

Ant colony optimization

Assignment 03 – report by Frédéric Charon

In this assignment we get familiar to swarm intelligence by implementing an ant colony optimization algorithm. The goal is to create a pheromone matrix, let several ants randomly find a way through a given graph and then visualize the resulting pheromones.

First, we get the given graph containing 30 nodes (from node 0 to node 29) and edges in between them. Then, we create a pheromone matrix, where we store a value of pheromones for each of these edges. Since we haven't any ants walked through the graph yet, we set each value to 0.

The next step is to implement the function for the ant to find it's way through the graph. The ant starts at node 0 and at each node, we check the connecting edges, chose one at random and add an amount of pheromone in the corresponding entry into the pheromone matrix. The amount depends on the weight of that edge, the higher the weight, the lower the amount of pheromone. We continue this procedure until the ant reaches the node 29. Finally, we return the way through the nodes the ant has chosen.

In the last function we visualize the graph by showing the pheromone values. We also show the shortest path using the Dijkstra algorithm, in this example the shortest path is shown by the nodes colored in yellow. For the pheromones the edges are painted orange, if the corresponding amount of pheromone reaches a certain value (here: 100) and red, if it reaches a very high value (here: 500), the remaining edges are painted grey.

Finally, we let 1000 ants walk through the graph, print their paths, print the pheromone Matrix and visualize the results with a graph.