

# Development of an automatically configurable ant colony optimization framework. State of art.

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## Abstract

Some animal species show an extreme degree of social organization. Such species (e.g. ants) have pheromone production and detection body parts and therefore seize an ability to communicate between each other in indirect way. This concept has inspired the development of algorithms which are based on social behavior of population called ant colony optimization algorithms (ACO). These algorithms allow to solve NP-hard problems in a very efficient manner. Since these algorithms are considered metaheuristic the development of a ACO framework is the next step of formalizing of this area is to provide tools for resolving general optimization problems. This article gives the brief overview of the current ACO research area state, existing framework description and some tools which can be used for the framework automatic configuration.

## 1 Introduction

Section descriptions. Heuristic information. Pheromones.

## 2 Combinatorial Optimization Problems and Constructive Heuristics

Combinatorial Optimization Problem is a tuple  $(\phi, \omega, f)$ .



## **3 The ACO Algorithmic Framework**

- 3.1 Choice of pheromone trails and heuristic information**
- 3.2 Solution construction**
- 3.3 Global pheromone update**
- 3.4 Pheromone update schedule**
- 3.5 Initialization of pheromones**
- 3.6 Pheromone reinitialization**
- 3.7 Local pheromone update**
- 3.8 Pheromone limits**
- 3.9 Local search**
- 3.10 ACO algorithms as instantiations of the ACO Meta-heuristic**

## **4 ACOTSP/ACOQAP: A unified framework of ACO algorithms for the TSP and QAP**

- 4.1 Finding a better ACO configuration for the TSP**
- 4.2 Finding a better ACO configuration for the QAP**

## **5 Applications of ACO to other problem types**

- 5.1 Continuous Optimization Problems**
- 5.2 Multi-objective problems**
- 5.3 Dynamic problems**
- 5.4 Stochastic problems**

## **6 ACO in combination<sup>6</sup> with other methods**

- 6.1 ACO and tree search methods**
- 6.2 ACO and exact methods**
- 6.3 ACO and surrogate models**