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EVALUATION OF MANUFACTURING TOLERANCE USING A STATISTICAL METHOD AND EXPERIMENTATION

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Abstract
This paper proposes a study of a milling process planning to determine the tolerancing for manufacturing using statistical tool. The deviation between the machined surface and the surface corresponding to the nominal one due to combined errors is expressed in terms of the small displacement torsor parameters. These parameters are considered as random variables, displacements are expresses as variances. Experimentation is realised on a set of manufactured parts which consists of measuring various defects on machine-tool. The experimental results and the simulation results are compared in this paper. 23 refs.
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Key Words: *Manufacturing Tolerancing, Statistical Analysis, Simulation, Three-Dimensional Model, Process Planning*

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OPTIMISING FLOW STRESS INPUT FOR MACHINING SIMULATIONS USING TAGUCHI METHODOLOGY

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Abstract
Flow stress is a vital input data for successful simulation of a machining process. However the flow stress data obtained from experiments do not represent the practical machining conditions which induce errors in the simulated output. In this research work the flow stress of Ti6Al4V titanium alloy is improved through a new integrated Taguchi – Finite element optimisation technique. The finite element (FE) outputs for cutting force, feed force and chip thickness ratio are compared with the results from the orthogonal machining process and an optimum set of material parameters of the Johnson – Cook (JC) flow stress equation is identified. The optimised flow stress is found to improve the simulated cutting forces by 3-16 %, feed forces by 2-25 %, chip thickness ratio by 0-19 % over flow stress computed from conventional JC model parameters. The yield strength parameter of the JC model impacts the simulation results the most and the JC material constitutive law is found to be robust in flow stress characterisation with the optimized parameters. 24 refs.
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Key Words: *Taguchi Optimisation, Finite Element Simulation, Orthogonal Cutting, Titanium Alloys, Flow Stress Models*

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HEAT TRANSFER ENHANCEMENT FOR NATURAL CONVECTION FLOW OF WATER-BASED NANOFLUIDS IN A SQUARE ENCLOSURE

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Abstract
Numerical analysis is performed to examine the heat transfer enhancement of Au, Al_2O_3, Cu and TiO_2 water-based nanofluids. The analysis uses a two-dimensional enclosure under natural convection heat transfer conditions and has been carried out for the Rayleigh number range $10^3 \leq Ra \leq 10^5$, and for the nanoparticles' volume fraction range $0 \leq \varphi \leq 0{,}10$. The governing equations were solved with the standard finite-volume method and the hydrodynamic and thermal fields were coupled together using the Boussinesq approximation. Highly accurate numerical results are presented in the form of average Nusselt number and heat transfer enhancement. The results indicate clearly that the average Nusselt number is an increasing function of both, Rayleigh number and volume fraction of nanoparticles. The results also indicate that heat transfer enhancement is possible using nanofluids in comparison to conventional fluids, resulting in the compactness of many industrial devices. However, low Rayleigh numbers show more enhancement compared to high Rayleigh numbers. 18 refs.
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Key Words: *Natural Convection, Nanofluids, Square Cavity, Heat Transfer, Numerical Modelling*

Pages 40-57

A HIERARCHICAL PRODUCTION PLANNING SYSTEM SIMULATOR

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Abstract
This research develops and demonstrates a Hierarchical Production Planning System Simulator (HPPSS) for the analysis of feedback-and-control mechanisms between linear programming models at two levels within a Hierarchical Production Planning (HPP) system. This work focuses on planning levels dealing with tactical decisions. Three areas distinguish it from prior research. First, the HPPSS allows explicit examination of the effects of different information exchanges between the levels of a hierarchical model. Second, the HPPSS allows examination of the problems for which a given feedback-and-control mechanism performs well. Finally, the HPPSS allows the effects of a rolling horizon implementation on the hierarchical models of the production planning problem to be investigated. The significance is that a more thorough understanding of the costs and benefits of various mechanisms for information exchange between the levels of hierarchical models of planning problems over time will lead to improved hierarchical decision-making techniques that may influence organizational design. 20 refs.
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Key Words: *Distributed Decision Making, Hierarchical Production Planning, Hierarchical Modelling, Simulation, Feedback and Control, Information Exchange*