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Multi-criteria decision making for selecting the best cruiser bikes using weighted sum model

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ABSTRACT: The decision-making process involved in real-world challenges is as complicated as the problems themselves. The best bike selection problem is addressed in this study using the Weighted Product Model (WPM), Weighted Sum Model (WSM) and Analytic Hierarchy Process (AHP). The most effective motorcycle among the available options should be easier to select using these techniques. Each bike is assessed during each operation carried out based on five criteria. Price, Engine, Power, Torque, and Mileage are the requirements. The Multiple Criteria Decision Making (MCDM) methods have made it possible to acquire scores that let operators classify objects.

Keywords: Weighted Product Model (WPM), Weighted Sum Model (WSM) and Analytic Hierarchy Process (AHP), Motor bikes, Multiple Criteria Decision Making (MCDM).

1 INTRODUCTION

Making decisions in the presence of several, frequently contradictory criteria is referred to as multiple criteria decision making (MCDM). In daily life, MCDM issues are prevalent. For the purpose of resolving difficult decision-making difficulties, many of them use Multi-Criteria Decision Analysis (MCDA) [1–3]. As it integrates computational and mathematical tools to allow decision-makers to subjectively evaluate performance criteria, MCDM is currently one of the most prominent and quickly expanding subfields of management science and operations research, according to Zavadskas *et al.* [4] and Almulhim [5]. It employs a broad category of operations research models that account for the difficulties in making decisions when there are several choice criteria [6].

Kaliszewski and Podkopae [7] demonstrated a method to obtain weights for the Simple Additive Weighting that provides the same ranking technique generated by an MCDM method. This is the substance and potential significance of our contribution. The weighted normalized decision matrix was developed by combining the two MCDM approaches WSM and WPM [8]. Sorooshian and Parsia [9] suggest a modified version of the WSM as a solution for MCDM designers in situations when another source of information is required to rank or weight the specific criterion or criterion set.

The WSM approach has the benefit of transforming the original data in a proportionate linear manner. It implies that the standardized scores' relative order of magnitude is unchanged [10]. WPM is a different suggested MCDM technique. This approach, which can be seen as a variation of the WSM, is better at tackling MCDM problems than other approaches [11].

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