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Review article

A state of the art literature review of VIKOR and its fuzzy extensions on applications

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ABSTRACT

Multi criteria decision making (MCDM) is one of the research areas of operations research and management science which has widely studied by researchers and practitioners. It finds a compromise solution for evaluating and ranking alternatives from the best to the worst under conflicting criteria with respect to decision maker(s) preferences. In a compromise approach, the VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR; that means multi-criteria optimization and compromise solution) continues to be applied satisfactorily across different application areas. This paper conducts a state-of-the-art literature review to categorize, analyze and interpret the current research on VIKOR applications. It also discusses the extensions of VIKOR applied in fuzzy environments. A total of 343 papers are classified into 13 different application areas and a number of sub-application areas. Furthermore, all papers are also categorized with respect to publication year, published journal, country of origin, application type (real case study vs empirical study), and version of fuzzy sets used. This comprehensive literature review provides an insight for researchers and practitioners on VIKOR applications in terms of showing current state and potential areas for future attempts to be focused in the future.

Contents

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1. Introduction

MCDM is one of the research areas of operations research and management science which has been widely studied by researchers and practitioners. It concerns about evaluating, assessing and selecting alternatives from the best to the worst under conflicting criteria with respect to decision maker(s) preferences. The main characteristics of an MCDM method include: (1) alternatives, (2) criteria against which the alternatives are evaluated, (3) scores that reflect the value of an alternative's expected performance on the criteria, and (4) criteria weights that measure the relative importance of each criterion as compared with others [1]. There are several MCDM methods proposed by researchers in literature. VIKOR is one of the famous MCDM methods that ranks alternatives and determines the compromise solution that is the closest to the "ideal". Regarding to the rapid increase in applications of VIKOR among others, we prompted to make this review to contribute to the literature by adding the recent VIKOR applications and draw a path for future studies.

Some studies need to be mentioned here to explain the need for this study. The scope of the earlier review papers on MCDM methods are illustrated in Table 1. Vaidya and Kumar [2] discussed analytic hierarchy process (AHP) that is extensively used as a developed tool. Ho [3] reviewed the literature on the applications of the integrated AHPs. Emrouznejad et al. [4] presented a comprehensive listing and analysis of data envelopment analysis (DEA) papers published between 1978 and 2008. Behzadian et al. [5] conducted a state-of-the-art literature survey to classify the research on technique for order preference by similarity to ideal solution (TOPSIS) applications and methodologies. Hatami-Marbini et al. [6] presented a classification scheme as four primary categories, namely, the tolerance approach, the a-level based approach, the fuzzy ranking approach and the possibility approach for DEA. Zavadskas and Turskis [7] considered decision making in light of the recent developments of MCDM methods in economics. A classification scheme and a comprehensive literature review was presented by Behzadian et al. [8] to uncover, classify, and interpret the current research on preference ranking organization method for enrichment of evaluations (PROMETHEE) methodologies and applications. Yin [9] conducted a bibliometric study on publication and citation patterns of grey system theory for papers published between 1996 and 2010 through a systemic search using the ISI web based databases with a specific focus on grey relational analysis (GRA) and grey prediction. In their literature review, Baležentis and Baležentis [10] focused on the full multiplicative form of multi-objective optimization by ratio analysis (MULTIMOORA) method. Specifically, they discussed its development as well as extensions alongside with an overview of their applications. Govindan and Jepsen [11] investigated how the Elimination et choix traduisant la realité (ELECTRE) and ELECTRE-based methods have been applied in various research