A study of decision process in MCDM problems with large number of criteria.


Summary: An effective decision process method is proposed to address the challenge in a multiple criteria decision-making (MCDM) problem because of large number of criteria. This method is based on the criteria reduction, tolerance relation, and prospect theory (PT). By building a discernibility matrix for tolerance relation (DMTR) in an MCDM problem with numerical values or interval numbers, this method first allows us to recognize a set of critical criteria from a large criteria pool, and ignore the other criteria. Next, it establishes the criteria weights through the DMTR as they are usually not indicated in the data. Then, the method ranks all the choices and selects the most desirable choice according to the weighted majority advantage value (WMAV). Here two risk-preference assumptions are proposed based on the PT and tolerance degree to select the WMAVs of different interval numbers with the same expectation. Using different risk-preference assumptions, we separately build WMAVs for different types of DMs. Finally, we presented two voting examples to demonstrate the applicability and effectiveness of the proposed method.

Keywords: decision process; criteria reduction; tolerance relation; prospect theory; risk preferences; weighted majority advantage value

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