Using fahp-vikor for operation selection in the flexible job-shop scheduling problem: A case study in textile industry

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Abstract

Scheduling of Flexible Job Shop Systems is a combinatorial problem which has been addressed by several heuristics and meta-heuristics. Nevertheless, the operation selection rules of both methods are limited to an ordered variant wherein priority-dispatching rules are not simultaneously deemed in the reported literature. Therefore, this paper presents the application of dispatching algorithm with operation selection based on Fuzzy Analytic Hierarchy Process (FAHP) and VIKOR methods while considering setup times and transfer batches. Dispatching, FAHP, and VIKOR algorithms are first defined. Second, a multi-criteria decision-making model is designed for operation prioritization. Then, FAHP is applied to calculate the criteria weights and overcome the uncertainty of human judgments. Afterwards, VIKOR is used to select the operation with the highest priority. A case study in the textile industry is shown to validate this approach. The results evidenced, compared to the company solution, a reduction of 61.05% in average delay.

Keywords

Flexible job shop problem, Scheduling, Dispatching algorithm, Fuzzy Analytic Hierarchy Process (FAHP), VIKOR