

CS312: Lab-4

By: Mayank Mittal (190030026)

Ayush Gupta (190030007)

Traveling Salesman Problem:

In this problem, we have to start from a city and come back to the same city while visiting every other city exactly once. We have to minimize the total cost of the travel where the cost is the value associated from one city to another (cost taken to travel from one city to another).

This is a famous NP-Hard problem.

So, in order to solve this problem in the given time, we will use the Genetic Algorithm.

Steps involved:

- 1) We first create some random possible tours and store them.
- 2) We do some crossovers and mutation in those population members
- 3) We take the best among them and compare whether the answer improved or not.
- 4) We then add some random members to the population to see if it minimizes the tour or not.
- 5) We then maintain only best N of these and repeat the above steps

Crossover Technique:

We have used the Partially Mixed Crossover Technique. In this technique, we take a random range. The permutation from this random range in the first parent is added to the end of the second child and vice-versa.

Mutation Technique:

We take a random range and then reverse the order of the cities in that random range.

Simulation:

In our code, we maintain the clock and the simulation ends when the time reaches 300 seconds. In that time, it performs the iteration over and over to reach the most optimal answer.

In order to improve the answers, I tried to use other mutation techniques where I rotated the cities in the random range. However, these didn't give better results. I also tried with different values of *mutation_count* and *random_insertion_count* in order to find which values would run more number of simulations as well as take more variety in their population. I also take the random range from the top half to increase the chances of better results.

As we observe the cost in the output.txt file, the cost decreases exponentially and converges to a constant value.