How to make more flexible MCDA Sorting: AHP FuzzySort

Luis Martínez
University of Jaén, Department of Computer Science

Abstract

Multi-Criteria Decision Analysis (MCDA) relates to the process of making decisions in situations where there are multiple and conflicting criteria. Different types of decision problems can be formulated within the context of MCDA from choice, sorting, ranking and description problems, to elimination and design ones. Most of the problems studied in the literature revolve around choice and ranking problems, thus many approaches have been developed and applied accordingly in real-world problems. However, some applications have been solved by sorting analysis, the multi-criteria sorting methods help decision makers (DMs) to assign each action to a certain category among several of them previously characterized either by the decision maker or are inherent in the problem. *In all the previously developed MCDA sorting methods, a strict boundary is assumed: i.e. above a boundary an alternative belongs to class A, below that* it belongs to class B. This strict boundary has two major problems though:

- There is the necessity of fine-tuning processes to avoid ambiguous or doubtful class assignments for alternatives that are close to the boundary.

- Insignificant differences in the priorities obtained by the alternatives can result in significant differences in the class assignment in the sorting MCDA approach

In spite of the fact that there exists a plethora of MCDA approaches (PROMETHEE, ELECTRE, TOPSIS, UTA, etc.), the Analytic Hierarchy Process (AHP) is one of the most widespread and useful MCDA methods. Nonetheless, it is only in 2012 that a variant of AHP for sorting problems has been proposed with AHPSort and its variant AHPSort II which drastically reduce the number of pairwise comparison but still uses strict boundary for sorting.

This talk introduces an Analytic Hierarchy Process-Fuzzy Sorting (AHP-FuzzySort) model that uses fuzzy sets theory and the fuzzy linguistic approach to improve the assignment of alternatives to classes in a flexible way providing more realistic sorting results.