Group no: 16
CS6380: Artificial Intelligence (Assignment 3)
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1. Problem Statement

Implementation of Traveling Salesman Problem using different algorithms like nearest neighbour,greedy heuristic and savings heurisitc and compare their results.

2. Description

Traveling Salesman Problem: The traveling salesman problem consists of a salesman and a set of cities. The salesman has to visit each one of the cities starting from a certain one and returning to the same city. The challenge of the problem is that the traveling salesman wants to minimize the total length of the trip and find the optimal route.

2.1. Nearest Neighbor

This is perhaps the simplest and most straightfor-ward TSP heuristic. The key to this algorithm is toalways visit the nearest city.

Nearest Neighbor, O(n 2)
1. Select a random city.
2. Find the nearest unvisited city and go there.
3. Are there any unvisitied cities left? If yes,
repeat step 2.
4. Return to the first city.

2.2. Greedy

The Greedy heuristic gradually constructs a tour by repeatedly selecting the shortest edge which adds to the tour as long as it doesn’t create a cycle with > N edges, or increases the degree of any node > 2. We must not add the same edge twice.

Greedy, O(n 2 log 2 (n))
1. Sort all edges.
2. Select the shortest edge and add it to our
tour if it doesn’t violate any of the above con-
straints.
3. Do we have N edges in our tour? If no, repeat
step 2.

2.3. Savings Heuristic

We used Clarke and Wright Savings Heuristic.
1. Form subtours i-0-i for i=1,2,...,n. (Each customer is visited by a separate vehicle)
2. Compute savings Sij=c0i + c0j - cij for all i,j
3. Identify the node pair (i,j) that gives the highest saving Sij
4. Form a new subtour by connecting (i,j) and deleting arcs (i,0) and (0, j) if the following conditions are satisfied
    a) both node i and node j have to be directly accessible from node 0
    b) node i and node j are not in the same tour.
    c) forming the new subtour does not violate any of the constraints associated with the vehicles.
5. Set Sij=-infinity, which means that this node pair is processed. Go to Step 3, unless all node pairs with Sij 0 are processed.

3. Result

TSP tours have been generated for all three algorithms and showed graphically and also compared thier results using the cost of tours.