

Group no: 31

CS6380: Artificial Intelligence (Assignment 3)

Chiranjeevi N (CS17M063)

Rajib Das Bhagat (CS17M034)

1. Problem Statement

Implementation of **Traveling Salesman Problem** using **Genetic Algorithm**.

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.

Genetic Algorithm: The genetic algorithm is a method for solving optimization problems which is based on natural selection. The genetic algorithm is applied to solve a variety of optimization problems which are not well suited for standard optimization algorithm.

3. Algorithm

The implementation of traveling salesman problem using genetic algorithm requires a sequence operations that repeats in generations loop.

i. Initial population.

Random population is generated. Each entity in a population is known as chromosomes.

ii. Find fitness.

For each chromosomes in a population, fitness function is calculated. Fitness function chosen as the inverse of sum of total cost from initial node to all the nodes visited and back to initial node.

iii. Selection.

From all the fitness function calculated above, the chromosomes containing the best two fitness function is selected as parents.

iv. Crossover.

Now, fitness function is used to find the best individual fitness to be chosen for crossover, among the chromosomes using tournament selection method. Children were created accordingly.

v. Mutation.

Analogies to one-point mutation, three-point mutation was performed. Three of randomly nodes were selected from parent1 and parent2. The nodes selected from parent1 was removed from parents2 and appended accordingly, and vice-versa. Fitness was calculated and the steps were repeated for certain number of times i.e generations.

4. Learning Outcome

Traveling salesman problem was known earlier using dynamic algorithm. The time complexity was dynamically unbounded. Here, in this assignment implementing the common problem and that too along with genetic algorithm gave us the insight details for all the basic steps required.

5. Bugs

Indeed their is a small bug. This do not harm the implementation process. The number of nodes in the graph is always less one.

Such as, if I give number of nodes = 10. And, click "Generate Tsp". The number of nodes visible is 9 and not 10. This 10th node seems like to be an invisible node. If I click "Start", edges are visible to that particular invisible node.