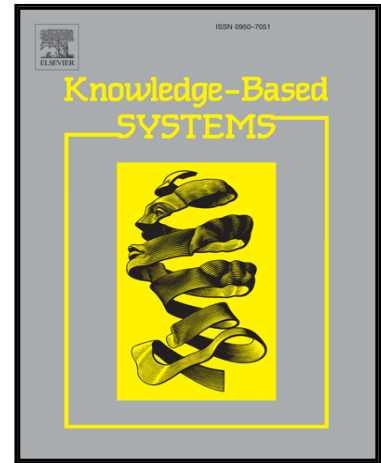


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A hesitant fuzzy mathematical programming method for hybrid multi-criteria group decision making with hesitant fuzzy truth degrees

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Abstract: This paper aims to develop a new hesitant fuzzy mathematical programming method for hybrid multi-criteria group decision making (MCGDM) with hesitant fuzzy truth degrees and incomplete criteria weight information. In this method, the types of assessment information on criteria are expressed by intuitionistic fuzzy sets, hesitant fuzzy sets, trapezoidal fuzzy numbers, intervals and real numbers, respectively. Firstly, the distances of each alternative to positive ideal solution (PIS) and negative ideal solution (NIS) are calculated. Then the hesitant fuzzy positive ideal group consistency index (HFPGCI) and hesitant fuzzy positive ideal group inconsistency index (HFPGICI), the hesitant fuzzy negative ideal group consistency index (HFNGCI) and hesitant fuzzy negative ideal group inconsistency index (HFNGICI) are defined, respectively. To derive the PIS, NIS and the criteria weights simultaneously, a new four-objective hesitant fuzzy mathematical programming model is constructed by minimizing the HFPGICI and HFNGICI as well as maximizing the HFPGCI and HFNGCI. Using the geometric-mean score functions of hesitant fuzzy sets, the four-objective programming model is transformed to a single objective program to resolve. Subsequently, the relative closeness degrees of alternatives for each decision maker (DM) are obtained and applied to derive the individual ranking order of alternatives. To generate the collective ranking order of alternatives, a multi-objective assignment model is established and converted into a single objective programming model to resolve. Thus, a new hesitant fuzzy mathematical programming method is proposed to solve hybrid MCGDM. Finally, a real example is provided to demonstrate the applicability and validity of the proposed method.

Keywords: Hesitant fuzzy set; Multi-criteria group decision making; Hesitant fuzzy mathematical

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