

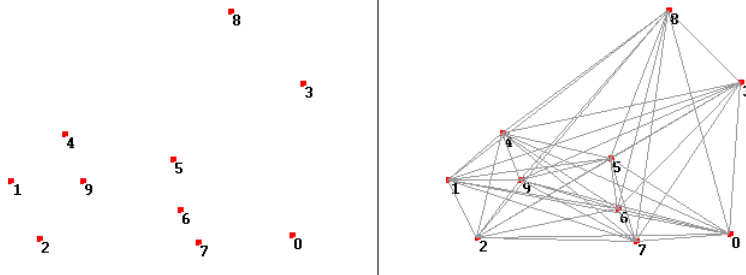
TP Metaheuristic 2023

Traveling Salesman Problem

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1 Problem Definition

Given a set of n cities (all interconnected), the goal is to find the shortest Hamiltonian circuit that visits them all. For the length of the circuit we will use the Euclidean distance.



2 Data format

In fact (for this study), cities are points in the two-dimensional space and all coordinates are integer values (i.e. $\in \mathbb{N}$).

2.1 Input data

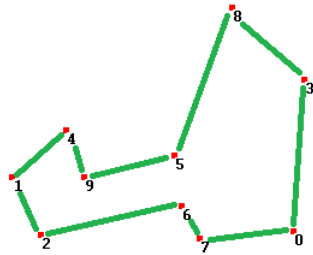
Points	x	y
0	288	273
1	54	228
2	78	276
3	297	147
4	99	189
5	189	210
6	195	252
7	210	279
8	237	87
9	114	228

```
cmd - Raccourci
C:\Users\vasquez\Desktop\VRP>type exemple.txt
10
288 273
54 228
78 276
297 147
99 189
189 210
195 252
210 279
237 87
114 228
C:\Users\vasquez\Desktop\VRP>
```

Data files do not contain the *id* of the points (*id* is implicitly the position of the (x, y) coordinates, starting from 0, in the data file). The first line gives the number n of points. The n following lines indicate their integer (x, y) coordinates values.

2.2 Output data

The solution file (*text format*) must represent n values ($\in [0, n - 1]$) separated by a space. These values correspond to a permutation of the n points.



```
cmd - Raccourci
C:\Users\vasquez\Desktop\VRP>type sol.txt
0 3 8 5 9 4 1 2 6 7
C:\Users\vasquez\Desktop\VRP>
```

$$\vec{s} = (0, 3, 8, 5, 9, 4, 1, 2, 6, 7) \text{ and } f(\vec{s}) = 803.890$$

3 Work to be done

You will experiment your algorithm on 5 instances. Your code must save the best solution found. Additionally, writing the solution file should be done every time an improvement occurs, so that one can stop it whenever desired without losing the solution.

You will need to submit the source code (C/C++ or Python) of your algorithm in text format (so that it can be compiled and run) as well as a one or two-page document describing your algorithm and containing a results table like :

Instance	size	best value	cpu time
Pb1.txt	100
...
Pb5.txt	1000

These 2 text-file documents must begin with the names of each student of the team (maximum 4 by team).

Additionally, your code will be executed on a blind instance with a CPU time limit of 60 seconds. A bonus will be awarded based on the team ranking.