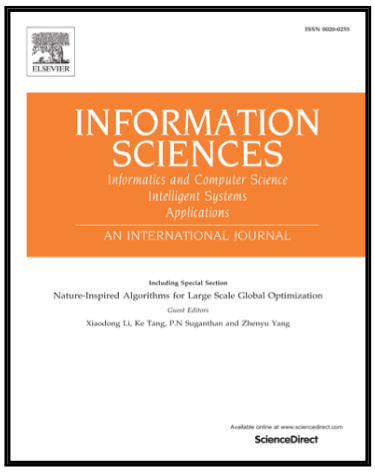

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Shyi-Ming Chen , Li-Wei Kuo , Xin-Yao Zou

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Multiattribute decision making based on Shannon's information entropy, non-linear programming methodology, and interval-valued intuitionistic fuzzy values

Shyi-Ming Chen[a,*], Li-Wei Kuo[a], Xin-Yao Zou[b]

[a] *Department of Computer Science and Information Engineering, National Taiwan University of Science and Technology, Taipei, Taiwan*
[b] *Office of Scientific Research and Industrial Service, Guangdong AIB Polytechnic College, Guangzhou, China*

*** Corresponding Author.**
***E-mail addresses*: smchen@mail.ntust.edu.tw (S.-M. Chen).**

Abstract

In this paper, we propose a novel multiattribute decision making (MADM) methodology based on Shannon's information entropy, the non-linear programming (NLP) methodology and interval-valued intuitionistic fuzzy values (IVIFVs), where attributes' weights and evaluating attributes' values with respect to alternatives are expressed by IVIFVs. Several examples are used to illustrate that the proposed MADM methodology can conquer the drawbacks of Wang and Chen's MADM methodology (2018) in interval-valued intuitionistic fuzzy (IVIF) environments.

***Keywords*:** Hyperbolic tangent function; IVIFSs; IVIFVs; MADM; NLP methodology; Shannon's information entropy.

1. Introduction

In [44], Zadeh proposed the theory of fuzzy sets, which has been applied in many fields [7], [11]-[13], [23], [39]. In [2], Atanassov extended the fuzzy set theory to propose the theory of intuitionistic fuzzy sets, which has been applied to deal with pattern recognition problems [6] and multiattribute group decision making problems [8]. In [3], Atanassov and Gargov extended the theory of intuitionistic fuzzy sets to propose the theory of interval-valued intuitionistic fuzzy sets (IVIFSs). Several multiattribute decision making (MADM) methodologies have been proposed [1], [9], [10], [15], [18], [19], [24], [25], [29]-[31], [33], [34], [37], [40]-[43], [45] based on IVIFSs, where evaluating attributes' values of alternatives are expressed by interval-valued intuitionistic fuzzy values (IVIFVs) [41]. In [1], Abdullah and Najib proposed an interval-valued intuitionistic fuzzy (IVIF)