Code / Project : CME1252 / 1
Year / Semester : 2020-2021 Spring Semester
Duration : 5 weeks

Project: Cars

The purpose of this project is to develop a car rental system for the DEUCENG Car Rental Company.

General Information

The system simulates a car rental company keeping the track of offices, employees, customers, cars and other necessary structures. In the simulation, all activities are daily based and simulation money unit is cp.

Company

DEUCENG Car Rental Company rents cars for short periods of time ranging from 1 to 4 days. Cars are rented on daily basis. At the end of rental duration, cars are returned with the same amount of fuel. Rental car fees are taken from customer's credit card on daily basis. There is no car sale, they can only be rented.

Office

The company has several offices. Each office has their unique ID, phone number, address. Each office has its employees and cars. Maximum 3 employees can work in an office. New offices can be set up or the current ones can be closed over time.

Employee

Each employee has his/her unique ID, name, surname, gender, and birthdate. Each one can make a maximum of 1 contract per day. The company should pay compensation (200 cp) to employees whose employment has been terminated.

Car

Each car has its unique ID, brand, model, class (economy/sports/luxury), kilometers (on the basis of 100 km and its multiples). The rents of the cars are 100, 200 or 300 cp according to the car classes, economy, sports or luxury, respectively.

Customer

Each customer has his/her unique ID, name, surname. Customers request cars from the company.

Car Request

Customer's car requests have their unique ID, brand, model, class (economy/sports/luxury), rental start/end date. If there is no specific demand for an attribute, the symbol "*" is used for brand or model.

Contract

Accepted car requests turns into a contract. Each contract has its unique ID, customer ID, car ID, rental start/end date.

Commands

```
load;input.txt                          // load and run "input.txt" file commands

addOffice;phone;address;city
addEmployee;name;surname;gender;birthdate;office_id
addCar;brand;model;class;km;office_id
addCustomer;name;surname
addCarRequest;office_id;customer_id;brand;model;class;start_date;end_date
addCarRequestRandom;office_id;class
addCarRequestNRandom;min_request_number;max_request_number

listOffice
listEmployee;office_id
listCar;office_id
listCustomer
listCarRequest                          // customer car requests for current day
listContract                            // contracts for current day

deleteOffice;office_id
deleteEmployee;office_id;employee_id

nextday
```

System Operations

The car rental system starts on 1.1.2021. System uses auto-increment IDs for all items starting from 1. System can take commands from a file or command line. System waits for commands from the command line after finishing all file commands. System shows ">>>" before command line commands, shows ">" before file commands.

The number of car requests per day is at least 1, at most 7 (when it is random). Office and employee are randomly selected for the car requests if not determined. If the request is met, a contract is prepared, otherwise it will be canceled. Car request's start day is always the current day. Car requests can be specific or random as shown below.

```
>addCarRequest;1;3;*;*;sports;1.1.2021;4.1.2021
>addCarRequestRandom;1;*             // Random car for office 1
>addCarRequestRandom;1;economy       // Random economy class car for office 1
>addCarRequestRandom;-1;*            // Random car for random office
>addCarRequestNRandom;1;7            // Random 1-7 car requests (random office, random class)
```

The system measures how many kilometers the car travels each day as 100, 200 or 300 km (randomly determined). Even if the car is not returned, the distance travelled is known (using GPS etc.). Also daily rental fees are paid automatically each day.

Office daily incomes:
- Car rental incomes (100/200/300 cp for economy/sports/luxury classes)

Office daily expenses:
- Daily office rent (100 cp)
- Daily employee salaries (30 cp per employee)
- Daily employee performance bonuses (5/10/15 cp per contract for economy/sports/luxury classes)
- Daily vehicle maintenance (cleaning/service/amortization/tax/insurance) expenses (20/70/120 cp + 5/10/15 cp for every 100 km for economy/sports/luxury classes)

Command "nextday" is used to pass the simulation to the next day. Incomes, expenses and other statistics are calculated. Also system recommendations are displayed for every three consecutive days. Only one most important recommendation is made at a time by the system for each office. As a result, both car purchase and staff recruitment recommendations cannot be made at the same time for an office.

Example Recommendations:

- If there are insufficient rental requests, 1 employee can be dismissed. If there are no employees left in that office, it can be closed.
- If there are a lot of rental requests and the cars are insufficient to meet the demand in an office, a new car of the most demanding or profitable class can be purchased. If the employees are insufficient, a new employee can be recruited. If the number of employees in an office is exceeded, a new office can be opened.

Sample Screens

```
--- Date:1.1.2021 ---

>>>load;input.txt

>addOffice;02324449988;21 Sokak No:50;Izmir
>addOffice;02325678990;56 Sokak No:60;Ankara
>listOffice
   1.Office;02324449988;21 Sokak No:50;Izmir
   2.Office;02325678990;56 Sokak No:60;Ankara
>addEmployee;Burcu;Fidan;Female;29.5.1988;1
>addEmployee;Adem;Deniz;Male;15.6.1980;1
>addEmployee;Bahar;Korkmaz;Female;28.11.1978;2
>listEmployee;1
   1.Employee;Burcu;Fidan;Female;29.5.1988;1
   2.Employee;Adem;Deniz;Male;15.6.1980;1
>listEmployee;2
   3.Employee;Bahar;Korkmaz;Female;28.11.1978;2
>addCar;Audi;Q7;economy;0;1
>addCar;BMW;X3;sports;0;1
>addCar;Mercedes;CLA;luxury;0;1
>addCar;Renault;Clio;economy;0;2
>addCar;Honda;Civic;sports;0;2
>listCar;1
   1.Car;Audi;Q7;economy;0;1 - available
   2.Car;BMW;X3;sports;0;1 - available
   3.Car;Mercedes;CLA;luxury;0;1 - available
>listCar;2
   4.Car;Renault;Clio;economy;0;2 - available
   5.Car;Honda;Civic;sports;0;2 - available
>addCustomer;Ilker;Yildirim
>addCustomer;Sibel;Ay
>addCustomer;Gulay;Uz
>addCustomer;Murat;Kaya
>addCustomer;Cem;Bilir
>listCustomer
   1.Customer;Ilker;Yildirim
   2.Customer;Sibel;Ay
   3.Customer;Gulay;Uz
   4.Customer;Murat;Kaya
   5.Customer;Cem;Bilir

>>>load;input2.txt

>addCarRequest;1;3;*;*;economy;1.1.2021;4.1.2021
   Contract:Employee2;Customer3;Car1;1.1.2021;4.1.2021
>addCarRequest;1;5;*;*;sports;1.1.2021;3.1.2021
   Contract:Employee1;Customer5;Car2;1.1.2021;3.1.2021
>addCarRequest;1;5;*;*;luxury;2.1.2021;4.1.2021
   Error:Car request must be for today
   Error:No employee for the contract
>addCarRequest;1;2;*;*;luxury;1.1.2021;8.1.2021
   Error:Car requests must be for 1-4 days
   Error:No employee for the contract
>addCarRequest;2;2;Honda;*;*;1.1.2021;3.1.2021
   Contract:Employee3;Customer2;Car5;1.1.2021;3.1.2021
>addCarRequest;2;2;*;*;sports;1.1.2021;1.1.2021
   Error:Car not available
   Error:No employee for the contract
>addCarRequest;2;2;Ferrari;*;*;1.1.2021;1.1.2021
   Error:No car
```

```
   Error:No employee for the contract
>listCarRequest
   1.CarRequest;1;3;*;*;economy;1.1.2021;4.1.2021
   2.CarRequest;1;5;*;*;sports;1.1.2021;3.1.2021
   3.CarRequest;1;5;*;*;luxury;2.1.2021;4.1.2021
   4.CarRequest;1;2;*;*;luxury;1.1.2021;8.1.2021
   5.CarRequest;2;2;Honda;*;*;1.1.2021;3.1.2021
   6.CarRequest;2;2;*;*;sports;1.1.2021;1.1.2021
   7.CarRequest;2;2;Ferrari;*;*;1.1.2021;1.1.2021

>>>listContract
   1.Contract:Employee2;Customer3;Car1;1.1.2021;4.1.2021
   2.Contract:Employee1;Customer5;Car2;1.1.2021;3.1.2021
   3.Contract:Employee3;Customer2;Car5;1.1.2021;3.1.2021

>>>nextday
   --- Office Profits ----
   Office1 incomes: 300 cp
      Car1: 100
      Car2: 200
   Office1 expenses: 275 cp
      Office rent: 100
      Employee salaries: 60
      Employee performance bonuses: 5 + 10 = 15
      Car1 maintenance: 20 + 5 = 25 (100 km)
      Car2 maintenance: 70 + 20 = 90 (200 km)
   Office1 profit: 25 cp

   Office2 incomes: 200 cp
      Car5: 200
   Office2 expenses: 240 cp
      Office rent: 100
      Employee salaries: 30
      Employee performance bonuses: 10
      Car5 maintenance: 70 + 30 = 100 (300 km)
   Office2 profit: -40 cp

   --- Office Statistics of the Last 10 Days ----
   --- Office1 ---
       The most rented car: Car1;Audi;Q7 - Car2;BMW;X3
       The most rented car class: Economy - Sports
       The car with the highest profit: Car2;BMW;X3
       The car class with the highest profit: Sports
       The average number of days the cars are rented: 3.5 days
       The customer who rented most: Customer3;Gulay;Uz - Customer5;Cem;Bilir
       The employee who rented most: Employee2;Adem;Deniz - Employee1;Burcu;Fidan
       The most profitable employee: Employee1;Burcu;Fidan (200 - 90 = 110 cp)
       Average income levels of the employees for the office: (75 + 110)/2 = 92.5 cp
   --- Office2 ---
       The most rented car: Car5;Honda;Civic
       The most rented car class: Sports
       The car with the highest profit: Car5;Honda;Civic
       The car class with the highest profit: Sports
       The average number of days the cars are rented: 3 days
       The customer who rented most: Customer2;Sibel;Ay
       The employee who rented most: Employee3;Bahar;Korkmaz
       The most profitable employee: Employee3;Bahar;Korkmaz (200 - 100 = 100 cp)
       Average income levels of the employees for the office: 100 cp


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--- Date:2.1.2021 ---

>>>load;input3.txt

>addCarRequest;1;3;*;*;economy;2.1.2021;4.1.2021
    Error:Car not available
>addCarRequest;1;5;*;*;sports;2.1.2021;3.1.2021
    Error:Car not available
>addCarRequest;1;2;*;*;luxury;2.1.2021;2.1.2021
    Error:Car not available
>addCarRequest;2;2;*;*;sports;2.1.2021;2.1.2021
```

```
    Error:Car not available

>>>nextday
   --- Office Profits ----
   Office1 incomes: 0 cp
   Office1 expenses: 160 cp
      Office rent: 100
      Employee salaries: 60
   Office1 profit: -160 cp

   Office2 incomes: 0 cp
   Office2 expenses: 130 cp
      Office rent: 100
      Employee salaries: 30
   Office2 profit: -130 cp

   --- Office Statistics of the Last 10 Days ----
   --- Office1 ---
       The most rented car: Car1;Audi;Q7 - Car2;BMW;X3
       The most rented car class: Economy - Sports
       The car with the highest profit: Car2;BMW;X3
       The car class with the highest profit: Sports
       The average number of days the cars are rented: 3.5 days
       The customer who rented most: Customer3;Gulay;Uz - Customer5;Cem;Bilir
       The employee who rented most: Employee2;Adem;Deniz - Employee1;Burcu;Fidan
       The most profitable employee: Employee1;Burcu;Fidan (200 - 90 = 110 cp)
       Average income levels of the employees for the office: (75 + 110)/2 = 92.5 cp
   --- Office2 ---
       The most rented car: Car5;Honda;Civic
       The most rented car class: Sports
       The car with the highest profit: Car5;Honda;Civic
       The car class with the highest profit: Sports
       The average number of days the cars are rented: 3 days
       The customer who rented most: Customer2;Sibel;Ay
       The employee who rented most: Employee3;Bahar;Korkmaz
       The most profitable employee: Employee3;Bahar;Korkmaz (200 - 100 = 100 cp)
       Average income levels of the employees for the office: 100 cp

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--- Date:3.1.2021 ---

>>>addCarRequest;1;3;*;*;economy;3.1.2021;5.1.2021
    Error:Car not available
>>>addCarRequest;1;5;*;*;sports;3.1.2021;3.1.2021
    Error:Car not available
>>>addCarRequest;1;2;*;*;sports;3.1.2021;4.1.2021
    Error:Car not available
>>>addCarRequest;2;2;*;*;sports;3.1.2021;4.1.2021
    Error:Car not available

>>>nextday
   --- Office Profits ----
   Office1 incomes: 0 cp
   Office1 expenses: 160 cp
      Office rent: 100
      Employee salaries: 60
   Office1 profit: -160 cp

   Office2 incomes: 0 cp
   Office2 expenses: 130 cp
      Office rent: 100
      Employee salaries: 30
   Office2 profit: -130 cp

   --- Office Statistics of the Last 10 Days ----
   --- Office1:
       The most rented car: Car1;Audi;Q7 - Car2;BMW;X3
       The most rented car class: Economy - Sports
       The car with the highest profit: Car2;BMW;X3
       The car class with the highest profit: Sports
       The average number of days the cars are rented: 3.5 days
       The customer who rented most: Customer3;Gulay;Uz - Customer5;Cem;Bilir
```

```
    The employee who rented most: Employee2;Adem;Deniz - Employee1;Burcu;Fidan
    The most profitable employee: Employee1;Burcu;Fidan (200 - 90 = 110 cp)
    Average income levels of the employees for the office: (75 + 110)/2 = 92.5 cp
--- Office2:
    The most rented car: Car5;Honda;Civic
    The most rented car class: Sports
    The car with the highest profit: Car5;Honda;Civic
    The car class with the highest profit: Sports
    The average number of days the cars are rented: 3 days
    The customer who rented most: Customer2;Sibel;Ay
    The employee who rented most: Employee3;Bahar;Korkmaz
    The most profitable employee: Employee3;Bahar;Korkmaz (200 - 100 = 100 cp)
    Average income levels of the employees for the office: 100 cp

--- System Recommendations ----
Office1: Buy new car (sports class)
Office2: Buy new car (sports class)
```

Suggested Weekly Program

1. Discussing and designing solution alternatives. Creating the necessary variables, structures. Screen.
2. Class designs. Attributes/methods. **Add** and **list** commands for office/employee.
3. **Add** and **list** commands for car/customer. **Delete** commands for office/employee.
4. **Add** and **list** for **CarRequest** commands. Making contracts. **listContract** command.
5. Command **nextday** operations (Office profits, statistics and system recommendations). Remaining parts of the application. Testing/Debugging.

First Evaluation: 2.4.2021 **Report:** 2.4.2021	**Final Evaluation:** 16.04.2021 (powerpoint + poster) **Report:** 16.04.2021