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Algorithm A: Genetic Algorithm

Algorithm B: Ant Colony Optimization

Description of enhancement of Algorithm A:

1. *Add a greedy based crossover method. It is to make search more specific and choose the best child.*
   This is because I discovered that the original crossover is rife with unpredictability; technically, it may provide decent results but would take much too long. The approach to enhance it is to give the algorithm more assurance. As a result, we choose greedy search to increase the degree of certainty. In the interim, the time cost will be reduced. And the result is clearly better and able to discover new route, able to find optimal solution.
2. *By utilising both the conventional crossover and the greedy-based crossover. The rationale for using both is that, while greedy-based crossover might produce good results, they are not always optimal and may overlook certain opportunities. As a result, we incorporate a normal crossover to close this gap.*
3. *Following the mutation, retain the best children in the last population to ensure the survival of the elite people. That is because mutations can wipe out the greatest generation, necessitating a restart. To prevent the issue, we choose to retain the finest.*
4. *After the Genetic algorithm, apply 2-opt to increase the performance.*

Description of enhancement of Algorithm B:

The basic goal of the algorithm is to encourage the ants to choose the path that has been demonstrated to be accurate (global best), while also learning from their experiences (local best) and thereby improve the algorithm. And the result is clearly better and able to discover new route and learn from experience, and time has been reduced much.

1. *Begin with a greedy search and set the result as the global best. This method was chosen since it produces excellent results in a short period of time.*
2. *Update the pheromone following the greedy search technique. This is to assist the initial ant group in locating a path.*
3. *Adjust the beta value based on the number of cities; this incorporates the greedy algorithm into the process of determining the next route.*
4. *Expand on the greedy algorithm concept by include a method for obtaining pheromones.*
   - *When the part of present path is a component of the optimal route, the pheromone will be left on the route; otherwise, it will do nothing.*
5. *Define the minimum and maximum pheromone concentrations. Additionally, establish a stagnation value based on the minimum and maximum pheromone concentrations. When the stagnation value falls below the tiny constant, the current pheromone is smoothed.*
6. *One strategy to establish the best pheromone is to occasionally allow ants to follow local best and occasionally to allow ants to follow global best. As a result, ants may benefit from history and have an excellent model to follow. Ants can locate the path much more easily and quickly.*