

## Lab 8: Graphs

due date: October 15

### Problem 1:

Write a program which uses the brute force approach to the traveling salesman problem, and prints out the length of the shortest round trip.

- read the edge list of a graph;
- read the edge weights of a graph;
- check all possible itineraries;
- print the sequence of nodes in the shortest itinerary;
- print the total length of the shortest itinerary.

Demonstrate your code on the “TSP” graph.

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### Problem 2:

Write a program which uses the heuristic approach to the traveling salesman problem. The program should make  $K$  attempts. On each attempt, it should pick a starting city at random, then repeatedly move to the closest unvisited city, until all cities have been visited and the tour returns home. Keep track of the shortest tour discovered in the  $K$  attempts, and when done, print out the corresponding list of cities you visited.

- read the distance matrix of a graph;
- read the value  $K$ ;
- carry out the heuristic  $K$  times;
- print the total length of the shortest itinerary you found.

Demonstrate your code on the “KN57” graph (57 cities!) using  $K=20$  attempts.

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### DATA FILES

The following files will be of use to you:

- **kn57\_distance\_matrix.txt**, the distance matrix for the “KN57” graph;
- **next\_perm.m**, computes the next permutation;
- **rand\_int2.m**, returns a random integer between  $I1$  and  $I2$ ;
- **rand\_perm.m**, returns a random permutation;
- **tsp\_edges.txt**, the edge list for the “TSP” graph;
- **tsp\_edge\_weights.txt**, the edge lengths for the “TSP” graph;

These files will be available from

[http://people.sc.fsu.edu/~jburkardt/data/graph\\_representation/graph\\_representation.html](http://people.sc.fsu.edu/~jburkardt/data/graph_representation/graph_representation.html)

or

<http://www.peterbeerli.com/classdata/ISC4221/graphics>