ABSTRACT

This research presents a generalized version of the vehicle routing problem which includes the additional practical aspects of multiple-role location and many requests at locations. Other practical considerations are also taken into account such as time constraints, different characteristics of vehicles, and multi-depot. The objective is to provide a near-optimal solution method for the specified vehicle routing problem.

The problem is introduced with the mathematical formulation that has the objectives to minimize a single aggregate objective function of cost incurs from the number of vehicles and the total traveled distance. Three algorithms are proposed based on PSO framework namely SD1, SD2, and SD3.

The potentials of the proposed algorithms are revealed by the preliminary evaluation using the pickup and delivery problems as benchmark instances. For further analysis, sets of instances are newly generated for the evaluation. From the experiments, the results show that number of location and requests significantly affect the computational efforts, and the small size swarm with long iteration provides good solutions for 100-request problems. The algorithm SD1 requires the longest computational time and seems to be the most robust in the case of half-random-half-clustered locations. SD2 requires the least computational effort, but gives inconsistent solution quality. The algorithm SD3 tends to outperform others in term of providing a good solution within reasonable time. The applicability of the algorithm for multi-objective VRP is demonstrated. In addition, the approaches shows its efficiency to solve many practical scenarios.

Keywords: Vehicle Routing Problem (VRP), Metaheuristics, Particle swarm optimization (PSO), Multi-depot, Pickup and delivery.