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A LOGICAL PROCESS SIMULATION MODEL FOR CONSERVATIVE DISTRIBUTED SIMULATION SYSTEMS

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Abstract
This paper presents a new logical process (LP) simulation model for distributed simulation systems where Null Message Algorithm (NMA) is used as an underlying time management algorithm (TMA) to provide synchronization among LPs. To extend the proposed simulation model for *n* number of LPs, this paper provides a detailed overview of the internal architecture of each LP and its coordination with the other LPs through sub-system components and models such as communication interface and simulation executive. The proposed architecture of LP simulation model describes the proper sequence of coordination that need to be done among LPs though different subsystem components and models to achieve synchronization. To execute the proposed LP simulation model for different set of parameters, a queuing network model is used. Experiments will be performed to verify the accuracy of the proposed simulation model using the pre-derived mathematical equations. Our numerical and simulation results can be used to observe the exchange of null messages and overhead indices. 21 refs.
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Key Words: *Discrete-Event Simulation, Distributed Systems, Large-Scale Networks, Queuing Model, Parallel Computing*

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FULLY-AUTOMATED LIQUID PENETRANT INSPECTION LINE SIMULATION MODEL FOR INCREASING PRODUCTIVITY

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Abstract
By proposing an optimization model for a new automated liquid penetrant inspection (LPI) system in order to increase its productivity, the paper tries to identify the best algorithm to solve this case study. The architecture of the system is dictated by the successive stages of the inspection process and the available conditions in the work shop. As a novelty in the field, the authors developed such a fully automated LPI system for inspecting different parts, which eliminates the need of the visual inspection made by operator, using instead dedicated software solution for processing the digital images of the inspected parts and for giving the pass/fail verdict. In the present case study, the attention was focused on optimizing the new LPI system architecture. Simulations in different working scenarios are run with the purpose to increase productivity by optimizing the critical waiting times within the system and by establishing the best order for inspecting parts belonging to three families subjected to LPI method. Moreover, the results of the simulation are used for programming the system by setting the optimal values of the functional parameters of system's equipment in order to avoid running a large number of tests which are expensive and time consuming. 28 refs.
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Key Words: *Discrete Event Simulation, LPI Line Design, Productivity, Optimization*

Pages 94-106

SIMULATION OF SHEET AND CLOUD CAVITATION WITH HOMOGENOUS TRANSPORT MODELS

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Abstract
This paper introduces the results of correlated numerical models study carried out to analyse cavitating flows. The flow field of steady attached sheet cavitation and the case of unsteady cavitation behaviour with quasi-periodic fluctuations is analysed with different homogenous cavitation transport models. Three models in form of additional transport equations for water volume fraction are combined with the RANS (Reynolds Averaged Navier–Stokes) equations and calibrated for the cavitating flow around the NACA66 (MOD) hydrofoil by means of an optimisation strategy. In the second stage, the optimised models are applied to the case of internal unsteady cavitating flow in Venturi type section. The results obtained using calibrated models are very close to each other, and agree well with the available experimental data, indicating that the optimisation process is recommended as a general – first step tool for mathematical models validation. 22 refs.
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Key Words: *Cavitation, Numerical Simulation, Homogenous Transport Model*

Pages 107-119

CONCEPTUAL MODEL FOR MANAGEMENT OF DIGITAL FACTORY SIMULATION INFORMATION

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Abstract
Digital Factory (DF) aims at proposing simulation tools to design a product and its production system in parallel. Nevertheless, DF is marked by the multiplicity and heterogeneity of simulation models that are used, that slows down its usage in industry. We propose in this paper a conceptual model to manage the different simulation information created and manipulated through a DF project. This model is based on an analysis of the current design strategies and the used simulation tools. Finally, an industrial application has been developed to validate the completeness of this model. 41 refs.
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Key Words: *Design Methodology, Digital Factory, Information Management, Manufacturing and Simulation Model*

Pages 120-131

NUMERICAL ANALYSIS OF RECTANGULAR GROOVE CUTTING WITH DIFFERENT RC TOOLS

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Abstract
The paper reports an advanced finite element analysis code for the investigation of the cutting process of rectangular groove. Three different restricted contact tools (RC tools) with rectangular, trapezoidal and double-trapezoidal shapes were employed in this study. The cutting force, feed force and rake face temperature distribution during the cutting process were analysed. The simulation results show that asymmetric tool-chip restricted contact shape causes the chip to break more easily than the symmetric tools. The RC tool shows significant reductions both in cutting force (6~8 %) and feed force (70~80 %) than traditional tools. It is also found that the RC tools give 12 % reduction in mean temperature on tool rake face compared to those of traditional tools. The simulation results indicate that the tools with asymmetric tool-chip contact shapes have advantages over symmetrical ones in terms of decreasing chip breakage, reducing cutting force and tool cooling. 27 refs.
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Key Words: *Restricted Contact Shape, RC Tools, FEM, Rectangular Groove Cutting, Metal Cutting*