

Evidence Theory Based Emergency Multi-Attribute Group Decision-Making: Application in Facility Location Problem

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Abstract : It is known that, in emergency situations, multi-attribute group decision-making (MAGDM) models are characterized by insufficient objective data and a lack of time to respond to the task. Evidence theory is an effective tool for describing such incomplete information in decision-making models when the expert and his knowledge are involved in the estimations of the MAGDM parameters. We consider an emergency decision-making model, where expert assessments on humanitarian aid from distribution centers (HADC) are represented in q-rung ortho-pair fuzzy numbers, and the data structure is described within the data body theory. Based on focal probability construction and experts' evaluations, an objective function-distribution centers' selection ranking index is constructed. Our approach for solving the constructed bicriteria partitioning problem consists of two phases. In the first phase, based on the covering's matrix, we generate a matrix, the columns of which allow us to find all possible partitionings of the HADCs with the service centers. Some constraints are also taken into consideration while generating the matrix. In the second phase, based on the matrix and using our exact algorithm, we find the partitionings -allocations of the HADCs to the centers- which correspond to the Pareto-optimal solutions. For an illustration of the obtained results, a numerical example is given for the facility location-selection problem.

Keywords : emergency MAGDM, q-rung orthopair fuzzy sets, evidence theory, HADC, facility location problem, multi-objective combinatorial optimization problem, Pareto-optimal solutions

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