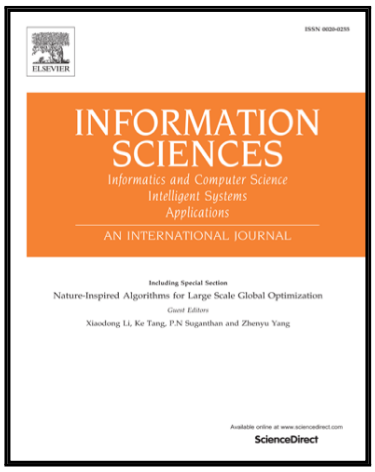

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On Possibilistic Representations of Fuzzy Intervals

Luciano Stefanini*, Maria Letizia Guerra†

Abstract

It is acknowledged that a fuzzy interval has two equivalent representations given in terms of the so called Left and Right sides of the membership function (LR-representation) or in terms of the Lower and Upper branches defining the endpoints of the α-cuts (LU-representation).

In this paper we suggest an additional representation of fuzzy intervals called ACF-representation (using an average cumulative function instead of the membership function), based on possibility theory.

We illustrate how to build the new representation and we state its basic properties. The main result is that the Average Cumulative (AC) function can be uniquely defined for any fuzzy interval and it is possible to move from one representation to the others through appropriate transformations.

An interesting link can be established between ACF-representation and quantile functions, with a possible statistical interpretation useful in real application.

We also recommend a parametric form of the AC function.

KEYWORDS: possibility distribution, parametric representations, fuzzy intervals, quantiles, average cumulative function.

1 Introduction

Representation of fuzzy intervals may take advantage of some key concepts emerging from possibility theory. Possibility theory has been widely studied; in particular, for a given normal, upper-semicontinuous and quasi-concave membership function two dual functions, called the possibility and the necessity measures have been introduced by Dubois and Prade in [12] and [13]. The relationship between membership functions and possibility distributions was primary introduced by Zadeh ([44]) in order to provide a graded semantics to natural language statements. Many other aspects have been focused by Dubois and Prade in [14] (see also the recent paper [16]) for normal fuzzy sets; Klir in

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