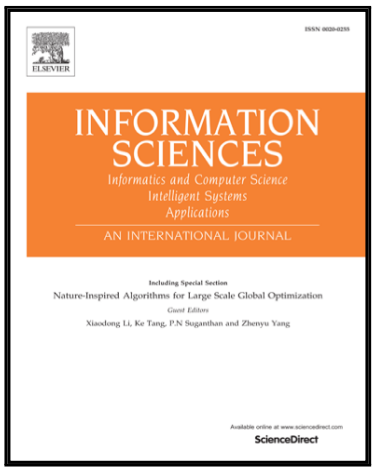

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Type Reduction Operators for Interval Type–2 Defuzzification

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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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