

TSP using Simulated Annealing

As a part of this assignment we implemented the Traveling Salesman problem using Simulated Annealing.

Procedure :

First we start off by taking a random tour and compute the cost of the tour. Then we randomly choose a pair of indices and swap the values of the indices which are present in between them. Then we calculate the cost of this new tour. If the cost of this tour is better than the current solution then this tour is accepted. And if it is less then it is accepted sometimes and the acceptance probability is dependent on the temperature. This above statement is one of the key steps in Simulated Annealing, it helps to come out of the local maxima once in a while with a low probability which makes SA stand out compared with Hill Climbing.

FACTORS AFFECTING THE COOLING SCHEDULE :

1. STARTING TEMPERATURE :

The temperature drives the search in this problem. The temperature measure represents how random the changes are being made to the path. The starting temperature must be high enough such that the algorithm is allowed to move to any energy state. If we do not do this the ending solution does not differ much from the starting solution. However, too high starting temperatures may lead the search into purely random fashion, so we need to find an optimal value for the temperature based on some results. Initially the temperature is high and large random changes are made and as the temperature falls gradually, only paths with small changes in cost will be accepted.

2. TEMPERATURE DECREMENT :

We should find a rate for temperature decrement at each stage of the algorithm. We In each iteration the temperature falls by a DROP_FACTOR which is close to 1 in general.

3. NUMBER OF ITERATIONS :

The number of iterations at each step play a major role in the success of the Simulated Annealing algorithm. At lower temperatures we need to do more iterations to fully explore that particular local minima and at higher temperatures the iterations can be less.

In this particular version we used a temperature of 10^9 and a cooling factor of 0.999.