

Nattapat Attiratanasunthron 2007: A Running Time Analysis for an Ant Colony Optimization Algorithm for Shortest Paths on Directed Acyclic Graphs. Master of Engineering (Computer Engineering), Major Field: Computer Engineering, Department of Computer Engineering. Thesis Advisor: Assistant Professor Jittat Fackcheroenphol, Ph.D. 59 pages.

In this thesis, we prove polynomial running time bounds for two Ant Colony Optimization (ACO) algorithms for two problems, *One-Max* and the single-destination shortest paths problem on directed acyclic graphs. More specifically, we extend the recent result of Neumann and Witt on *One-Max*, to the case of multiple ants by showing that our multiple-ant algorithm runs in $O(\frac{1}{\rho} n^2 \log n)$ time, where ρ is the evaporation rate and n is the number of variables. This result stands in sharp contrast with that of Neumann and Witt, where a single-ant algorithm is shown to require an exponential running time if $\rho = O(n^{-1-\epsilon})$ for any $\epsilon > 0$. For shortest path problem on a DAG, we show that an ACO-based algorithm runs in $O(\frac{1}{\rho} n^2 m \log n)$ time for DAG with n nodes and m edges. We believe that this is the first running time analysis of an ACO-based algorithm on a practical problem. We also propose a new notion of convergence, called greedy convergence.

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Student's signature



Thesis Advisor's signature

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