Editorial

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Manufacturing is a significant wealth generation sector, accounting for over 20% of the European Union's (EU's) gross domestic product. To compete successfully in the global market, European manufacturing industry needs to be underpinned by well focused advanced production systems research. Because of the breadth of the field, commercial considerations and the multi-nationalism of the EU, production research activities within it have been naturally fragmented.

Under its Sixth Framework Programme (FP6), the EU introduced networks of excellence (NoE) as a new 'instrument' to overcome fragmentation of European research and help shape the conduct of research in Europe. The operation of these networks is based on a joint programme of activities aimed principally at integrating the research activities of the network partners while also advancing knowledge on the topic.

The EU's FP6 NoE for innovative production machines and systems (I*PROMS) was inaugurated in October 2004. I*PROMS integrates the production research activities of 30 research centres from 14 countries in Europe. It addresses production research in an integrated manner to help shape this research area and overcome fragmentation. By creating an EU-wide research community concentrating on future manufacturing concepts, processes and systems, I*PROMS acts as the main research hub within the EU for the whole area of production machines and systems.

I*PROMS adopts the knowledge-based 'autonomous factory' vision for delivering increased competitiveness for manufacturing in 2020. The network focuses on intelligent and adaptive production machines and systems that meet dynamic business and value drivers through advanced information and communication technology.

I*PROMS promotes the development of common concepts, tools and techniques enabling the creation and operation of flexible, reconfigurable, sustainable, fault-tolerant and eco- and user-friendly production systems. Such systems should react rapidly to changing customer needs, environmental requirements, design inputs and material/process/labour availability to manufacture high quality, cost-effective products.

I*PROMS addresses six manufacturing challenges namely, concurrent manufacturing, integration of human and technical resources, conversion of information to knowledge, environmental compatibility, reconfigurable enterprises, and innovative manufacturing processes and products. Work on those themes is conducted by four interconnected clusters: advanced production machines (APM), production automation and control (PAC), innovative design technology (IDT) and production organisation and

management (POM). The research undertaken by these four I*PROMS clusters covers a broad range of topics including new processes for new materials, miniaturisation, mechatronic modules, nanotechnology, modelling and simulation, product life cycle planning, flexible manufacturing systems, process integration, new process control and sensors concepts, intelligent manufacturing process/near-net shape processes and substitution of harmful substances. Further information can be found at the I*PROMS website (URL: http://www.iproms.org).

The papers presented in this issue were selected from the *I*PROMS Virtual Conference on Innovative Production Machines and Systems* (http://www.conference.iproms.org). The papers address some of the control-related topics covered by three I*PROMS clusters, namely, APM, PAC and POM.

The APM area is represented by the following contributions:

- 'Calibrating force vs. position control applied to a milling operation using two hybrid automata' (Charbonnaud et al.)
- 'Hydraulic axis actuation control for precision motion' (El-Shalabi et al.)
- 'Energy harvesting for wireless sensor nodes: investigation of architectures and sources of energy' (Mekid and Zhu).

The PAC area is addressed in the following papers:

- 'Review and analysis of fuel cell system modelling and control' (Thanapalan et al.)
- 'Optimisation of a fuzzy logic controller using the bees algorithm for a robot gymnast' (Pham et al.)
- 'An efficient trajectory planning approach for autonomous robots in complex bridge environments' (To et al.)
- 'Hierarchical and modular fuzzy architecture for multiple mobile robots' (Awadalla)
- 'Ultrasonic distance scanning techniques for mobile robots' (Pham et al.).

The POM area is represented by the following paper:

- 'Automatic quality control of seam puckers based on shadow detection' (Mariolis).