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TOPSIS approach to linear fractional bi-level MODM problem based on fuzzy goal programming

Abstract

The objective of this paper is to present a technique for order preference by similarity to ideal solution (TOPSIS) algorithm to linear fractional bi-level multi-objective decision-making problem. TOPSIS is used to yield most appropriate alternative from a finite set of alternatives based upon simultaneous shortest distance from positive ideal solution (PIS) and furthest distance from negative ideal solution (NIS). In the proposed approach, first, the PIS and NIS for both levels are determined and the membership functions of distance functions from PIS and NIS of both levels are formulated. Linearization technique is used in order to transform the non-linear membership functions into equivalent linear membership functions and then normalize them. A possible relaxation on decision for both levels is considered for avoiding decision deadlock. Then fuzzy goal programming models are developed to achieve compromise solution of the problem by minimizing the negative deviational variables. Distance function is used to identify the optimal compromise solution. The paper presents a hybrid model of TOPSIS and fuzzy goal programming. An illustrative numerical example is solved to clarify the proposed approach. Finally, to demonstrate the efficiency of the proposed approach, the obtained solution is compared with the solution derived from existing methods in the literature.

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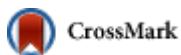
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