Swarm Intelligence Course

Practical Exercises - ACOTSP

The goal of these practice exercises is to improve the knowledge about ACO algorithms using the software ACOTSP.V1.0. The code can be download from www.http://iridia.ulb.ac.be/ mdorigo/ACO/aco-code/public-software.html. To compile you have to use 'make' and '–help' gives you the running options.

1 Exercises

The numeric parameters in the following exercises, except when indicated differently, are the set of the following values: $\alpha = 1$, $\beta = 3\text{-}5$, $\rho = 0.5$ number of ants $m = 20$, number of runs = 10. Note that, to be sure that no local search has been used include 'l0'

- Exercise 1.2 Ants are able to find shorter paths by *stigmergy*, that is, indirect communication mediated by modifications of the environment. For the problem instance d198.tsp and att532.tsp, show that cooperation improves the probability of finding quickly better solutions. The obtained results by using the MMAS algorithm, the MMAS algorithm without heuristic function and MMAS algorithm without pheromone procedure can help you to compare the performance of the cooperative and non cooperative approach.

- Exercise 1.3 Compare the results obtained by using AS, ACS and MMAS algorithms for instances att532.tsp and d198.tsp. Run each algorithm 10 times, for each instance.

- Exercise 1.4 Using the parameter settings of $m = 2$, $m = 6$, $m = 10$, $m = 25$, $m = 50$ and $m = 100$ show if the number of ants has influence on the MMAS obtained results (solution quality and computation time) for the problem instance att532.tsp and d198.tsp.

- Exercise 1.6 For ACS Algorithm. Use a profiler to identify how much computation time is taken by different procedures as solution construction and pheromone evaporation.
  What are the most expensive parts?

- Exercise 1.7 Compare the performance of the ACS algorithm with and without the candidate list.
  Most of the successful ACO algorithms apply 'candidate lists' to test the available neighbours according to some heuristic criterion and choose from them only a specific number of best-rated ones. In ACOTSP code the number of the best neighboors to be chosen is given by setting the option '–nnants'

– Exercise 1.8 Compare the performance of the ACS algorithm without and with local search (3-opt local search).