ANT COLONY SYSTEM ALGORITHM FOR GENERALIZED TRAPEZOIDAL FUZZY CAPACITATED VEHICLE ROUTING PROBLEM

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ABSTRACT

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Traffic congestion causes late arrivals at customers and long travel times resulting in large transport costs. Traffic congestion also can result in the travel time of the vehicle from one place to another cannot be determined precisely even though the distance travelled is the same. In this paper, fuzzy capacitated vehicle routing problem (FCVRP) or capacitated vehicle routing problem (CVRP) with travel time expressed by generalized trapezoidal fuzzy numbers is addressed. These fuzzy travel times are reduced to corresponding crisp ones using fuzzy ranking method. Then, we propose an ant colony system (ACS) algorithm with the status transition rule, global pheromone trail update and local pheromone trail update for constructing the optimal vehicle routes of the reduced problem of FCVRP. A numerical example of Bright Gas 5.5 kg distribution is demonstrated to find the optimal solution of the proposed method. Travel time are obtained basing on real data measured by an electronic system at two different times over three days. Small streets for which this data are not available are supposed to have a constant travel time. Computational results show that taking advantage on the available information on different rush hour peaks intensity, it is possible to obtain better vehicle routing.

Kata Kunci: *Capacitated Vehicle Routing Problem, Trapezoidal Fuzzy Number, Ant Colony System, Ranking Function*