Lab task 2. Divide and Conquer

Session 1. Fuel consumption. Program design and strategy approach

We want to know the fuel consumption of a collection of cars, of which the following features are known:

- Model
- Fuel type
- Transmission type
- Numbers of seats
- Fuel tank capacity (in liters of fuel)
- (Average) fuel consumption, in liters of fuel per 100km driven

For this purpose, all vehicles will perform the same route, from Ciudad Real to Teruel, visiting N points of interest (POIs), for which the distances in kilometers between them are known.

We are asked to:

- Calculate the total consumption of each vehicle.
- Show the cars that can complete the trip, sorted in non-decreasing order according to total consumption.
- Indicate the vehicles, if any, that could not complete the trip.

To do so, the student should:

1. Implement a Java (object oriented) program, including the necessary methods to:
    a. Read the file "**cars_dataset.csv**" containing the set of vehicles to be analyzed.
        i. The information is presented in different lines of the file and separated by commas (model, fuel type, seats, transmission, tank capacity, average consumption). Example:

```
Hyundai Creta,Diesel,5.0,Automatic,50.0,7.1
Range Rover,Petrol,7.0,Automatic,90.0,11.35
...
```

    b. Read from the keyboard the number N of POIs
    c. Randomly generate the distances between POIs in the route.
2. Design a Divide and Conquer strategy for calculating the total consumption of each vehicle considering the distances between POIs on the trip, car tank capacity and average fuel consumption.

3. Study the most appropriate sorting method to list the vehicles capable of completing the trip, based on their total consumption.

Session 2. **Fuel consumption. D&C algorithm implementation and complexity analysis**

Based on the implementation carried out in the previous session, the basis of the program and the functions for reading the dataset, also carried out previously, the information from the POIs, and the divide and conquer strategy to solve the problem,

In this session the student is asked to:

1. Implementation of the Divide and Conquer algorithm to solve the problem.
2. Show the results on the screen in an appropriate manner.
    a. Orderly information about the total consumption of the vehicles (in increasing order) should be given.
    b. Indicate those vehicles that cannot complete the trip.
3. Carry out several simulations of trips, modifying the number of POIs and the distance between them.
4. Calculate the theoretical complexity of the implemented Divide and Conquer algorithm. Justify the answer.
5. Calculate the complexity of all the methods/algorithms implemented in the program. Justify the answer.