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Bi-Criteria Vehicle Routing Problem for Possibility Environment

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Abstract : A multiple criteria optimization approach for the solution of the Fuzzy Vehicle Routing Problem (FVRP) is proposed. For the possibility environment the levels of movements between customers are calculated by the constructed simulation interactive algorithm. The first criterion of the bi-criteria optimization problem - minimization of the expectation of total fuzzy travel time on closed routes is constructed for the FVRP. A new, second criterion – maximization of feasibility of movement on the closed routes is constructed by the Choquet finite averaging operator. The FVRP is reduced to the bi-criteria partitioning problem for the so called “promising” routes which were selected from the all admissible closed routes. The convenient selection of the “promising” routes allows us to solve the reduced problem in the real-time computing. For the numerical solution of the bi-criteria partitioning problem the -constraint approach is used. An exact algorithm is implemented based on D. Knuth’s Dancing Links technique and the algorithm DLX. The Main objective was to present the new approach for FVRP, when there are some difficulties while moving on the roads. This approach is called FVRP for extreme conditions (FVRP-EC) on the roads. Also, the aim of this paper was to construct the solving model of the constructed FVRP. Results are illustrated on the numerical example where all Pareto-optimal solutions are found. Also, an approach for more complex model FVRP with time windows was developed. A numerical example is presented in which optimal routes are constructed for extreme conditions on the roads.

Keywords : combinatorial optimization, Fuzzy Vehicle routing problem, multiple objective programming, possibility theory
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