

Editorial

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This special issue of the Journal of Intelligent Manufacturing Systems gathers some of the most representative papers presented in the Track **Holonic and Multi-Agent Technologies for Industrial Systems** of the 14th IFAC Symposium “Information Control Problems in Manufacturing”—INCOM’12 organized on May 23–25, 2012 in Bucharest.

INCOM 2012 focused both on strategic R&D lines in manufacturing control and logistics, and on real problems of design, deployment and operations management. Manufacturing systems with *Distributed Intelligence* were analyzed in terms of: holonic and multi-agent technologies, intelligent processes, products and Product Lifecycle Management, service orientation, semi-heterarchical control topologies and computing architectures for agile and sustainable shop floor processes.

Manufacturing systems are amongst the most complex and demanding artifacts in modern society but also amongst the most valuable ones. The challenges include coping with their heterogeneous nature and their on-line interactive nature in combination with competitive pressures. Off-line plans are known to become invalid within minutes after arriving on the factory floor. Therefore, researchers are looking into matching technologies which are able to answer these challenges. *Holonic systems* are, actually by definition, targeting such challenges. *Agent technologies* focus on interactive and decentralized aspects. In particular, developments aim to deliver open systems and system components, as well as infrastructure and infrastructural components rather than closed systems. This open nature implies that developments will not solve industrial problem on their own but rather

contribute while avoiding the unnecessary constraining of an overall solution.

Technological advances in wireless sensor networks are enabling new levels of distributed intelligence in several forms such as active products that interact with the working environment and smart metering for monitoring the history of products over their entire life cycle and the behavior of resources. These distributed intelligences offer new opportunities for developing techniques to reduce myopic decision making in manufacturing control systems thereby potentially enhancing their sustainability. Control architecture could itself switch modes of operation to adapt to severe disruptions. *Manufacturing sustainability* is addressed in this special issue with respect to: fault-tolerance to disturbances; energy efficiency at resource and shop floor level; balancing resource usage; cost efficiency and in line quality control of products. Innovative services will be enablers and drivers of growth of next generation of manufacturing enterprises that are competitive and sustainable.

This JIMS volume gathers some contributions related to concepts, methods and frameworks addressing trends in the *service orientation* of control technology and management applied to manufacturing enterprises.

The *service orientation* is emerging at multiple organizational levels in enterprise business, and it leverages technology in response to the growing need for greater business integration, flexibility and agility of manufacturing enterprises. Close related to IT infrastructures of web services, the Service Oriented Architecture represents a technical architecture, a business modeling concept, a type of infrastructure, an integration source and a new way of viewing units of automation within the enterprise.

Papers in this volume shed light on multi-agent systems and Holonic Manufacturing Execution Systems (HMES) creating the basis for agility, so that manufacturing enterprises

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can deliver new, more flexible business processes that harness the value of the services approach from a client's perspective are sought. Information systems integration and interoperability at enterprise level are feasible by considering that the customized product becomes the "active controller" of manufacturing enterprise resources.

The papers included in the special issue INCOM'12 of the *Journal of Intelligent Manufacturing Systems* cover these specific research lines, which represent a trend for modern manufacturing control.

Some of the new, outstanding ideas presented at INCOM'12 can be found in this volume: A new paradigm of Intelligent Product based on Distributed Intelligence in manufacturing, also leading to solutions for product-driven automation; A new paradigm of reconfigurable manufacturing systems based on monitoring resource services; New approaches for mixing production planning with product scheduling and resource allocation for batch optimization; New approaches for dynamic mode switching in semi-heterarchical control systems for myopia reduction and agility.