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Topic of Research: Modelling and Simulation of a Flexible Manufacturing System with Dynamic Scheduling of Parts

Findings

Five studies have been conducted in a systematic manner with an aim to develop efficient and effective JPRs. The first study intends to select the best JPR which will perform optimally for a number of performance measures using multi-criteria decision making (MCDM) methods. The findings of this study reveals that JPRs bases on combined strategy performed better over single strategy. It was found in the first study that JPRs bases on combined strategy i.e. PDT and WPDT performed better over single strategy. Hence, in the second study two new JPRs based on combined strategies have been developed and analyzed. The first rule is based on taking geometric mean (GM) of processing time (PT) and due date (DD) and it is termed as GMPD whereas, the second rule is derived by taking harmonic mean (HM) of PT and DD and it is coined as HMPD. Performance of the proposed JPRs is evaluated and is found that the proposed GMPD rule performs better than other JPRs in achieving optimal values of multiple performance measures. Further, the effectiveness of the developed rules in FMS was examined in the third study for which a framework based on an integration of simulation and multi criteria decision making (MCDM) methods for the selection of an appropriate JPR yielding optimum results for multiple SPMs taken together was developed. The developed framework has been implemented on a specific FMS taken from the literature in order to select the best JPR. The results of the study reveals that the proposed rule GMPD is the best rule among the considered JPRs for optimum performance of the five SPM as it is ranked first. Subsequently, the effect of other input factors along with JPRs was explored and investigated in the fourth study. The results of the study revealed that considering 3 machines, with GMPD as JPR and shortest distance as AGV selection rule yields the optimal performance of the FMS. Further, among the three input variables, the number of machines was found to have a significant effect on the multi-performance measures. Finally, in the fifth study, an attempt has been made to design and develop an artificial neural network (ANN) model for prediction of the select performance measures (PMs) of a single machine job scheduling (SMJS) system. An ANN model with 2 hidden layers having 16 neurons in each hidden layer was found to be the optimum model for prediction of the PMs as it resulted in the minimum mean squared error. The actual and predicated values of the PMs obtained from the optimum ANN model were compared and it was found that they were in close agreement.