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AN EFFICIENT OPTIMISTIC TIME MANAGEMENT ALGORITHM FOR DISCRETE-EVENT SIMULATION SYSTEM

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Abstract
Time Wrap algorithm is a well-known mechanism of optimistic synchronization in a parallel discrete-event simulation (PDES) system. It offers a run time recovery mechanism that deals with the causality errors. For an efficient use of rollback, the global virtual time (GVT) computation is performed to reclaim the memory, commit the output, detect the termination, and handle the errors. This paper presents a new unacknowledged message list (UML) scheme for an efficient and accurate GVT computation. The proposed UML scheme is based on the assumption that certain variables are accessible by all processors. In addition to GVT computation, the proposed UML scheme provides an effective solution for both simultaneous reporting and transient message problems in the context of synchronous algorithm. To support the proposed UML approach, two algorithms are presented in details, with a proof of its correctness. Empirical evidence from an experimental study of the proposed UML scheme on PHOLD benchmark fully confirms the theoretical outcomes of this paper. 35 refs.
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Key Words: *Discrete Event Simulation, GVT Computation, Optimistic Algorithm, Parallel and Distributed Systems, Time Wrap Algorithm*

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ASPECT OF SELECTIVE REROUTING IN MULTICRITERIA SCHEDULING OF FLEXIBLE MANUFACTURING

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Abstract
In this paper, a Multi-Criteria Scheduling Algorithm (*MCSA*) based on swapping of dispatching rules and Selective Rerouting (*SR*) approach based on lateral entry of critical jobs in the queue of alternate machine is used. Further, the effect of simultaneous application of *MCSA* and *SR* has been investigated. The system performance has been evaluated using mean flow time, maximum flow time, mean tardiness and maximum tardiness as the performance measures. Simulation studies using ProModel® simulation software were carried out at different breakdown levels for a range of part complexity and part mix, in three types of flexible job shops with Job/Machine ratio less than, equal to and greater than unity involving a total of 799 simulation runs. Each run of simulation spans for a period of 2000 completed jobs. The results establish that simultaneous application of *MCSA* and *SR* improves the system performance between 12.17 % to 28.73 % and 30.51 % to 47.67 % over that when *SR* and *MCSA* respectively are applied individually. The improvement is more at low breakdown levels and high part complexity. 27 refs.
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Key Words: *Selective Rerouting, Part Complexity, Part Mix, Breakdown Level, Performance Index*

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ASSESSING MOTORCYCLE CRASH-RELATED HEAD INJURIES USING FINITE ELEMENT SIMULATIONS

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Abstract
Motorcycle crash-related fatalities and injuries have a relatively increasing tendency compared to other vehicles. The new development of safety devices and technologies for prediction of their behaviour are therefore also increasingly important. Motorcycles have the least amount of protective devices amongst vehicles. A small disturbance in the motion of motorcycles can expose the riders to severe impacts leading to injuries especially in the appendicular part of the body, but the severest injury is usually to the head. Head injuries are the most common cause of death amongst motorcyclists (approximately 45 %). Thus, naturally, the main protective equipment preventing motorcyclists from fatal injuries is the helmet. In this study, detailed finite element models of helmet and human head are used to simulate and analyse the impacts on a protected and unprotected head in a scenario typical for motorcycle-related collisions. 20 refs.
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Key Words: *FEA, Motorcycle Crash, Head Impact, Helmet, Design of Experiments*

Pages 152-164

A SIMULATION APPROACH TO FACILITATE MANUFACTURING SYSTEM DESIGN

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Abstract
In recent years, the manufacturing sector has faced unparalleled levels of change and its intricacies are also challenging. This has lead to manufacturers acquiring new methods for planning and control of their manufacturing systems. One approach that can give good results in this context is simulation modelling. In this paper, a simulation modelling technique is applied to a bottling process in a winery to analyze the variations in the duration of the process with different changes in the production line. Step changes have been made during the simulation model construction. Based on the results of this study, it is possible to predict in which parts of the process it is best to invest so that a greater yield can be obtained. The objective of this study was achieved, since the process duration could be reduced from a two-day bottling process to attain all the bottling in a single day. 20 refs.
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Key Words: *Manufacturing Systems Design, Simulation Modelling, Process Optimisation*