MINISTERUL EDUCAȚIEI REPUBLICII MOLDOVA

UNIVERSITATEA TEHNICĂ A MOLDOVEI

Facultatea „Calculatoare, Informatică şi Microelectronică”

FAF

RAPORT

Lucrare de laborator nr. 1
la Cercetări operaționale

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Laboratory Work 1

Problem Description

Aunt Marry is an old lady from Chișinău. She lives in the area near the Circus and everyday she needs to take the trolleybus in order to get to the city center. From there she can go further to the Piața Centrală, where she doesn't buy anything, rather she spends her time hearing the latest news in the city.

Unfortunately, Aunt Marry is upset by the way the municipal transport is optimized especially when she returns back home. For example, from station **Ștefan cel Mare** to station **Circul** there go trolleybuses nr: 7, 10, 24, 25 (I will skip 11 and 14 as they are routed comparably few times per day). Thus, she doesn't care so much what is the number of the trolleybus she takes in order to reach the destination station. One thing she noticed is that often the trolleybuses arrive as a train (all at once) to the station, but there appear gaps of around 10 or even 15 minutes when there no trolleybuses arrive. What Aunt Marry wants, neglecting the car traffic in our city, is an evenly distributed timetable when she can wait for the minimum amount of time the transportation that will take her to the destination.

Subproblem 1

Given the timetables of trolleybus arrival, find an algorithm to optimize the traffic from station **Ștefan cel Mare** to station **Circul**. Visualize the data output of your solution.

Solution

The main idea of the solution is to read all the data first in the form of a dict containing stations as names and trolleybus timetable as values. This timetabel being itself a dictwith the trolleybus number as key and the values being a list of time calculated in minutes with time 00:00 being considered 0 minute.

After reading the data we put the times at which arrive each trolleybus for the station Stefan cel Mare in the same list and calculate the gap between arriving of trolleybuses. After this we obtain a n-1 gaps between trolleybuses n being the number of times in this list. Then we calculate a coef that is formed by adding the „e''-s to the power of each gap.

After calcualting this first coeficient we shift one trolleybus left 1 minute and calculate again the coef. And we do it until this coef is becoming smaller. If it starts to become bigger we memorise the number of shifts and the last coef. Then we do the same in the oposite direction. At the end we verify what side is better and save the number of shifts and the new timetable. Then we poside to the next trolleybus.

Subproblem 2

Given the timetables of trolleybus arrival, find an algorithm to optimize the traffic among all given stations.

Solution. Basically we call the same functions as in first subproblem, the logic is the same but for every station.

Subproblem 3

Given the passenger traffic load between two stations (written in the parentheses), find an algorithm to determine the number of trolleybuses of each type needed to satisfy the law obedient citizens' needs that use the public transportation. For example, how many trolleybuses of number 3 are needed to completely consume the load? If there isn't sufficient data, what would you need more to take into consideration?

PS: Consider that there can be max 70 people in a trolleybus.

Solution

First we created a file containig the graph of the passanger load in order to work with it. Then we calculate max route nr per station. Then for each number of routes per station we determine the stations that we should work with and then the number of trolleybuses for each route that we need. The calculation of nr of trolleybuses is made by finding the needed number of people for the working station. And then dividing it by max nr of people in trolleybus.

If we have 1 route of trolleybus for station then all trolleybus go to this route. If we have more then 1 then we divide it by number of trolleybuses and aproximate it to ceil for first one and to floor for others. This nr of trolleybuses will be added to the main dict of trolleybus and nr of trolleybuses. After finding needed nr of trolleybuses we substract the max number of people for each route containing this trolleybuses until we reach 0. And then we purside to next station until we process them all. In the end we obtain the number of trolleybuses for each station and we output the workign graph to see how that nr of people are 0 for each station.