

MIS40530 Reading Assignment

Ant Colony Optimization: A New Meta-Heuristic

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Introduction and Context

The paper has two main aims:

- ① Provide an overview of ant colony optimisation as a field and detail current research trends
- ② Introduce the *Ant Colony Optimization* (ACO) meta-heuristic

Gap and Research Aim

- No clear gap is identified.
- The authors hope that the ACO meta-heuristic can be used to characterise ant colony algorithms and thus aid future research.

Methodology

- 1 The parameters governing a generalised problem and solution are defined
- 2 A set of rules are defined, governing the behaviour of the ants
- 3 An implementation is provided, in pseudocode, of the ACO meta-heuristic

Results

As a proof-of-concept, details are given on the application of the ACO meta-heuristic to some discrete optimisation problems:

- The traveling salesman problem
- The problem of routing in communications networks

The success (of others) in using ant colony algorithms to solve discrete optimisation problems is presented:

- Fast (comparable in speed to other state-of-the-art methods)
 - ▶ The traveling salesman problem
 - ▶ The quadratic assignment problem
 - ▶ The sequential ordering problem
- Slower than other methods
 - ▶ The job scheduling problem (slower than other methods)

Analysis and Significance

- No quantitative results are presented
- The application examples show qualitatively that the ACO meta-heuristic can be applied to various problems

Significance

- The paper was published in conference proceedings
- It has 348 citations to date (IEEE Xplore)
- A more thorough paper was published in the same year in the the journal “Artificial Life”, which has 3135 citations to date on Google Scholar

Conclusion

- The paper was concise and well written
- The examples highlight the application of the algorithm
- The effectiveness of ant optimisation methods by others cannot be seen as an endorsement of the ACO meta-heuristic
- The level of citations indicate that the heuristic did prove to be of use in categorising ant colony algorithms