Projeto 1

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1 Introduction

The problem that will be solved in this project is a generalization of the TSP (traveling salesman problem) named mTSP (multiple traveling salesman problem).

2 Constructive Heuristic

Our heuristic method checks for the nearest neighbor city for each travelling salesman, it firstly runs a single time for each salesman setting all of them to begin at the first city on the list and finding the nearest city of each without repeating them, after that it runs for each salesman's until it travel through each city or it visits his max number of cities, the maximum number of cities for each salesman is calculated by doing: (number of cities + number of travelling salesman's) / number of travelling salesman's and the final value is rounded down. Because the value is rounded down it has the possibility of leaving unvisited cities, that it's solved by checking if it has remaining cities

and checking which one of the saleman's is closer to this city.

3 Computational experiments

All computational experiments where made in the school using a Mac CPU with Apple M1, 16 GB Ram, and the Heuristic method was implemented in Python 3.9.6 in Visual Studio Code 1.85.2.

3.1 Test Instances

The test instances are 9 files instances provided by the teacher, that vary in number of cities these being: 13, 17, 19, 31, 47, 59, 71, 83, 91, and varying the number of salesman being respectively: 1, 1, 1, 3, 3, 3, 5, 5, 5. and the distances are also provided inside the files.

3.2 Results

This table resumes the results of each instance based on the best value possible (BV) and the value we got (V), and also showing the Number of Cities Number of Travelling Salesman's.

Instance Name	N_{Cities}	TS	BV	V
mTSP-n13-m1	13	1	3071	3243
mTSP-n17-m1	17	1	3948	4895
mTSP-n19-m1	19	1	4218	4514
mTSP-n31-m3	31	3	5841	6905
mTSP-n47-m3	47	3	6477	8760
mTSP-n59-m3	59	3	6786	8153
mTSP-n71-m5	71	5	8618	11707
mTSP-n83-m5	83	5	9246	10666
mTSP-n91-m5	91	5	9586	13534

As we can see, the gap between the Best Value and the Value we got, gets bigger the more cities and more salesman's are provided.