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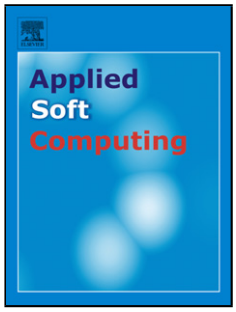

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PII: S1568-4946(18)30018-8
DOI: https://doi.org/doi:10.1016/j.asoc.2018.01.012
Reference: ASOC 4659

To appear in: *Applied Soft Computing*

Received date: 17-2-2017
Revised date: 20-9-2017
Accepted date: 5-1-2018

Please cite this article as: Yaya Liu, Keyun Qin, Luis Martínez, Improving decision making approaches based on fuzzy soft sets and rough soft sets, *<![CDATA[Applied Soft Computing Journal]]>* (2018), https://doi.org/10.1016/j.asoc.2018.01.012

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Improving decision making approaches based on fuzzy soft sets and rough soft sets

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Abstract

Hybrid soft sets, such as fuzzy soft sets and rough soft sets, have been extensively applied to decision making. However in both cases, there is still a necessity of providing improvements on approaches to obtain better decision results in different situations. In this paper several proposals for decision making are provided based on both hybrid soft sets. For fuzzy soft sets, a computational tool called D-score table is introduced to improve the decision process of a classical approach and its convenience has been proved when attributes change across the decision process. In addition, a novel adjustable approach based on decision rules is introduced. Regarding rough soft sets, several new decision algorithms to meet different decision makers' requirements are introduced together a multi-criteria group decision making approach. Several practical examples are developed to show the validity of such proposals.

Keywords: `Fuzzy soft set`, `Rough soft set`, `Decision making`, `Group decision making`

1. Introduction

Classical mathematical tools, which require all notions to be exact, usually fail to handle the uncertainty, imprecision and vagueness in a wide variety of practical fields. Although theories such as fuzzy set theory [1], rough set theory [2], intuitionistic fuzzy set theory [3] and vague set theory [4] have been proved useful mathematical approaches in modeling these uncertainties, all of them have a common limitation—-the inadequacy of the parametrization tool. In 1999, soft set theory was put forward by Molodstsov [5] as a new mathematic tool for dealing with uncertainty, which is free from the above mentioned limitation. Afterwards, the generalized models of soft sets (hybrid soft sets) come forth rapidly and there has been an increasing interest in the practical applications of hybrid soft set theories, especially with regard to their applications in decision making [6–17].

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