Please provide a valid input". Re prompt for input.
		#	
13	Validate double input	3	Get out of validation loop. Continue with rest of the program functions.
		4.7	
		f	Display, "Only numbers are allowed! Please provide a valid input". Re prompt for input.
		%	

Automated testing with Junit

Code – Junit testing

```
package lk.dinuka.VehicleRentalSystem.Controller;

import lk.dinuka.VehicleRentalSystem.Model.Car;
import lk.dinuka.VehicleRentalSystem.Model.Motorbike;
import lk.dinuka.VehicleRentalSystem.Model.Vehicle;
import org.junit.Rule;
import org.junit.Test;
import org.junit.rules.TemporaryFolder;

import java.io.*;
import java.math.BigDecimal;
import java.util.*;

import static lk.dinuka.VehicleRentalSystem.Model.RentalVehicleManager.MAX_VEHICLES;
import static lk.dinuka.VehicleRentalSystem.Model.Vehicle.count;
import static org.junit.Assert.assertEquals;
import static org.junit.Assert.assertTrue;

public class WestminsterRentalVehicleManagerTest {


   @Test
   public void addVehicleCar() {        //testing whether a car can be added into the system
      //test HashMap
      HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether the plate No already exists in the system

      //test arrayList
      List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList


      Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70), "Car", "Auto", true);

      int initialNumOfVehicles = vehiclesArrayList.size();

      if (initialNumOfVehicles <= MAX_VEHICLES) {      //checking whether the vehicles existing in the system has occupied all the available parking lots


         vehiclesMap.put("CAR-123", newCar);      //adding new car into vehiclesMap
         vehiclesArrayList.add(newCar);

//          System.out.println(vehiclesArrayList);
//          System.out.println(vehiclesMap);
```

```
//          assertTrue("New Car wasn't added into the system", vehiclesArrayList.add(newCar));
//checking whether the car was added to the arrayList
        assertEquals(initialNumOfVehicles + 1, vehiclesArrayList.size());        //??
        assertEquals(initialNumOfVehicles + 1, vehiclesMap.size());


        System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");


        assertTrue("The new car hasn't been added to the system arrayList",
vehiclesArrayList.contains(newCar));
        assertTrue("The new car hasn't been added to the system hashMap",
vehiclesMap.containsKey("CAR-123"));


    } else {
        System.out.println("There are no available spaces. 50 vehicles have been added!");
    }

    System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs
  }

  @Test
  public void addVehicleBike() {        //testing whether a motorbike can be added into the
system
    //test HashMap
    HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

    //test arrayList
    List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList


    Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

    int initialNumOfVehicles = vehiclesArrayList.size();
    System.out.println(vehiclesArrayList);
    System.out.println(vehiclesMap);

    if (initialNumOfVehicles <= MAX_VEHICLES) {      //checking whether the vehicles existing in
the system has occupied all the available parking lots

        vehiclesMap.put("BIK-123", newBike);      //adding new car into vehicles arrayList
        vehiclesArrayList.add(newBike);

//          System.out.println(vehiclesArrayList);
```

```
//          System.out.println(vehiclesMap);


//          assertTrue("New Motorbike wasn't added into the system",
vehiclesArrayList.add(newBike));     //checking whether the motorbike was added to the
arrayList
          assertEquals(initialNumOfVehicles + 1, vehiclesArrayList.size());        //??
          assertEquals(initialNumOfVehicles + 1, vehiclesMap.size());


          System.out.println("\nThere are " + (MAX_VEHICLES - Vehicle.getCount()) + " parking lots
left, to park vehicles.");


          assertTrue("The new motorbike hasn't been added to the system arrayList",
vehiclesArrayList.contains(newBike));
          assertTrue("The new motorbike hasn't been added to the system hashMap",
vehiclesMap.containsKey("BIK-123"));


       } else {
          System.out.println("There are no available spaces. 50 vehicles have been added!");
       }

       System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs
    }


    @Test
    public void testEditCar() {
       //test HashMap
       HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

       //test arrayList
       List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList


       Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
"Car", "Auto", true);
       String enteredPlateNo = newCar.getPlateNo();

       vehiclesArrayList.add((newCar));
       vehiclesMap.put(enteredPlateNo, newCar);

       if (vehiclesMap.containsKey(enteredPlateNo)) {
          System.out.println("This Plate No exists in the system.");
          System.out.println();         //to keep space for clarity
```

```
        //print information of vehicle when asked whether to edit
        System.out.println("Make: " + vehiclesMap.get(enteredPlateNo).getMake());
        System.out.println("Model: " + vehiclesMap.get(enteredPlateNo).getModel());
        System.out.println("Engine Capacity: " +
vehiclesMap.get(enteredPlateNo).getEngineCapacity());
        System.out.println("Daily Cost (in £): " +
vehiclesMap.get(enteredPlateNo).getDailyCost());
        System.out.println("Type: " + vehiclesMap.get(enteredPlateNo).getType());

        if (vehiclesMap.get(enteredPlateNo) instanceof Car) {
           System.out.println("Transmission: " + ((Car)
vehiclesMap.get(enteredPlateNo)).getTransmission());
           System.out.println("Has Air Conditioning: " + ((Car)
vehiclesMap.get(enteredPlateNo)).isHasAirCon());
        } else {
           System.out.println("Start Type: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getStartType());
           System.out.println("Wheel Size: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getWheelSize());
        }

        boolean edit = true;
        if (edit) {
           System.out.println("\nMake required changes to vehicle information.");

        } else {
           System.out.println();      //keeps space and goes back to main menu
        }
     }

//      vehiclesMap.clear();       //clearing to make sure that other unit tests aren't affected by
this unit test
//      vehiclesArrayList.clear();

     System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs
  }

  @Test
  public void testEditBike() {
     //test HashMap
     HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

     //test arrayList
     List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList
```

```
        Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);
        String enteredPlateNo = newBike.getPlateNo();

        vehiclesArrayList.add(newBike);
        vehiclesMap.put(enteredPlateNo, newBike);

        if (vehiclesMap.containsKey(enteredPlateNo)) {
            System.out.println("This Plate No exists in the system.");
            System.out.println();          //to keep space for clarity

            //print information of vehicle when asked whether to edit
            System.out.println("Make: " + vehiclesMap.get(enteredPlateNo).getMake());
            System.out.println("Model: " + vehiclesMap.get(enteredPlateNo).getModel());
            System.out.println("Engine Capacity: " +
vehiclesMap.get(enteredPlateNo).getEngineCapacity());
            System.out.println("Daily Cost (in £): " +
vehiclesMap.get(enteredPlateNo).getDailyCost());
            System.out.println("Type: " + vehiclesMap.get(enteredPlateNo).getType());

            if (vehiclesMap.get(enteredPlateNo) instanceof Car) {
                System.out.println("Transmission: " + ((Car)
vehiclesMap.get(enteredPlateNo)).getTransmission());
                System.out.println("Has Air Conditioning: " + ((Car)
vehiclesMap.get(enteredPlateNo)).isHasAirCon());
            } else {
                System.out.println("Start Type: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getStartType());
                System.out.println("Wheel Size: " + ((Motorbike)
vehiclesMap.get(enteredPlateNo)).getWheelSize());
            }

            boolean edit = true;
            if (edit) {
                System.out.println("\nMake required changes to vehicle information.");

            } else {
                System.out.println();      //keeps space and goes back to main menu
            }
        }

//      vehiclesMap.clear();       //clearing to make sure that other unit tests aren't affected by
this unit test
//      vehiclesArrayList.clear();

        System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs
    }
```

```
   @Test
   public void testDeleteCarAvailable() {     //testing the result when a car that is in the system is requested to be deleted
      //test HashMap
      HashMap<String, Vehicle> vehiclesMap = new HashMap<>();         //used to check whether the plate No already exists in the system

      //test arrayList
      List<Vehicle> vehiclesArrayList = new ArrayList<>();      //temporary arrayList


      Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70), "Car", "Auto", true);

      String carPlateNo = "CAR-123";

      vehiclesMap.put(carPlateNo, newCar);
      vehiclesArrayList.add(newCar);

      int initialNumOfVehicles = vehiclesArrayList.size();

//       System.out.println(vehiclesArrayList);
//       System.out.println(vehiclesMap);


      if (vehiclesMap.containsKey(carPlateNo)) {
         Vehicle vehicleToBeDeleted = vehiclesMap.get(carPlateNo);

         vehiclesArrayList.remove(vehicleToBeDeleted);
//          assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
         vehiclesMap.remove(carPlateNo);
         count -= 1;         //decreasing the number of vehicles from the system by one

         String type = vehicleToBeDeleted.getType();

         System.out.println("\nA " + type + " has been deleted from the system.");
         System.out.println("The details of the vehicle that was deleted: " + vehicleToBeDeleted.toString());     //displaying information of deleted vehicle

//          System.out.println(initialNumOfVehicles);
         assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
//          System.out.println(initialNumOfVehicles);
//          assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
      } else {
         System.out.println("There's no vehicle related to the Plate No: " + carPlateNo);
      }
```

```
        System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs
    }

    @Test
    public void testDeleteCarUnavailable() {       // testing the result when cars that are not
        // in the system are requested to be deleted

        //test HashMap
        HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList

        String carPlateNo = "CAR-123";

        int initialNumOfVehicles = vehiclesArrayList.size();

//        System.out.println(vehiclesArrayList);
//        System.out.println(vehiclesMap);


        if (vehiclesMap.containsKey(carPlateNo)) {
            Vehicle vehicleToBeDeleted = vehiclesMap.get(carPlateNo);

            vehiclesArrayList.remove(vehicleToBeDeleted);
//            assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
            vehiclesMap.remove(carPlateNo);
            count -= 1;         //decreasing the number of vehicles from the system by one

            String type = vehicleToBeDeleted.getType();

            System.out.println("\nA " + type + " has been deleted from the system.");
            System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());     //displaying information of deleted vehicle


            assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
//            assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
        } else {
            System.out.println("There's no vehicle related to the Plate No: " + carPlateNo);
        }

        System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs

    }
```

```
   @Test
   public void testDeleteBikeAvailable() {     //testing the result when a motorbike that is in the
system is requested to be deleted
      //test HashMap
      HashMap<String, Vehicle> vehiclesMap = new HashMap<>();        //used to check whether
the plate No already exists in the system

      //test arrayList
      List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList

      Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

      String bikePlateNo = "BIK-123";

      vehiclesMap.put(bikePlateNo, newBike);
      vehiclesArrayList.add(newBike);

      int initialNumOfVehicles = vehiclesArrayList.size();

//       System.out.println(vehiclesArrayList);
//       System.out.println(vehiclesMap);


      if (vehiclesMap.containsKey(bikePlateNo)) {
         Vehicle vehicleToBeDeleted = vehiclesMap.get(bikePlateNo);

         vehiclesArrayList.remove(vehicleToBeDeleted);
//          assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
         vehiclesMap.remove(bikePlateNo);
         count -= 1;         //decreasing the number of vehicles from the system by one

         String type = vehicleToBeDeleted.getType();

         System.out.println("\nA " + type + " has been deleted from the system.");
         System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());     //displaying information of deleted vehicle


         assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
//          assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
      } else {
         System.out.println("There's no vehicle related to the Plate No: " + bikePlateNo);
      }

      System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~");     //used to separate test outputs
```

```
    }

    @Test
    public void testDeleteBikeUnavailable() {          // testing the result when motorbikes that are
not
        // in the system are requested to be deleted
        //test HashMap
        HashMap<String, Vehicle> vehiclesMap = new HashMap<>();          //used to check whether
the plate No already exists in the system

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>();      //temporary arrayList


        String bikePlateNo = "BIK-123";

        int initialNumOfVehicles = vehiclesMap.size();

//        System.out.println(vehiclesArrayList);
//        System.out.println(vehiclesMap);


        if (vehiclesMap.containsKey(bikePlateNo)) {
            Vehicle vehicleToBeDeleted = vehiclesMap.get(bikePlateNo);

            vehiclesArrayList.remove(vehicleToBeDeleted);
//            assertTrue(vehiclesArrayList.remove(vehicleToBeDeleted));
            vehiclesMap.remove(bikePlateNo);
            count -= 1;          //decreasing the number of vehicles from the system by one

            String type = vehicleToBeDeleted.getType();

            System.out.println("\nA " + type + " has been deleted from the system.");
            System.out.println("The details of the vehicle that was deleted: " +
vehicleToBeDeleted.toString());      //displaying information of deleted vehicle


            assertEquals(initialNumOfVehicles - 1, vehiclesArrayList.size());
//            assertEquals(initialNumOfVehicles - 1, vehiclesMap.size());
        } else {
            System.out.println("There's no vehicle related to the Plate No: " + bikePlateNo);
        }

        System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs

    }
```

```
    @Test
    public void testPrintList() {
        Vehicle newCar = new Car("CAR-123", "Honda", "Grace", "1300", BigDecimal.valueOf(70),
"Car", "Auto", true);
        Vehicle newBike = new Motorbike("BIK-123", "Hero", "Honda", "800",
BigDecimal.valueOf(40), "Motorbike", "Push", 15);

        //test arrayList
        List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList


        vehiclesArrayList.add(newCar);
        vehiclesArrayList.add(newBike);

        Collections.sort(vehiclesArrayList);    //sort vehicles alphabetically, according to make


        // print the plate number, the type of vehicle (car/ motorbike).

        String leftAlignFormat = "| %-15s | %-12s |%n";

        System.out.format("+-----------------+--------------+%n");
        System.out.format("|   Plate ID      |   Type       |%n");
        System.out.format("+-----------------+--------------+%n");

        for (Vehicle item : vehiclesArrayList) {
            if (item instanceof Car) {
                System.out.format(leftAlignFormat, item.getPlateNo(), "Car");
            } else if (item instanceof Motorbike) {
                System.out.format(leftAlignFormat, item.getPlateNo(), "Motorbike");
            }
        }
        System.out.println("+--------------------------------+");

        vehiclesArrayList.clear();           //emptying arrayList so that other unit tests can run
smoothly
        count -= 2;

        System.out.println("~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ ~ ~ ~ ~ ~ ~ ~ ~");      //used to separate test outputs

    }


    //testing write/ save file ---------------
    @Rule
    public TemporaryFolder tempFolder = new TemporaryFolder();

    @Test
```

```
   public void testSaveFile() throws IOException {
      //test arrayList
      List<Vehicle> vehiclesArrayList = new ArrayList<>();     //temporary arrayList



      File file = tempFolder.newFile("test.txt");

      FileWriter soldFile = new FileWriter("test.txt", true);


      soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
---+----------+-------------+--------+-----------+-----------+%n"));
      soldFile.write(String.format("|   Plate ID     |   Make       |   Model     | Engine Capacity|
Daily Cost(£) |   Type    | transmission | AirCon | Start type | Wheel Size |%n"));
      soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
---+----------+-------------+--------+-----------+-----------+%n"));
//             soldFile.write(System.getProperty("line.separator"));      //line break


      String leftAlignFormat2 = "| %-15s | %-13s | %-12s | %-14s | %-13s | %-9s | %-12s | %-6s |
%-10s | %-10s |%n";


      //writing into the file
      for (Vehicle veh : vehiclesArrayList) {
         if (veh instanceof Motorbike) {
            soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
                  veh.getDailyCost(), veh.getType(), "     -    ", "   -  ", ((Motorbike)
veh).getStartType(), ((Motorbike) veh).getWheelSize()));
         } else {
            soldFile.write(String.format(leftAlignFormat2, veh.getPlateNo(), veh.getMake(),
veh.getModel(), veh.getEngineCapacity(),
                  veh.getDailyCost(), veh.getType(), ((Car) veh).getTransmission(), ((Car)
veh).isHasAirCon(), "    -    ", "     -    "));
         }
         soldFile.write(System.getProperty("line.separator"));      //line break
      }
      soldFile.write(String.format("+-----------------+--------------+-------------+----------------+-----------
---+----------+-------------+--------+-----------+-----------+%n"));


      assertTrue(file.exists());


   }
   // ----------------
```

```
    @Test
    public void testViewGUIFX() {
//        GUI.main(null);      //used to open javafx application
        //test won't complete until javaFX application is closed
    }

    @Test
    public void testViewGUIAngular() {
//        API.getAllVehiclesToFront();              //send vehicles to front end
//        API.postBookingsFromFront();              //handle booking
//        API.postAvailabilityFromFront();          //handle availability
//
//
//        //Open Angular GUI in browser
//        ProcessBuilder builder = new ProcessBuilder("explorer.exe", "http://localhost:4200/");
//
//        builder.redirectErrorStream(true);
//
//        Process p = null;
//        try {
//            p = builder.start();
//        } catch (IOException e) {
//            e.printStackTrace();
//        }
//        BufferedReader r = new BufferedReader(new InputStreamReader(p.getInputStream()));
//        String line;
//        while (true) {
//            try {
//                line = r.readLine();
//                if (line == null) {
//                    break;
//                }
//                System.out.println(line);
//
//            } catch (IOException e) {
//                e.printStackTrace();
//            }
//        }
    }

    @Test
    public void testIntInputValidationString() {

        String data = "Hello Human\r\n";
        InputStream stdin = System.in;
        try {
            System.setIn(new ByteArrayInputStream(data.getBytes()));
            Scanner scanInput = new Scanner(System.in);
```

```
        System.out.println("Input entered: " + scanInput.nextLine());

//          while (!scanInput.hasNextInt()) {
        if (!scanInput.hasNextInt()) {
            System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//            scanInput.next();                                    //removing incorrect input entered
        }

      } finally {
        System.setIn(stdin);
      }
    }

    @Test
    public void testIntInputValidationCharacter() {

      String data = "@\r\n";
      InputStream stdin = System.in;
      try {
        System.setIn(new ByteArrayInputStream(data.getBytes()));
        Scanner scanInput = new Scanner(System.in);
        System.out.println("Input entered: " + scanInput.nextLine());

//          while (!scanInput.hasNextInt()) {
        if (!scanInput.hasNextInt()) {
            System.out.println("Only integer numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//            scanInput.next();                                    //removing incorrect input entered
        }

      } finally {
        System.setIn(stdin);
      }
    }

    @Test
    public void testIntInputValidationInteger() {
      int scanInput = 4;

      assertTrue("Only integer numbers are allowed! Please provide a valid input", scanInput ==
(int) scanInput);

    }

    @Test
    public void testDoubleInputValidationString() {
      String data = "Hello Humans\r\n";
      InputStream stdin = System.in;
```

```
      try {
         System.setIn(new ByteArrayInputStream(data.getBytes()));
         Scanner scanInput = new Scanner(System.in);
         System.out.println("Input entered: " + scanInput.nextLine());

//          while (!scanInput.hasNextInt()) {
         if (!scanInput.hasNextInt()) {
            System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//             scanInput.next();                                  //removing incorrect input entered
         }

      } finally {
         System.setIn(stdin);
      }
   }

   @Test
   public void testDoubleInputValidationCharacter() {

      String data = "$\r\n";
      InputStream stdin = System.in;
      try {
         System.setIn(new ByteArrayInputStream(data.getBytes()));
         Scanner scanInput = new Scanner(System.in);
         System.out.println("Input entered: " + scanInput.nextLine());

//          while (!scanInput.hasNextInt()) {
         if (!scanInput.hasNextInt()) {
            System.out.println("Only numbers are allowed! Please provide a valid input");
//error handling message for characters other than integers
//             scanInput.next();                                  //removing incorrect input entered
         }

      } finally {
         System.setIn(stdin);
      }
   }

   @Test
   public void testDoubleInputValidation() {
      double scanInput = 4.02;

      assertTrue("Only numbers are allowed! Please provide a valid input", scanInput == (double)
scanInput);
   }
}
```

/*Reference:

https://stackoverflow.com/questions/156503/how-do-you-assert-that-a-certain-exception-is-thrown-in-junit-4-tests

https://www.mkyong.com/unittest/junit-4-tutorial-2-expected-exception-test/

https://stackoverflow.com/questions/12558206/how-can-i-check-if-a-value-is-of-type-integer

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Screenshots – Junit testing