Boğaziçi University

CMPE 548 MONTE CARLO METHODS

TERM PROJECT PROPOSAL

Improving Monte Carlo Methods with Ant Colony Optimization

Gözde Berk

Alptekin Orbay

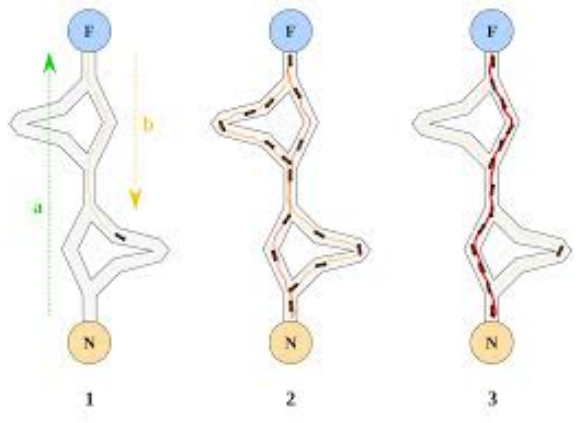
Gizem Esra Ünlü

Dec 4, 2017

1 Proposal

In 1991, *ant system* algorithm was first proposed by Dorigo et al. to solve combinatorial optimization problems under the umbrella of swarm intelligence methods that are inspired from the social behaviors of insects and animals, in this case ants.[1] Each ant in the ant colony tends to follow the best path between the nest and the target place. The most favorable paths to food sources are the ones that are mostly marked by *pheromones* deposited by ants. It was first applied to the traveling salesman problem. Then, it was extended to other combinatorial problems.

Each ant samples the possible paths to the target destination. After a while, the paths are also weighted by the pheromones accumulated on the ground. The behavior of the ants is modeled via parametrization and used to calculate the probability. So, we are going to apply it to traveling salesman problem due to the stochastic decision making mechanism of ants while choosing the next city to visit whose probability is affected by the amount of the pheromones present. On the other hand, each ant symbolizes a particle. Therefore, *Ant Colony Optimization* is a solution for *Particle Filter* impoverishment problem.[2]



(a) The image is reprinted from [a]

[a]Toksari M., A hybrid algorithm of Ant Colony Optimization (ACO) and Iterated Local Search (ILS) for estimating electricity domestic consumption: Case of Turkey

2 References

[1] Dorigo M., Brittari M., Stutzle T. (2006), Ant Colony Optimization, *IEEE Computational Intelligence Magazine*, Nov, 2006.

[2] Zhong J, Fung Y. and Dai M. (2010), A Biologically Inspired Improvement Strategy for Particle Filter: Ant Colony Optimization Assisted Particle Filter, *International Journal of Control, Automation, and Systems*, 2010.