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COST-TIME PROFILE SIMULATION FOR JOB SHOP SCHEDULING DECISIONS

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Abstract
Manufacturers have to look constantly for new strategies and tools to improve processes, decrease cost and increase productivity and efficiency. Production scheduling is one of the crucial elements in manufacturing and has an impact on delivery deadlines and also on the production process in terms of its utilization. On the other hand, the value stream optimization is very important for lean manufacturing efforts. This paper is aimed to research the impact of job shop scheduling on value stream optimization and decreasing of cost-time investment. Value stream mapping represents a very efficient tool for visualization of activities within production flow focused on activity duration with the purpose to eliminate non-value added activities. Value stream costing is based on value stream and eliminates the need for overhead allocation and calculation. Cost-time profile is a powerful tool for visualization and calculation of cost accumulation during the time across the entire manufacturing flow. Software tools used in this paper are: Lekin scheduling system for constructing the schedules based on four different dispatching rules and Cost-Time Profiler software for simulating the impact of different schedules on total production cost and cost-time investment (representing the time value of money), which is proposed as a new scheduling objective function. 32 refs.
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Key Words: *Cost-Time Profile, Lean Manufacturing, Value Stream Costing, Scheduling, Cost-Time Investment Simulation*

Pages 225-236

USE OF NEURAL NETWORKS IN PREDICTION AND SIMULATION OF STEEL SURFACE ROUGHNESS

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Abstract
Researches on machined surface roughness prediction in the face milling process of steel are presented in the paper. The data for modelling by the application of neural networks have been collected by the central composite design of experiment. Input variables are the parameters of machining (number of revolutions – cutting speed, feed and depth of cut) and the way of cooling, while the machined surface roughness is output variable. In the modelling process the algorithms Back-Propagation Neural Network, Modular Neural Network and Radial Basis Function Neural Network have been used. Various architectures of neural networks have been investigated on a data sample and they have generated the prediction results which are at the *RMS* (Root Mean Square) error level of 5.24 % in the learning phase (8.53 % in the validation phase) for the Radial Basis Function Neural Network, 6.02 % in the learning phase (8.87 % in the validation phase) for the Modular Neural Network and for the Back-Propagation Neural Network 6.46 % in the learning phase (7.75 % in the validation phase). 29 refs.
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Key Words: *Neural Networks, Surface Roughness, Face Milling, Modelling and Simulation*

Pages 237-251

DESIGNING A LAYOUT USING THE MODIFIED TRIANGLE METHOD, AND GENETIC ALGORITHMS

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Abstract
This paper describes the use of genetic algorithms (GA) for solving the facility layout problem (FLP) within manufacturing systems' design. The paper considers a specific heuristic layout planning method, known as the modified triangle method. This method seeks for an optimal layout solution based on the degrees of flows between workstations. The search for an optimal solution is extremely time-consuming and not suitable for larger systems; therefore we have developed a system based on evolutionary computation. Our paper presents a system, based on GA, and the results obtained regarding several numerical cases from the literature. We propose the usage of this system by presenting numerous advantages over other methods of solving FLP for problem representation and evolutionary computation for solution search. 43 refs.
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Key Words: *Facility Layout Problem, Triangle Method, Genetic Algorithms*

Pages 252-263

ROLE-BASED COMMAND HIERARCHY MODEL FOR WARFARE SIMULATION

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Abstract
In warfare modelling and simulation (M&S), the mission assigned to an aggregate unit, such as platoon, company, battalion, etc., is achieved by the military operations that the unit's subordinates perform. In this procedure, the tactics for achieving the mission play an essential role for the aggregate unit to translate the abstract mission statement into concrete military operations to be performed by its subordinates in consideration of the dynamically changed warfare situation. However, the practical component-based warfare M&S software does not provide a model to explicitly represent such tactics. In this paper, we define ROle-based Command Hierarchy (ROCH) model for users to formally represent the tactics of units at design time and develop ROCH framework to support that an aggregate unit dynamically assigns roles to its subordinates considering their situation at runtime. Then, we discuss the benefits of our approach from the perspectives of composability, reusability, adaptability, and scalability. 13 refs.
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Key Words: *Component-Based Warfare Simulation, Tactical Model, Dynamic Role Assignment*

Pages 264-275

FINITE ELEMENT MODELLING AND SIMULATION OF CHIP BREAKING WITH GROOVED TOOL

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Abstract
A finite element model is presented to simulate chip breaking when orthogonal turning medium carbon steel with a grooved cutting tool is used. The chip formation, chip breaking, cutting force, stress, strain and temperature are simulated by the thermo-elastic-plastic finite element method, using commercial finite element software. The cutting process is simulated from the initial to the steady-state of cutting force, and then to periodic fractures of machined chip, by incrementally advancing the cutting tool. Normalized Cockcroft & Latham's criterion is employed to predict the effect of tensile stress on chip fracture. The cutting force and bending moment are analysed to explain the mechanism of chip breaking. Experiments on the application of the grooved cutting tool were performed. The simulated broken chip profile and cutting force compare well with experimental observations that the established FE model is capable of capturing the overall trend of the experimental results. 24 refs.
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Key Words: *Orthogonal Machining, Chip breaking, Grooved Tool, FEM, Chip Fracture Criterion*