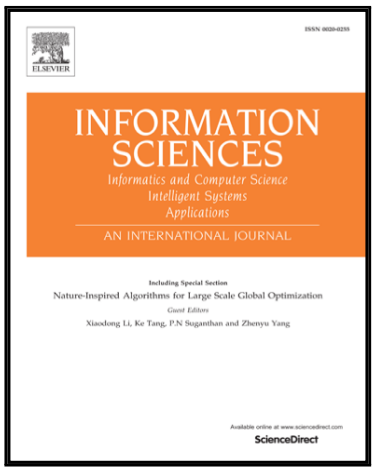

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On Operations of Possibilistic Belief Structures

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Abstract

This paper studies operations on possibilistic belief structures, which are constructed by basic possibility assignments, or equivalently, maxitive belief structures, as a framework for modeling imprecise possibility distributions. Different from Dempster-Shafer structures, it is shown that there is no one-to-one correspondence between basic possibility assignments and their induced upper and lower possibilities. The operations on the set of basic possibility assignments might not induce the operations on their upper and lower possibilities. An operation on basic possibility assignments is called proper if it is also the operation on their upper and lower possibilities. We introduce set operations and point operations on basic possibility assignments. Set operations include intersection, union, complement, difference, projection, marginalization, cylindrical extension, vacuous extension and Cartesian product operations. Point operations include all binary and unary operations. We show that all point operations are proper. For set operations, it is shown that union, projection, marginalization, cylindrical extension, vacuous extension and Cartesian product operations are proper, while intersection, complement and difference operations are not proper. In addition, we study construction of compatible possibility distributions and show that the lower possibility of a basic possibility assignment can be represented by the infinimum of compatible possibility distributions. We also show that the local computation technique can be applied to the computation problem of possibilistic belief structures.

Keywords:
Possibility distribution; Basic possibility assignment; Maxitive belief

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