

## New approaches to evaporation in ant colony optimization algorithms

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### Abstract

In Ant Colony Algorithms (ACA), artificial ants construct a solution by building a path on a construction graph. The ants behavior is specified by defining start states, construction rules, transition rules, pheromone update rules and evaporation mechanisms. In this paper we introduce new approaches, based on the generation function and geometrical, algebraic explanation of the convergence, for deriving the evaporation mechanisms in Ant Colony Optimization algorithms.

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*Keywords and phrases* : Ant colony optimization, ant colony algorithms, generation function, evaporation, velocity of evaporation, geometrical-algebraic convergence.

### 1. Introduction

Ant Colony Optimization (ACO) meta-heuristics have proved to be remarkably successful in solving a range of discrete optimization problems. ACO algorithms have been applied to an increasingly wide range of problems, including the Traveling Salesman Problem (TSP) [1], Vehicle Routing Problem (VRP) [2], Quadratic Assignment Problem (QAP) [3], bus driver scheduling [4], network routing [5], sequential ordering [6] and graph colouring [7].

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*Journal of Interdisciplinary Mathematics*

Vol. 9 (2006), No. 1, pp. 179–184

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