A hybrid fuzzy AHP-PROMETHEE decision support system for machine tool selection in flexible manufacturing cell

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Abstract

The selection process of a suitable machine tool among the increased number of alternatives has been an important issue for manufacturing companies for years. This is because the improper selection of a machine tool may cause many problems that will affect the overall performance. In this paper, a decision support system (DSS) is presented to select the best alternative machine using a hybrid approach of fuzzy analytic hierarchy process (fuzzy AHP) and preference ranking organization method for enrichment evaluation (PROMETHEE). A MATLAB- based fuzzy AHP is used to determine the weights of the criteria and it is called program for PriorityWeights of the Evaluation Criteria (PWEC), and the PROMETHEE method is applied for the final ranking. The proposed model is structured to select the most suitable computer numerical controlled (CNC) turning centre machine for a flexible manufacturing cell (FMC) among the alternatives which are assigned from a database (DB) created for this purpose. A numerical example is presented to show the applicability of the model. It is concluded that the proposed model has the capability of dealing with a wide range of desired criteria and to select any type of machine tool required for building an FMC.

Keywords
Machine selection; Decision-making; CNC; machines; FMC; Fuzzy AHP; PROMETHEE