

CPT_S 580 Project

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Topic: *A heuristic algorithm for Traveling Salesman Problem (TSP)*

1. The Implementation of the Algorithm

The Algorithm I used to solve TSP is called *Double the Tree*.

The implementation process is that:

- i. Firstly, computes the minimum spanning tree T of the input graph
- ii. And then constructs the Eulerian graph $H = 2T$ by doubling each edge of T .
- iii. Constructs A Eulerian tour of H . That tour is also a tour in G .
- iv. Lastly, obtain a Hamiltonian cycle by shortcutting the tour.

2. Result

Input: the adjacent matrix of input graph.

Output: The sequence of the TSP tour computed by the algorithm and the total cost.

Exercise 6.4.2

a -> d -> e -> c -> b -> a

The total cost: 15

Exercise 6.4.3

a -> d -> c -> e -> b -> a

The total cost: 29

Exercise 6.4.4

a -> c -> e -> d -> b -> f -> a

The total cost: 36

Exercise 6.4.5

a -> f -> e -> b -> c -> d -> a

The total cost: 35

3. Answer to Questions

- 1) For graphs 6.4.2. and 6.4.3, find the optimal cost of a Hamiltonian cycle by exhaustively trying out all possibilities. Did your implementation of Algo. 6.4.2 find the actual optimal cycles for these two graphs?

The optimal cost I found for 6.4.2 is 15 and the optimal cost I found for 6.4.3 is 29, which are the same values as the results computed by my implementation of Algo. 6.4.2.

- 2) Is the found value within the multiplicative factor of 2 from the optimal cost?

Yes, because both graph 6.4.2 and 6.4.3 obey the triangle inequality.