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Nearest neighbour algorithm

From Wikipedia, the free encyclopedia

This article is about an approximation algorithm to solve the travelling salesman problem. For other uses, see Nearest neighbor.

The **nearest neighbour algorithm** was one of the first algorithms used to determine a solution to the travelling salesman problem. In it, the salesman starts at a random city and repeatedly visits the nearest city until all have been visited. It quickly yields a short tour, but usually not the optimal one.

Below is the application of nearest neighbour algorithm on TSP

These are the steps of the algorithm:

1. start on an arbitrary vertex as current vertex.
2. find out the shortest edge connecting current vertex and an unvisited vertex V.
3. set current vertex to V.
4. mark V as visited.
5. if all the vertices in domain are visited, then terminate.
6. Go to step 2.

The sequence of the visited vertices is the output of the algorithm.

The nearest neighbour algorithm is easy to implement and executes quickly, but it can sometimes miss shorter routes which are easily noticed with human insight, due to its "greedy" nature. As a general guide, if the last few stages of the tour are comparable in length to the first stages, then the tour is reasonable; if they are much greater, then it is likely that there are much better tours. Another check is to use an algorithm such as the lower bound algorithm to estimate if this tour is good enough.

In the worst case, the algorithm results in a tour that is much longer than the optimal tour. To be precise, for every constant **r** there is an instance of the traveling salesman problem such that the length of the tour computed by the nearest neighbour algorithm is greater than **r** times the length of the optimal tour. Moreover, for each number of cities there is an assignment of distances between the cities for which the nearest neighbor heuristic produces the **unique worst possible tour**.[1]

The nearest neighbour algorithm may not find a feasible tour at all, even when one exists.

Notes [edit]

1. ^ G. Gutin, A. Yeo and A. Zverovich, 2002

See also [edit]

- K-nearest neighbor algorithm

References [edit]

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Categories: Travelling salesman problem | Approximation algorithms | Heuristic algorithms | Graph algorithms