Vehicle Allocation Problem (Modified)

Problem Description

The initial problem raised is the problem of assigning vehicles to previously requested trips, included in the HashCode'18 challenge.

For this exercise, an extension is proposed. Without modifying the initial conditions of the problem, we now want to introduce a new situation to take into account: if the trips to be made have been requested by a person with reduced mobility. In this case, each trip will have a new binary identifier that will inform about the condition of the traveler: with reduced mobility or not.

As far as vehicles are concerned, we will now also have additional information, as they will not all be the same. In the fleet of vehicles, certain adapted vehicles are available, in a certain percentage of the total. When allocating a journey to a vehicle, this condition will be taken into account.

A solution will be considered optimal if it assigns adapted vehicles to journeys requested by people with disabilities. This allocation is not considered obligatory, as the driver can help passengers to get on and off, but it is considered very desirable for their better comfort. For that reason, this condition will be considered as a secondary restriction on the problem. The length of the journey in a non-adapted vehicle will also be taken into account, so that longer journeys will be penalized to a greater extent if they are made in a non-adapted vehicle when this was requested.

The student will need to consider two options to take this additional situation into account: either model it as a restriction or establish that it is something more of a priority and treat it as a multi-objective problem.

Data Files

The format of the data file will be respected mainly from that provided in the HashCode'18 challenge. Only two new sections are added:

1. In the information of each trip, a last Boolean value appears, which will indicate if the applicant suffers from reduced mobility: '0' will indicate that there is no problem, while '1', that he/she suffers from it.
2. The last line of the file describes the fleet of vehicles. It is an array of boolean values with a length equal to the number of vehicles included in the fleet. A '0' will be considered to mean that the vehicle identified with the value of that position in the array is not adapted for people with reduced mobility, while '1' means that it is adapted.

Example of an input file:

`3 4 2 3 2 10`	`3 rows, 4 columns, 2 vehicles, 3 rides, 2 bonus and 10 steps`

0 0 1 3 2 9 0	ride from [0, 0] to [1, 3], earliest start 2, latest finish 9, regular passenger
1 2 1 0 0 9 1	ride from [1, 2] to [1, 0], earliest start 0, latest finish 9, passenger with reduced mobility
2 0 2 2 0 9 0	ride from [2, 0] to [2, 2], earliest start 0, latest finish 9, regular passenger
1 0	vehicle 0: adapted, vehicle 1: not adapted

The output file format will be considered as exactly the same one requested for the HashCode'18.

1 0 2 2 1	this vehicle is assigned 1 ride: [0] this vehicle is assigned 2 rides: [2, 1]

In this case, we see that the original score is 10 (the first trip earns 6 points and the other two, 2 points each). However, we would now have to bear in mind that vehicle 1 has assigned a journey that takes a passenger with reduced mobility without being adapted, contravening a restriction of the problem. Is a design decision for the student to decide exactly how this contravening should be included in the algorithm, as is part of the solution requested.