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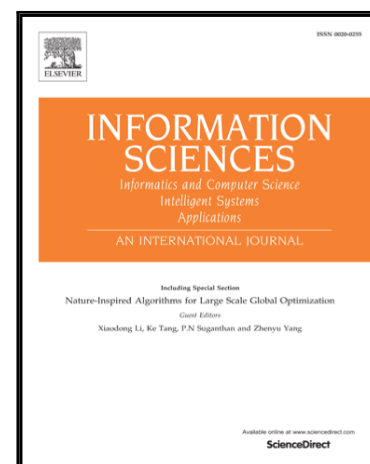
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Type Reduction Operators for Interval Type-2 Defuzzification

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Abstract

Fuzzy sets are an important approach to model uncertainty. Defuzzification maps fuzzy sets to non-fuzzy (crisp) values. Type-2 fuzzy sets model uncertainty in the degree of membership in a fuzzy set. Type-2 defuzzification maps type-2 fuzzy sets to non-fuzzy values. Type reduction maps type-2 fuzzy sets to type-1 fuzzy sets, in order to make type-2 defuzzification easier and to implement more efficient type-2 defuzzification algorithms.

This paper is a first step towards a theoretical foundation of the emerging field of type reduction. Five mathematical properties of type reduction are defined, and two existing type reduction methods (Nie-Tan and uncertainty weight) are examined with respect to our five properties. Furthermore, two new type reduction methods are proposed: consistent linear type reduction and consistent quadratic type reduction. All our five properties are satisfied by consistent quadratic type reduction.

Keywords: defuzzification, type-2 fuzzy sets

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