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## Editorial

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**Biographical notes:** Frédéric Grimaud, MSc and PhD in Computer Science, is Associate Professor and Deputy-Director of the Laboratory for Information Science and Technology at the Ecole des Mines de Saint-Etienne (France). His research activity focuses on the use of discrete-event simulation for design and management of production and logistics systems. In addition, he is in charge of many courses on simulation and lean manufacturing in different engineering schools and universities.

Alexandre Dolgui, DrHab, PhD, Eng, is the Director of the Laboratory for Information Science and Technology at the Ecole des Mines de Saint-Etienne (France). His principal research focuses on manufacturing line design, production planning and supply chain optimisation. The main results are based on exact mathematical programming methods and their intelligent coupling with heuristics and metaheuristics. He has co-authored five books, edited 11 additional books or conference proceedings, and published about 115 papers in refereed journals, 15 book chapters and over 250 papers in conference proceedings. He is an Area Editor of the *Computers and Industrial Engineering*, an Associate Editor of *Omega – the International Journal of Management Science* and *IEEE Transactions on Industrial Informatics*. He is also an Editorial Board Member of 10 other journals, including *Int. J. Simulation and Process Modelling*.

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This issue is composed of revised and extended versions of seven papers selected at the 12th and 13th IFAC Symposium ‘Information Control Problems in Manufacturing’ (INCOM06 and INCOM09). All the papers were subjected to a rigorous peer review process with at least three referees. This endeavour was performed twice: before the symposiums, for their initial version, and after the symposiums, for the extended version.

The 12th and 13th IFAC symposiums INCOM06 (Saint-Etienne, France) and INCOM09 (Moscow, Russia) were major scientific events in our domain.

INCOM06 welcomed 783 participants: 544 academics plus 239 industrial representatives; 98 sessions in the final program, 42 industrial exhibitors, 2665 pages of symposium proceedings with 950 authors.<sup>1</sup>

As to INCOM09 there were 654 participants including 112 industrial representatives, 17 participants in VIP meeting (Russian Ministers, Presidents of Leading Universities and Directors of Research Institutes) and over 2200 pages of the proceedings were published.<sup>2</sup>

The next symposium INCOM’12 will be held in Bucharest, Romania (May 23–25, 2012) to bring together again international researchers from academia and industry in the fields of industrial engineering and operational research, automatic control and computer science, working on improving manufacturing systems and logistics.<sup>3</sup>

The articles of this issue are from the long-established symposium sessions ‘Simulation in industrial engineering’ where the presentations focused on the practical use of discrete-event simulation and soft computing techniques for

the design and analysis of the production systems and supply chains.

Let us begin with the first paper. ‘Proactive production activity control by online simulation’, by Olivier Cardin and Pierre Castagna, deals with application of discrete-event simulation to observe the actual behaviour and forecasting of future trends in a complex manufacturing system. In the control of a production system the use of simulation is constrained by the necessity to forecast the state of the system in real time. This implies that the initial state of the simulation must be the actual state of the system. This crucial technical problem is overcome in this paper. The case study of a FMS reported in this paper illustrates the technical feasibility of the developed concepts. The potential benefits for online control of FMS based on simulation are spotlighted. We hope that the reader will appreciate this engaging work.

The second paper ‘An emulation-based execution control system evaluation tool: application to a furniture manufacturing group’ by Thomas Klein and André Thomas illustrates an essential research project for the use of simulation when the execution control system of an enterprise has to be changed. It is often necessary to compare different potential execution control systems. The approach developed is based on emulation via discrete-event simulation. The emulator of the shops is connected to the control system studied in order to evaluate its performances. The proposed test bed architecture offers the possibility to present a quantitative comparison between the previously used control system and the considered one.

An industrially sized emulation model is developed and so now the author can study real-life sized systems.

The third paper 'A simulation-based equipment environment for flexible manufacturing systems' by Yi-Sheng Huang and Ho-Shan Chiang concerns a simulation environment for FMS. The tool developed provides a controller to coordinate equipment within a cell. A scenario solution to model the handshaking communication of the equipment is provided. Then, this is converted into a Petri net which is then emulated to simulate the process studied. The obtained Petri net can be formally analysed. The main advantage of this emulator is that it does not need the actual equipment of an FMS for experimental testing. Thus, numerous experiments can be conducted without danger and extensive costs.

The next paper is 'Feasibility evaluation of multi-site scheduling by distributed simulation of workshops' by Simon Enjalbert, Bernard Archimède and Philippe Charbonnaud. The authors propose a distributed simulation tool for the evaluation of the feasibility of multi-site scheduling. This problem is not sufficiently studied in literature. A generic framework to model this problem is developed. These results are interesting because they permit to generate and solve various problems of tasks coordination in distributed production systems. The HLA protocol is employed to guarantee the synchronisation and chronology of events. In addition, a case study is reported for a supply chain composed of three enterprises. This demonstrates the effectiveness of this distributed simulation tool. Thus, their paper will be especially useful for anyone dealing with supply chain and network modelling and scheduling.

The paper 'Risk analysis for cooperation policies benefits in reducing the bullwhip effect in a telecom supply chain' by Caroline Thierry, Jaouher Mahmoudi, Jacques Lamothe studies the 'bullwhip effect'. This is when small variations in end-item demand create order and inventory oscillations that amplify from a downstream site to an upstream site. The authors apply risk analysis methods and show the profits or losses that can accrue when applying various corporation policies. These policies are based on known planning, information sharing and stock-adjustment strategies. The supply chain considered is four-staged. Novel simulation techniques were developed which can be easily integrated in the risk analysis models used. Well written, clear and motivating, this paper is an extraordinary look at the bullwhip effect with risk analysis techniques.

The following paper 'Manufacturing network simulation using a data-driven model' by Mohand Essaid, Frédéric Grimaud and Patrick Burlat deals with study of alliances leading to the creation of supply networks. Before signing a partnership agreement it is essential to evaluate viability of proposed supply network. Simulation provides an attractive tool to make decisions on potential partners. However, due to its complexity, associated high cost, and excessive time consumption, simulation has failed to gain a wide acceptance from industrial users. This paper presents a

generic simulation model which attempt to create reusable enterprises modules for evaluating supply chain performance. The simulation was developed using ARENA software. It is connected with spreadsheet configuration tool. The latter permits a data-driven approach for simulation instances creation. The type of enterprise, its demand response strategy and production management policy used, and the effectiveness of its equipment are the constituents of the model instantiation. These aspects constitute a library of modules from which various configurations of supply network can be implemented and simulated. The tool is tested in a make to stock environment to evaluate supply chain configurations when enterprises of different effectiveness levels and management policies are cooperating in a supply network.

The last paper of this issue is 'A genetic algorithm with tournament selection for optimising inspection allocation in multiproduct multistage production systems' written by Przemyslaw Korytkowski. This paper is from INCOM09 and slightly different from other papers because it uses queuing models instead of discrete-event simulation. One compelling reason to include this paper is that it completes perfectly the simulation based approach by using approximate analysis of queuing models which underlies discrete-event simulation. This paper concerns the problem of optimal allocation of inspection stations in a production line. Inspection is a very important issue for modern production systems where the quality is a major challenge. Nevertheless, the inspection stations and procedures are costly. Thus, it is crucial to have some decision-aid techniques to plan the number and placement of these pieces of equipment. The author suggests a genetic algorithm which uses instead of simulation a GI/G/n queuing model and decomposition method for the cost and performance evaluation. The experimental study reported shows that the method proposed is efficient and can be used for real life situations.

This issue was specifically constructed to put together several articles on different aspects of this area written by some of the foremost scientists in this domain. We hope that all our readers will enjoy and take away some knowledge and insight from the papers presented.

We would like to thank the authors for their contributions and the anonymous referees for the time they have put in reviewing all papers. Thanks as well to Dr. M.A. Dorgham, Editor-in-Chief of the *Int. J Simulation and Process Modelling*, and Dick Sharp journal manager for their help in publishing this special issue. The Guest Editors thank also Chris Yukna for his help in English.

## Notes

<sup>1</sup><http://www.emse.fr/incom06>

<sup>2</sup><http://incom09.org/>

<sup>3</sup><http://www.incom12.ro/>