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SIMULATION OF MANUFACTURING CELLS WITH UNRELIABLE MACHINES

Elleuch, M.; Masmoudi, F.; Ben Bacha, H. & Maalej, A. Y.
Mechanical Engineering Department, National School of Engineers of Sfax (ENIS), Sfax, Tunisia
E-Mail: faouzi.masmoudi@enis.rnu.tn

Abstract
Cellular manufacturing is an application of a group technology used to improve the performance of manufacturing systems. A number of factors, including vulnerability to machine breakdown, under utilization of resources and eventual unbalanced workload distribution in a multi-cell plan disturb the smooth working of the factory when using the group technology concept.
This paper focuses on a manufacturing cell composed of unreliable machines. We are interested in the problem of cell production availability facing unexpected circumstances due to an internal perturbation caused by machine breakdown. We consider a policy of intercellular transfer in the event of breakdown to improve the availability of the cells. We examine through simulation the performance of the system and evaluate the intercellular transfer policy in terms of some selected criteria. The results indicate, under the assumed conditions, that the developed policy improves the performance of the production cells. 14 refs.
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Key Words: *Manufacturing Cell, Machine Breakdown, Intercellular Transfer, Simulation, Performance Measures*

Pages 13-24

SIMULATIONS OF TRANSPORTATION LOGISTIC SYSTEMS UTILISING AGENT-BASED ARCHITECTURE

Kavicka, A.; Klima, V. & Adamko, N.
Jan Perner Transport Faculty, University of Pardubice, Studentska 95, 532 10 Pardubice, Czech Republic
E- Mail: antonin.kavicka@upce.cz

Abstract
This paper presents a methodology related to rapid and flexible prototyping of simulation models reflecting large-scale transportation logistic systems. This methodology is based on a proprietary architecture (called ABAsim) inspired by the paradigm of autonomous agents. The architecture was designed within the framework of research and development of an integrated computer environment, which is specialized for simulations of a wide class of transportation logistic systems. Basic characteristics of the mentioned architecture are briefly described, whereas a flexibility of simulation models, developed within that architecture, is emphasised. The high degree of flexibility is enabled due to consistent hierarchical structure of relevant conceptual models and indirect addressing mechanism utilised for inter-agent communication. Because of the applied approaches, the simulation model configuration can be built by replacing relevant sub-models, individual agents or their internal components. In addition, exploitation of Petri nets for definitions of control procedures and utilisation of a proprietary CASE-tool also supports rapid and flexible model prototyping. There is also presented a complex simulation tool Villon (developed within ABAsim architecture) and corresponding experience with its utilisation within simulations mirroring compound systems from the field of transportation logistics systems. 16 refs.
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Key Words: *Agent-Based Simulation, Simulation Model Architecture, Petri Nets, Simulation of Transportation Logistic Systems*

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SIMULATION OF A SUSPENSION SYSTEM WITH ADAPTIVE FUZZY ACTIVE FORCE CONTROL

Mailah, M. & Priyandoko, G.
Department of Applied Mechanics, Faculty of Mechanical Engineering, Universiti Teknologi Malaysia,
81310 Skudai, Johor, Malaysia
E- Mail: musa@fkm.utm.my

Abstract
This paper presents the design of a new and novel control technique applied to an active suspension system of a quarter car model using adaptive fuzzy (AF) logic and active force control (AFC) strategies. The two main advantages of the proposed method are the simplicity of the control law and low computational burden. The overall control system essentially comprises three feedback control loops, namely the innermost PI control loop for the force tracking of the hydraulic actuator, intermediate AFC control loops for the compensation of the disturbances and outermost AF control loop for the computation of the optimum target/commanded force. AF algorithms were used to approximate the estimated mass of the hydraulic actuator in the AFC loop. The performance of the proposed control method was then simulated, evaluated and later compared to examine the effectiveness of the system in suppressing the undesirable effects of the suspension system. It was found that the active suspension system with Adaptive Fuzzy Active Force Control (AF-AFC) yields superior performance compared to the AF system without AFC and the passive counterparts. 17 refs.
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Key Words: *Active Suspension, Quarter Car Model, Adaptive Fuzzy, Active Force Control*

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MODELLING, SIMULATION AND OPTIMAL TUNING OF TCSC CONTROLLER

Panda, S.; Padhy, N. P. & Patel, R. N.
Department of Electrical Engineering, IIT, Roorkee, Uttaranchal-247667, India
E- Mail: speeddee@iitr.ernet.in

Abstract
A systematic procedure for modeling, simulation and optimal tuning the parameters of a Thyristor Controlled Series Compensator (TCSC) controller, for the power system stability enhancement is presented in this paper. For the simulation purpose, the model of single-machine infinite bus (SMIB) power system with TCSC controller is developed in MATLAB/SIMULINK. The design problem of TCSC controller is formulated as an optimisation problem and genetic algorithm (GA) is employed to search for the optimal TCSC controller parameters. By minimizing a time-domain based objective function, in which the oscillatory rotor speed deviation of the generator is involved; stability performance of the power system is improved. The results obtained from simulations validate the effectiveness of proposed modelling and tuning approach for power system stability improvement. The simulation results also show that the proposed TCSC controller is effective in damping a range of small disturbance conditions in the power system. 20 refs.
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Key Words: *Thyristor Controlled Series Compensator, Modelling, Optimal Tuning, Genetic Algorithm, Power System Stability*

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BOTTLENECK ANALYSIS IN MDF-PRODUCTION BY MEANS OF DISCRETE EVENT SIMULATION

Penker, A.; Barbu, M. C. & Gronalt, M.
Kompetenzzentrum Holz GmbH, Wood Carinthian Competence Center, Klagenfurterstr. 87-89, 9300 St.Veit/Glan, Austria
E- Mail: a.penker@kplus-wood.at

Abstract
Material flow analysis by means of discrete event simulation proved to be a useful tool for decision support by several studies. This case study presents a bottleneck analysis for an Austrian Medium Density Fibreboard (MDF) production plant. The developed model was linked to actual production data and animated. The aim was to picture production, storage and transporting processes from the hot pressing of the boards through to shipping of batched costumer orders with sufficient accuracy. Different scenarios representing varying production programs and warehouse allocation principles were simulated. The results of the reference scenario showed good alignment to the corresponding factory data. At a production program with increased share of cut-to-size panels the saw turned into a bottleneck and the utilisation of the finished goods warehouse increased significantly.
The simulation provided useful information about the capability of the production, transport and storage systems and their performance at altered conditions. 8 refs.
(Extended paper from the 17th International DAAAM Symposium, Vienna, Austria, 8-11 November 2006.)

Key Words: *Medium Density Fibreboard, Discrete Event Simulation, Material Flow Analysis, In-Process-Storage Capacity, Warehouse Utilisation*