CS312 - Artificial Intelligence Lab
Assignment 3

Group 10

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Introduction

In this task, with a given a set of cities (coordinates) and distances between them, find the best (shortest) tour given that visiting all cities exactly once and returning to the origin city in a given amount of time had to be found. It encloses the concept of Travelling Salesman Problem.

Methodology

We have used Ant Colony Optimization for solving TSP in initial stages of our problem solving further we have tried to improve it with Genetic Algorithm. In further stages we have tried to keep track of **at most** 10 best tours and then applied genetic algorithm to it, for crossovers we have used heuristic crossover method with adjacency representation.

Observations

- We were able to observe that for ant colony optimization changing its parameters were causing it give different solutions, we have tried to keep the parameters as optimized as possible so that we can get best possible optimized tour.
- We were also able to observe that genetic algo was not able to find better solutions than ant colony opt, which means if we apply only ant colony opt, we would have gotten the same results.

Outputs and Inference

We tweaked the values of the given below parameters and found the most optimized combination, which is mentioned below.

α: 4

β: 3

Q: 100

ρ: 0.1

The following are the definitions to the parameters:

• α determines the contribution of the pheromones in the probability of choosing the next city for the tour.

• β determines the contribution of intercity distances in the probability of choosing the next city for the tour.

• Q is a constant value that determines the update value (pheromones delta) of the pheromones.

• ρ is the pheromone evaporation constant that plays a major role in updating the pheromones after all N ants are simulated.

Outputs:

For euc_100,

Best Tour:

35 78 67 89 90 42 44 40 94 3 82 91 51 14 23 49 31 68 83 69 95 5 76 6 47 21 81 39 24 34 92 96 74 27 60 28 11 72 22 16 26 97 54 1 48 63 41 98 29 36 25 20 88 75 73 8 46 66 32 12 93 2 9 30 55 64 15 84 33 99 17 59 86 52 13 18 10 85 57 4 19 38 0 65 56 7 53 45 80 62 71 77 43 87 79 50 70 61 37 58

Tour Length: 1636.19

Time taken: 125

For noneuc_100,

Best Tour:

72 80 98 10 84 15 64 22 45 54 66 23 1 21 75 29 50 14 53 77 33 39 24 81 74 28 91 90 61 62 88 35 89 99 20 6 65 43 27 69 51 34 67 30 57 73 38 8 36 59 87 31 83 16 9 68 12 71 60 93 26 47 56 48 97 85 44 92 40 79 13 52 78 25 2 19 42 49 95 5 17 55 7 11 4 3 46 58 76 0 96 37 41 32 86 70 94 18 63 82

Tour Length: 5244.65

Time taken: 152