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ACCEPTED MANUSCRIPT

A hybrid of Ant Colony and firefly algorithms (HAFA) for solving vehicle routing problems

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The main highlights of the paper entitled "A hybrid of Ant Colony and firefly algorithms (HAFA) for solving vehicle routing problems" are as follows:

- A new hybrid of ant colony system and firefly algorithm has been developed to solve vehicle routing problems.
- New firefly encoding scheme and distance measurement technique has been presented to represent solution space as the firefly population.
- A novel pheromone shaking procedure has been proposed as an alternative to local search to avoid local optima.
- The proposed approach provides better results than other existing firefly based approaches for solving vehicle routing problems.

Abstract. Vehicle routing problem is a classical NP-hard optimization problem. In the present study, we developed a hybrid algorithm namely HAFA, which incorporates certain aspects of firefly optimization (FA) and ant colony system (ACS) algorithms for solving a class of vehicle routing problems. ACS provides the basic framework to our proposed algorithm and FA has been used to search for the unexplored solution space. Furthermore, pheromone shaking process has been used in ACS to escape from local optima by avoiding pheromone stagnation on the exploited regions. The performance of proposed algorithm is compared with some of other existing meta-heuristic approaches by testing on certain standard benchmark datasets. Results shows that the proposed approach is able to find near optimal solutions with faster convergence rate as compared to other existing meta-heuristics. Furthermore, the consistency of our algorithm in finding the optimal solutions has been shown by comparing the standard deviations with other algorithms. Finally, the results demonstrate the superiority of proposed approach over other existing FA based approaches for solving such type of discrete optimization problems.

Keywords: Meta-heuristics, Ant colony optimization, Firefly optimization, vehicle routing problems

1. Introduction

It is now well recognized that an optimized routing plan can make a huge difference in the cost of transportation of goods from warehouses to distribution centers. As a result, routing and scheduling of vehicles has aroused interest among the researchers working in this field. The very first work in this area was the formulation of capacited vehicle routing problem (CVRP) proposed

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