

Heterogeneous ant colony optimization based on adaptive interactive learning and non-zero-sum game

Jingwen Meng

Shanghai University of Engineering Science

Xiaoming You (✉ yxm6301@163.com)

Shanghai University of Engineering Science

Sheng Liu

Shanghai University of Engineering Science

Research Article

Keywords: Ant colony algorithm, Adaptive interactive learning, Elite information exchange, Non-zero-sum game, TSP

Posted Date: June 28th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-533743/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Ant colony optimization (ACO) is prone to get into the local optimum and has a slow convergence speed when it is applied to the Travelling Salesman Problem (TSP). Therefore, for overcoming the drawbacks of ACO, a heterogeneous ant colony optimization based on adaptive interactive learning and non-zero-sum game is proposed. Firstly, three subpopulations with different characteristics are constructed into heterogeneous ant colony to enhance the performance of the ant colony. Secondly, the adaptive interactive learning mechanism is adopted when the algorithm diversity decreases, in which the objects to be communicated are selected adaptively according to the population similarity. In this mechanism, the way of communication is to pair the inferior individuals with the superior individuals, which enlarges the searching range and speeds up the convergence speed. Finally, an elite information exchange strategy based on non-zero-sum game is adopted when the algorithm falls into local optimum, in which each subpopulation selects the partners for elite information exchange according to the normalized comprehensive evaluation operator, which is helpful for each subpopulation to select the most appropriate strategy for getting out of the local optimal. Through this model, the accuracy of the solution is further improved. The data that used for this experiment is from the TSPLIB library under MATLAB simulation with various ranges of TSP datasets. Experimental results indicate that the proposed algorithm has a higher quality solution and faster convergence speed in solving the traveling salesman problem.

Full Text

This preprint is available for [download as a PDF](#).