FSD301: Dynamically solving the TSP

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1 Presentation

The main objective of this session is to implement Held-Karp's algorithm to solve the Traveling Salesman Problem. The lab is language agnostic, i.e., you can choose whatever programming language you prefer to implement it. Held-Karp's algorithm is a dynamic programming algorithm: it solves first small subproblems and stores their solution to reuse them.

2 Questions

1. define your own data structures to represent nodes and set of nodes, as set of nodes are needed in the algorithm. You may of course use the networkx Python library.

2. implement Held-Karp's algorithm and test it.

3. test your implementation of Held-Karp's algorithm on several problem contained in the `tspXX.txt` files.

   The first line in `tspXX.txt` gives you the number of cities in the problem. Each following line represents the coordinates of a city. A Python script `reader_students.py` is available to help you understand how to extract the vertices from the files.

   Here are the results you should obtain if you print the floored length of the total path computed by the algorithm (the execution time comes from a Python implementation...):

# of cities	length of tour	execution time
5	8387	0.64s
10	12349	0.77s
15	19269	4.694s
20	23328	4min 5s
25	26442	more than 2.5h...

   Hint: for larger problems (20 or more vertices), sets of nodes can be represented by integers to be more efficient.

3 Documents to be uploaded

You should upload your solution in the corresponding LMS repository. Either upload a single file or an archive, but do not forget to **add your names in the file name**.