

SCHEDULING RULES FOR A SMALL DYNAMIC JOB-SHOP: A SIMULATION APPROACH

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Abstract

The objective of this paper is to study a selected set of scheduling criteria commonly used in scheduling research and develop a set of simple rules that can be easily implemented in relatively small dynamic job-shops. Simulation models were developed for two dynamic production shop environments, namely, a job-shop with jumbled flow and a job-shop with limited jumbled flow. Five scheduling criteria were used with each of the three models. They are, (i) Slack per Remaining Operations (SPRO), (ii) Priority Ratio (PR), (iii) Earliest Due Date (EDD), (iv) Total Work Content Remaining (TWKR), and (v) Smallest Processing Time (SPT). In each of these cases, performance statistics relating to work-in-process (WIP) inventory and job lateness were gathered. The results show that in most cases, simple rules such as SPT and EDD outperform the other rules. SPT rule minimizes the performance metrics that measure WIP inventory levels and the EDD rule minimizes the performance metrics that measure deviation of job completion time from the promised due date. 11 refs.

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Key Words: *Scheduling, Job-Shop, Simulation*

PERFORMANCE ANALYSIS OF AN AUTOMATED PRODUCTION SYSTEM WITH QUEUE LENGTH DEPENDENT SERVICE RATES

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Abstract

In this paper, a simulation model is built to analyze the performance of a pull type (Kanban) automated production system with a continuous supply of raw materials and generally distributed demand and service times. The system under consideration represents an attempt of modeling a Kanban controlled production system where the station production rates are dependent on product queue lengths. It is composed of three stations; one of them is a bottleneck station. Stations have different processing speeds (low, medium and high) and are connected by a conveyor system whose actuation is coordinated with the stations. Conveyors transfer the products between stations and provide local buffering of material at the processing tool level. A number of sensors exist on each conveyor to control the processing speed and the operational/stoppage state of the stations. Numerical experiments are conducted to check the model validity and to study the effect of different parameters on the system performance. Results obtained from the simulation model are compared with results obtained from an analytical model built for the same system. The model is used to obtain accurate estimates of the system performance measures such as throughput, waiting queue lengths and work-in-process inventory. Results show that changing sensors' positions affect the system performance considerably. Hence, an optimization study is conducted in order to find the values of sensors' positions that optimize the system performance. 22 refs.

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Key Words: *Performance Analysis, Automated Production Systems, Kanban, Simulation, Optimization*

A MODIFIED ANP AND ITS APPLICATION IN SIMULATION CREDIBILITY EVALUATION

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Abstract

With the size and complexity of simulation applications growing rapidly, many simulation systems cannot be structured hierarchically, involving the interaction and dependence of elements in a hierarchy. To give an efficient credibility evaluation for the intricate simulation systems involving network configuration, this paper proposes a modified fuzzy ANP method to calculate weights of indices for assessing. The method used triangle fuzzy numbers to establish judgment matrix, together with confidence level, expressing Subject Matter Experts' degree of understanding with respect to the importance of each component. Furthermore, a new possibility measurement for fuzzy numbers is proposed, to obtain the relative importance ranking of components for the simplified judgment in dealing with the vagueness defined measurement scales. The approach is used to calculate the credibility of a control and guide simulation system for a type of missile. The application result shows that the method is reasonable, easy and feasible. 27 refs.

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Key Words: *ANP, Triangle Fuzzy Numbers, Confidence Level, Credibility Evaluation, Simulation System*

ANALYSIS AND OPTIMIZATION OF A BAKERY PRODUCTION LINE USING ARENA

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Abstract

Production planning in German bakeries is mainly based on the experience of the responsible production manager. As a result production planning happens more or less "chaotic", which often results in "bottle-necks", deficient dimensioning, ineffective staff allocation and operational problems. The aforementioned points cause a production environment in which factories are not able to achieve the best possible economical and ecological performance.

As shown in several industry branches, it is highly advantageous to use virtual models in order to detect and improve suboptimal processes. Models behave like the real system and provide the possibility to predict the changes that may occur to the real production, if the specifications of the production change. For those reasons, virtual modelling supplies the user with a powerful tool for production planning. In this case study ARENA was used as the modelling and simulation tool to analyse a bakery production line. 9 refs.

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Key Words: *Simulation, ARENA, Production Planning, Bakery, Process Analysis*