Editorial

Special issue section on

Contemporary Approach to Production Processes Management

We would like to warmly welcome and thank you for reaching for this issue of the *JAMRIS – Journal of Automation Mobile Robotics Intelligent Systems*. The chosen topic *Contemporary Approach to Production Processes Management* is not accidental.

The conditions and requirements ruling enterprises' functioning are more and more complicated demanding, changing and challenging each day. The companies have to constantly search for and use new ways, methods of managing their inner processes, implement new manufacturing systems to be competitive and be able to exist on the market. It's inevitable however time consuming and costs generating. In the papers there are described the issues of scheduling of production tasks implementing methods of artificial intelligence, theories of neuron nets, automation processes, control of the performed tasks. Among the mentioned issues there are also presented methods of modeling and simulating of performed activities on the basis of virtualization of production systems using the philosophy of digital factory. What's worth mentioning is the fact that all the paper included in this issue were presented on a conference *Intelligent Manufacturing Systems '2008*.

We are indebted to the authors and reviewers for their efforts, outstanding contributions and assistance in the preparation of this special issue. We would like to express our special, sincere gratitude to the editors of JAMRIS for giving your consent to publishing all this papers and reviewers for their efforts in making the reviews and comments on the papers.

In the first paper A. Wannagat and B. Vogel-Heuser are focused on sensor failures and ways of their management by increasing flexibility and availability of self-adapting manufacturing systems. This proposal introduces a conceptual design of self-adapting system software to manage sensor failures in factory automation. The approach reconfigures the arrangement of software modules in real time to preserve the required stability of production processes without interrupts. Reconfiguration will be decided by rules from a knowledge base system. This paper discusses conventional, object oriented and agent based concepts, and focuses on modeling of these concepts. For discussion purposes, a real industrial application - a continuous thermo-hydraulic press will be presented as application example.

The second paper by A. Vallejo, R. Morales-Menendez, H. Elizalde-Siller covers the issue of intelligent control system over next-generation of High-Speed Machining (HSM) systems Next-generation of High-Speed Machining (HSM) systems demand advanced features such as intelligent control under uncertainty. These require, in turn, an efficient administration and optimization of all resources in the system towards a previously identified objective. This work presents an optimization system based on Markov Decision Process (MDP). The intelligent control system guides the actions of the operator in peripheral milling processes. Early results suggest that MDP framework can cope with this application; this makes room up to several benefits. Future work will address the full integration of the developed optimization scheme within a commercial machining center.

M.O. Ait El Menceur, P. Pudlo, J.-F. Debril, P. Gorce, F.-X. Lepoutre deal with alternative movement techniques identification. Few studies in literature propose quantitative techniques to achieve this purpose for example a biomechanical index based technique named JCV. This method finds its limits when dealing with three-dimensional complex movements. In the present study authors propose a modification of this method so that it will be applied to complex movements. They consider a non-habitual end effector (Midpoint between Hips). They obtain other indices, 3BJCV, to which a non-supervised clustering technique is applied. They have applied this method to the ingress movements of 37 young and elderly subjects with or without

prosthesis entering in a minivan vehicle. The proposed method allows the identification of the two big classes of ingress movements observed by Ait El Menceur *et al.*

B. Kilundu, P. Dehombreux, Ch. Letot, X. Chiementin present a procedure for early detection of rolling bearing damages on the basis of vibration measurements. First, an envelope analysis is performed on band-pass filtered signals. For each frequency range, a feature indicator is defined as sum of spectral lines. These features are passed through a principal component model to generate a single variable, which allows tracking change in the bearing health. Thresholds and rules for early detection are learned thanks to decision trees. Experimental results demonstrate that this procedure enables early detection of bearing defects.

In the fifth paper, A. Pashkevich, A. Klimchik, D. Chablat, P. Wenger present a new stiffness modeling method for multi-chain parallel robotic manipulators with flexible links and compliant actuating joints. In contrast to other works, the method involves a FEA-based link stiffness evaluation and employs a new solution strategy of the kinetostatic equations, which allows computing the stiffness matrix for singular postures and to take into account influence of the external forces. The advantages of the developed technique are confirmed by application examples, which deal with stiffness analysis of a parallel manipulator of the Orthoglide family.

M. Nentwig and P. Mercorelli deal with a robust throttle valve control, which has been an attractive problem since throttle by wire systems were established in the mid-nineties. Control strategies often use a feed-forward controller, which use an inverse model; however, mathematical model inversions imply a high order of differentiation of the state variables resulting in noise effects. In general, neural networks are a very effective and popular tool for modeling. The inversion of a neural network makes it possible to use these networks in control problem schemes. This paper presents a control strategy based upon an inversion of a feed-forward trained local linear model tree. The local linear model tree is realized through a fuzzy neural network. Simulated results from real data measurements are presented, and two control loops are explicitly compared.

In the next paper, A Hamrol and A. Kujawińska deal with the analysis of process stability with the use of process control charts. A new idea of pattern recognition and two original methods of data processing, called OTT and MW have been described. The software application CCAUS (Control Charts - Analysis Unnatural Symptoms) supporting process control charts analysis with OTT and MW has been presented as well. Also the paper contains the results of the verification of the proposed methods performed on the basis of data obtained from two machining operations.

In the eight paper, J. Pomares, P. Gil, J.A. Corrales, G. J. García, S.T. Puente, F. Torres present a cooperative robot-robot approach to construct metallic structures is presented. In order to develop this task, a visual-force control system is proposed. The visual information is composed of an eye-in-hand camera, and a time of flight 3D camera. Both robots are equipped by a force sensor at the end-effector. In order to allow a human cooperate with both robots, an inertial motion capture system and an indoor localization system are employed. This multisensorial approach allows the robots to cooperatively construct the metallic structure in a flexible way and sharing the workspace with a human operator.

J. Matuszek and J. Mleczko: as constant fight for the client led by fulfilling customers' demands by the shortening time of order's performance as well as delivery cycle etc. define the reality of companies' existence nowadays, the companies are forced to meet short deadlines with keeping the product price competiveness condition at the same time. That is hardly possible without a proper APS (Advanced Planning System) class advanced planning support system. Though expensive, it's being used in conditions of unit and small-batch production and this paper has been drawn on the basis of the research on overloads-of moving bottlenecks in the mentioned above conditions. It has been proved that due to vast amount of resources and tasks some especially small and medium-sized enterprises (SME) are not able to deal with such big data range and to optimize their production processes. Therefore, the author took on building a heuristic algorithm, which could find a good enough solution and based on TOC (Theory Of Constraints) assumptions and their verification he conducted some tests in real production systems. The mentioned above method found its application in the industrial scale, as extension of the ERP class system.

M. López Campos and A. Crespo Márquez present a chronological tour for the most important models of maintenance management, describes them in a general way and classifies them according to their functioning under declarative models and under process oriented models. It distinguishes in addition the innovations proposed by every author and compares the elements that form every model, with some of the points that the norm ISO 9001:2000 mentions, as well as with other criteria considered suitable to the case. From this analysis are derived the results between which are distinguished some desirable characteristics for

a modern and efficient maintenance management model. In addition is discussed the application of these models to support industrial needs, as well as its future challenges.

S. Kłos and J. Patalas deal with a computer-based information system for enterprise integration, with enterprise resource planning (ERP) systems, which support management processes. Today ERP implementation is a strategic decision due to the fact that it influences enterprise's development by giving all the necessary information from all areas of enterprise functioning, therefore should also evolve together with enterprises.

In the last paper, M. Gregor, Št. Medvecký, J. Matuszek, and A. Štefánik present the results of research and development of the Digital Factory solutions in industry, which cover design of assembly system, its processes, simulations model, ergonomic analysis etc. In the paper are presented the solutions developed in the framework of co-operation with industrial partners like Volkswagen Slovakia, Thyssen Krupp PSL, Whirlpool. The paper contains results of research realized in 3D laser scanning and digitization of large size objects of the current production systems. The developed and validated methodology shows the procedure of 3D laser scanning application by the digitization of production halls, machine tools, equipment, etc. This procedure was tested and validated in chosen industrial companies. The paper presents achieved benefits and future research goals as well.

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