

Ant Colony Optimization

For the first run of my implementation of ant colony optimization, the parameter values that I used were: ALPHA – 0.4, BETA – 1.0, RHO – 0.65, Q – 100. Using these parameters, my ants converged more slowly than other runs. The average tour length did end up decreasing overall, but no definite path was converged upon in 25 cycles.

On the second run the parameter values that I used were: ALPHA – 1.0, BETA – 0.4, RHO – 0.65, Q – 100. Using these parameters, my ants converged fairly quickly. By iteration 15 the majority of my ants were taking a tour of length 1340. By the end of iteration 25, all of my ants were taking the same 1340 path.

For the third run the parameter values that I used were: ALPHA – 1.0, BETA – 1.0, RHO – 0.65, Q – 100. Using these parameters, my ants converged slightly slower than the second run but more quickly than the first. My ants converged on a worse path than the second, with the majority of ants settling for a tour length of 1785 by iteration 18.

Run four saw the following parameters used: ALPHA – 1.0, BETA – 1.0, RHO – 0.4, Q – 100. With these parameters, my ants converged more slowly than in the third run and on a worse path. By iteration 20, the majority of my ants were choosing a tour of length 2260.

On run five, the following parameters were used: ALPHA – 0.4, BETA – 1.0, RHO – 0.65, Q – 100. Using these parameters my ants converged fairly quickly but on a poor path. By iteration 8 the majority of my ants were choosing a tour of length 2290.

When comparing ant colony optimization with A*, the two algorithms found different solutions. Although some of my ants found the optimal 1255 path in ACO, the path was never converged upon. However, with A*, the optimal path was always found. They found different solutions because in ant colony optimization, the paths chosen are still based on a probability. Even if an edge is better than another edge, the ant might not take the best edge since it is still up to chance. A* seemed more efficient for this problem. During all of my ACO runs, I elected to evaporate pheromone first.

When choosing between using A* versus using ant colony optimization, there are several factors to consider. If we know information about all of the nodes and edges in the graph, A* is optimal as it is guaranteed to find the shortest path. However, ACO is great at finding solutions to problems where not a whole lot is known about the environment that the algorithm is operating in.