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LAMINAR NATURAL CONVECTION OF NON-NEWTONIAN NANOFLUIDS IN A SQUARE ENCLOSURE WITH DIFFERENTIALLY HEATED SIDE WALLS

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Abstract
The present work deals with the laminar natural convection in a square cavity with differentially heated side walls subjected to constant temperatures and filled with homogenous 0,4 wt. % aqueous solution of carboxymethyl cellulose (CMC) based Au, Al_2O_3, Cu and TiO_2 nanofluids obeying the Power law rheological model. The governing differential equations have been solved by the standard finite volume method and the hydrodynamic and thermal fields are coupled together using the Boussinesq approximation.

The main objective of this study is to investigate the influence of the nanoparticles' volume fraction ($0\ \% \leq \varphi \leq 10\ \%$) on the heat transfer characteristics of CMC based nanofluids over a wide range of nanofluid Rayleigh number ($10^3 \leq Ra_{nf} \leq 10^6$).

Accurate numerical results are presented in the form of dimensionless temperature and velocity variations, isotherms, mean Nusselt number and heat transfer enhancement. The results indicate clearly that the heat and momentum transfer characteristics are affected only by the nanofluid Rayleigh number, while the type of nanoparticles (i.e. thermo-phyisical properties) and their volume fraction have effect only on the heat transfer enhancement. 20 refs.
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Key Words: *Natural Convection, Non-Newtonian Nanofluids, Mean Nusselt Number, Heat Transfer Rate Enhancement, Numerical Modelling*

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APPLYING SWARM INTELLIGENCE TO DESIGN THE RECONFIGURABLE FLOW LINES

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Abstract
Reconfigurable Manufacturing System (RMS) justifies the need of hour by combining the high throughput of dedicated manufacturing system with the flexibility of flexible manufacturing systems. At the heart of RMS lies the Reconfigurable Machine Tools which are capable of performing multiple operations in its existing configurations and can further be reconfigured into more configurations which makes the configuration selection an arduous task. In the present research work the design of single part reconfigurable flow line has been attempted considering multiple objectives i.e. cost and machine utilization. A methodology is proposed for multiple objective optimization of RMS configuration based on machine utilization and cost by applying Multiple Objective Particle Swarm Optimization (MOPSO). A case study has been taken to illustrate the developed approach of flow line optimization applying MOPSO. 24 refs.
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Key Words: *Reconfigurable Manufacturing System, Reconfigurable Machine Tool, Single Part Reconfigurable Flow Line, Machine Selection, Multiple Objective Particle Swarm Optimization*

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COORDINATION OF ROBOTS WITH OVERLAPPING WORKSPACES BASED ON MOTION CO-EVOLUTION

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Abstract
The level of autonomy is the most important feature by which the modern robotic systems development is directed. Furthermore, if the robots are supposed to work together in order to solve a complex task, their workspaces are shared. In this case, the robots present dynamic obstacle to each other. This paper presents a solution of the problem of motion coordination of two robots with overlapping workspaces based on co-evolutionary algorithm for simultaneous motion planning of the two robots. A method for exact calculation of the solution coding chromosome length based on physical limitations of the robots is proposed. The algorithm is evaluated in a simulation environment developed in Matlab. Implementation to the real industrial FANUC Lr Mate 200*i*C robots is performed. The simulation and implementation show high potential in terms of convergence robustness and time. 28 refs.
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Key Words: *Motion Planning, Industrial Robots, Co-evolutionary Algorithm*

Pages 39-49

COMPUTER AND EXPERIMENTAL SIMULATION OF BIOMASS PRODUCTION USING DRUM CHIPPER

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Abstract
When producing wood chips using a drum chipper, several material, construction, and technological parameters that influence this process need to be observed and controlled. The correct choice of optimal parameters during the production of wood chips is reflected in the amount of used energy deposited within the wood mass. The results of monitoring the thermal characteristics of individually different kinds of wood chips show that biomass using rougher-structured wood fibers is more suitable for larger systems. Dust particles within the wood fractions are undesirable despite however welcome the consistent form and size structures of the wood chips are. Based on the results of computer simulations, real measurements, and testing during the production of wood chips, we found discrepancies between the predicted and actual characteristics of the desired outputted wood fuel. The reasons for the determined discrepancies are stated and commented on. 24 refs.
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Key Words: *Biomass, Drum Chipper, Production Optimisation, Influential Parameters, Simulation Model*

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MULTI-OBJECTIVE BUFFER SPACE ALLOCATION WITH THE CROSS-ENTROPY METHOD

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Abstract
The buffer allocation problem (BAP) has been widely studied by researchers while pursuing diverse research goals. Similarly, the cross-entropy method has been applied to a variety of optimisation problems with single objectives. In this article it is extended to the multi-objective case and proposed as a computationally economic approach to optimise at least two conflicting objectives of the BAP, namely throughput rate and allocated buffer space, while using computer simulation as evaluation function of small to large stochastic queuing networks of unreliable resources. No assumptions are made regarding the service time, time-to-failure and repair time distributions, and a general solution for obtaining the network-related Pareto front is proposed. The results for test networks indicate that reasonable Pareto fronts can be obtained via a low number of multi-objective solution evaluations using the modified cross-entropy method (CEM). 29 refs.
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Key Words: *Cross-Entropy, Simulation, Multi-Objective Optimisation, Buffer Allocation*