Physics-Inspired Optimization Algorithm for Obtaining Initial Routes of Capacitated Vehicle Routing Problem

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Capacitated vehicle routing problem (CVRP) is NP-Hard and computing exact solutions in real life situations is mostly infeasible. Therefore, heuristic methods are used as an alternative. In heuristic methods the quality of the final solution is directly related with the initial solution space. In this study, artificial physics based optimization algorithm is applied to CVRP in order to obtain the initial population pool of a heuristic method. The A, B and P group 74 test instances of Augerat et al are considered. The group average deviations of the initial solutions from best known solutions is calculated as 37.95%, 32.10% and 31.45% for A, B and P groups respectively. Then, a conventional genetic algorithm (GA) with one point crossover and one point mutation is chosen as a heuristic search algorithm and the initial solutions obtained are used for the first generation of the GA. The GA is executed 1000 generations with crossover and mutation rates as 0.9 and 0.1, respectively. For each problem, GA is executed 10 times and best output is recorded. As a result, 7.15%, 4.37% and 6.33% group average deviations are obtained after heuristic search.

Keywords: Capacitated Vehicle Routing, Heuristic Search, Physics-Inspired Optimization, Artificial-Physics Optimization, Genetic Algorithms