

Fundamentals of Operations Research

Project (3+1)

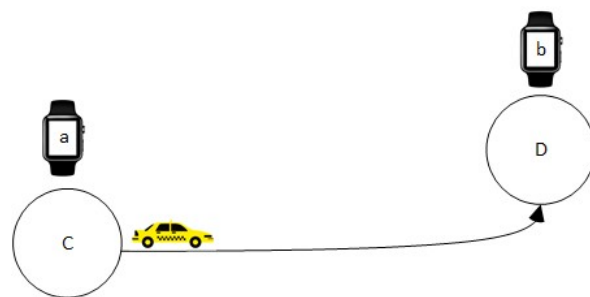
A Taxi Agency in Shiraz want to plan a work day. there is n reserved trip that should be done in the following day, each trip is for one passenger and take palce from one location to another location at a determined time. for each trip $i=1, \dots, n$ we have:

a_i the start time of trip i

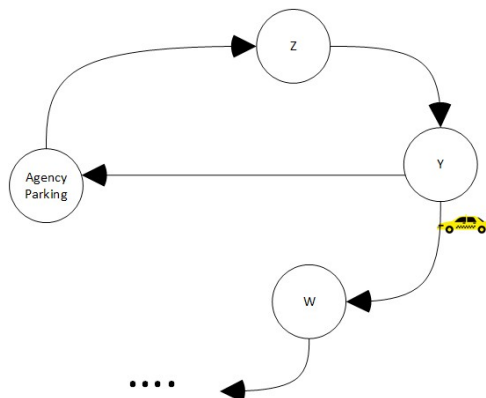
b_i the end time of trip i

c_i the starting point of the trip i

d_i the ending point of the trip i



after each trip, driver can go back to parking or going to another trip-passenger, For example in the image below the driver from source tacking trip j from Z to Y , after Bring the passenger j to Y . we could decide wether driver come back to parking without any passenger or taking another feaseble trip which may cost Y to W in the example



Matrix D show distances, element d_{zy} indicate the distances between location z and location y .

1) Under the management of Mr. Trump, he wants to minimize the number of Taxis to maximize profit, propose a flow network model and integer programming model with respect to this condition solve these model using software proposed by TA. Plot the solution (path of each driver) for each taxi for dataset 1.

- Give the Network flow model graphically for dataset 1, what model is it?
- Give the mathematical formulation for integer linear programming model.

For each dataset 1,2 and 3 report :

- The optimal number of taxi
- Running time of network model
- Running time of ILP model

2) Under the management of Ms. Thunberg, she takes care a lot about the environment, climate change, and global warming so she decides to minimize the times when the driver is driving alone and not carrying a passenger which have the most fuel loss here. Design or change previous network and integer model in order to minimize this objective. Show a difference of chosen path for a driver in the second dataset compare with the previous question.

- Give the Network flow model graphically for dataset 1, what model is it?
- Give the mathematical formulation for integer linear programming model.

For each dataset 1,2 and 3 report :

- The optimal cost and the number of taxies used
- Running time of network model
- Running time of ILP model
- Compare the running time in cases (1) and (2) and for data set 1,2 and 3 what is your conclusion?

3) The new management Mr. Trümmerberg wants to not only take benefit from minimizing the number of Taxis, but also care about the environment and global warming, suggest a new method based on network flow and your last models and integer programming model satisfy both of these conditions. Suppose he can tolerate 10% loss in profit of the taxi number for benefit of environment. (Bonus + 1)