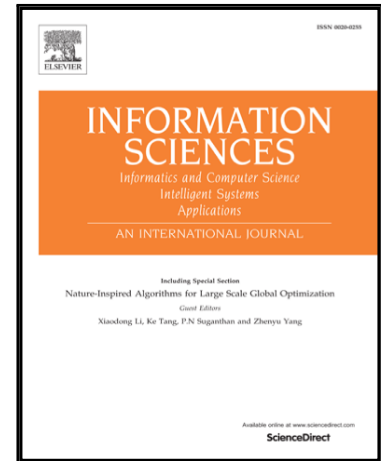


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Connecting the linguistic hierarchy and the numerical scale for the 2-tuple linguistic model and its use to deal with hesitant unbalanced linguistic information

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Abstract: The 2-tuple linguistic representation model is widely used as a basis for computing with words (CW) in linguistic decision making problems. Two different models based on linguistic 2-tuples (i.e., the model of the use of a linguistic hierarchy and the numerical scale model) have been developed to address term sets that are not uniformly and symmetrically distributed, i.e., unbalanced linguistic term sets (ULTSs). In this study, we provide a connection between these two different models and prove the equivalence of the linguistic computational models to handle ULTSs. Further, we propose a novel CW methodology where the hesitant fuzzy linguistic term sets (HFLTSSs) can be constructed based on ULTSs using a numerical scale. In the proposed CW methodology, we present several novel possibility degree formulas for comparing HFLTSSs, and define novel operators based on the mixed 0-1 linear programming model to aggregate the hesitant unbalanced linguistic information.

Keywords: Unbalanced linguistic term set, hesitant linguistic term set, numerical scale model, computing with words.

1. Introduction

Using linguistic information in decision making problems implies the need for computing with words (CW) [18, 19, 25, 27, 28, 29, 36, 37, 38, 59, 60, 61]. Several different linguistic computational models for CW have been presented in [4, 7, 8, 21, 26, 28, 41, 42, 56, 57]. In particular, Herrera and Martínez [21] initiated the 2-tuple linguistic representation model. This model is well suited for dealing with linguistic term sets that are uniformly and symmetrically distributed and results in matching of the elements in the initial linguistic terms. The 2-tuple linguistic model has been successfully used in a wide range of applications

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