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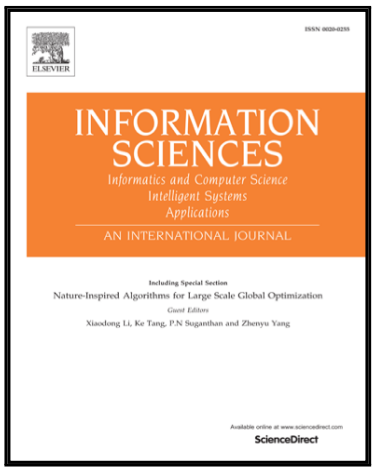

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Hybrid Discrete Artificial Bee Colony Algorithm with Threshold Acceptance Criterion for Traveling Salesman Problem

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Abstract

Artificial bee colony (ABC) algorithm, which has explicit strategies to balance intensification and diversification, is a smart swarm intelligence algorithm and was first proposed for continuous optimization problems. In this paper, a hybrid discrete ABC algorithm, which uses acceptance criterion of threshold accepting method, is proposed for Traveling Salesman Problem (TSP). A new solution updating equation, which can learn both from other bees and from features of problem at hand, is designed for the TSP. Aiming to enhance its ability to escape from premature convergence, employed bees and onlooker bees use threshold acceptance criterion to decide whether or not to accept newly produced solutions. Systematic experiments were performed to show the advantage of the new solution updating equation, to verify the necessity of using non-greedy acceptance strategy for keeping sufficient diversity, to compare different selection schemes for onlooker bees, and to analyze the contribution of scout bee. Comparison experiments performed on a wide range of benchmark TSP instances have shown that the proposed algorithm is better than other ABC-based algorithms and is better than or competitive with many other state-of-the-art algorithms.

Keywords: Artificial bee colony algorithm, Traveling salesman problem,

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