

## **Possibility Theory Based Multi-Attribute Decision-Making: Application in Facility Location-Selection Problem under Uncertain and Extreme Environment**

**Authors :** Bezhan Ghvaberidze

**Abstract :** A fuzzy multi-objective facility location-selection problem (FLSP) under uncertain and extreme environments based on possibility theory is developed. The model's uncertain parameters in the q-rung orthopair fuzzy values are presented and transformed in the Dempster-Shaper's belief structure environment. An objective function - distribution centers' selection ranking index as an extension of Dempster's extremal expectations under discrimination q-rung orthopair fuzzy information is constructed. Experts evaluate each humanitarian aid from distribution centers (HADC) against each of the uncertain factors. HADCs location problem is reduced to the bicriteria problem of partitioning the set of customers by the set of centers: (1) - Minimization of transportation costs; (2) - Maximization of centers' selection ranking indexes. Partitioning type constraints are also constructed. For an illustration of the obtained results, a numerical example is created from the facility location-selection problem.

**Keywords :** FLSP, multi-objective combinatorial optimization problem, evidence theory, HADC, q-rung orthopair fuzzy set, possibility theory

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