Editorial

Embedded Systems Design in Intelligent Industrial Automation

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Industrial automation (IA) is the vast area of embedded computing devoted to industrial applications. Apart from many tailored solutions (numerical controllers, hardware controllers, etc.) the scene is dominated by programmable logic controllers, widely known by the abbreviation PLC, which represent the most wide-spread class of embedded computing platforms. In the past, the progress in embedded technologies has determined qualitative breakthroughs in the performance of automation systems, their affordability and efficiency of their design.

Intelligent industrial automation (IIA) has appeared as a branch of research and development, answering the challenges of flexible and adaptive manufacturing, which require mass customization instead of mass production. It stipulates the use of information and communication technology (ICT) methods and tools for creating self-configurable or easily-reconfigurable control systems to automate manufacturing processes.

The automation systems need to go beyond being a collection of networking PLCs—they should be intelligent in the way that they interact and behave and how they are used by a range of people, from control engineers to maintenance technicians. That is why the newly emerging trends in automation deal with service-oriented architectures, knowledge engineering, and Web-services. Most solutions to safety and predictive maintenance issues are implemented nowadays by such novel embedded solutions as wireless smart sensor networks.

Automation systems research faces the same significant challenges as does the embedded systems world, of which it is an integral part. One of these is the quest for integrated high-level design methods, languages, and tools [1]. In the automation domain this has translated into the development of component-based software architectures supporting visual programming, such as the IEC 61499 standard [2] and strategies for controlling distributed applications [3].

The challenges of designing these applications using embedded technologies are also contributing to the development of the embedded technologies themselves, in turn giving rise to new challenges.

This special issue is organized in collaboration with O³neida [4], the global organization, operating as a network of networks to promote distributed industrial automation based upon open standards.

Taking the O³neida perspective of the IA value added chain [5] means that an IA solution, developed or deployed by any organization, must include an analysis of the implications on the company's internal processes, on the management of its extended supply chain, all within the context of the complete product life cycle.

O³neida has recently extended its interest into new research-intensive application areas of IIA, such as

  (i) energy management,
 (ii) building automation,
(iii) health over Internet protocol (HoIP).

O³neida facilitates collaboration of industrial, academic, and research organizations by providing collaborative frameworks within which to conduct national and international research and development projects.

It also helps with knowledge transfer by supporting new publication initiatives, such as this special issue, or a series of industrial automation books, recently launched with the Instrumentation Society of America.

O³neida also works to develop and promulgate the international standards required to promote interoperable intelligent solutions in automation. For example, the joint paper [3] demonstrates collaboration of O³neida members from 9 organizations worldwide, in the work, aiming at the improvement of the IEC 61499 standard.

Finally, O³neida has recently opened O³neida Europe, its second international node focused on European industrial automation activities. O³neida Asia is expected to be formed later this year.

This special issue is a fine example of the collaboration environment, created by O³neida and enthusiastically supported by its members.

The papers, selected for this special issue, cover a wide spectrum of the automation research, concerning topics such as extending the capabilities of embedded computing platforms, or using them to the benefit of automating demanding manufacturing systems. These papers can be divided onto three thematic groups.

The first group refers to the high-level system engineering in flexible and reconfigurable manufacturing, implementing the idea of system-level languages in the IIA domain, which naturally leads to the new generation of embedded control devices beyond PLCs. In particular, the paper by Ferscha et al. proposes a higher-level design methodology for flexible manufacturing systems with distributed control. The work by Ferrarini et al. applies metamodeling and model-driven architectures techniques for reconfigurable control of manufacturing systems. New programming architectures and methodologies for such controllers, in particular the novel IEC 61499 architecture, are discussed by Gerber et al. and Dubinin et al. Thus, Gerber et al. investigate migration from the currently dominating PLC architecture of IEC 61131-3 to IEC 61499. Dubinin et al. propose a formal syntactic model of IEC 61499, needed to address the issue of its execution semantics.

The second group of papers addresses the solutions enabling intelligent networking, which progresses from simple device connectivity to provision of web-services and the use of service-oriented architectures. The latter imposes new requirements to the resource-constrained embedded platforms. Maciá-Pérez et al. deal with the problem of managing control applications and embedded services in automated equipments through a specialized reference frame of IT services. Collado et al. address the problem of implementing an XML parser on embedded device. The growing popularity of XML makes this work very relevant to many automation applications. Thramboulidis et al. propose the use of service-oriented architectures (SOA) as an integration technology to "glue" different applications, used in the design of intelligent automation systems. López Orozco et al. deal with performance of the FIPA agent-based protocols, which provide a higher-level communication language for intelligent automation nodes.

The third group of papers represents the important area of verification and validation of embedded automation systems. Vyatkin et al. propose a visual specification language to be used in formal verification of modular automation systems.

The works included in this special issue certainly cannot represent the whole body of relevant research. They rather highlight some exciting application areas of advanced embedded technologies. We hope this special issue will facilitate joint research between the industrial automation and the embedded systems research communities.

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Special Issue on
WiMAX, LTE, and WiFi Interworking

Call for Papers

Although WiMAX, LTE, and WiFi provide wireless broadband connectivity, they have been optimized for different usage models: WiFi for very high-speed local area network connectivity and WiMAX, LTE for high-speed wireless cellular connectivity. By combining WiMAX, LTE, and WiFi technologies, service providers can offer better usability of the networks infrastructure and support for seamless mobility and roaming. The unique similarities between WiMAX, LTE, and WiFi networks that make the proposed synergy promising is these technologies are fully packet switching uses IP-based technologies to provide connection services to the Internet. This standards- and IP-based network approach provides compelling benefits to service providers to collaborate between these technologies.

This special issue is intended to foster state-of-the-art research in the area of WiMAX, WiBro, LTE, and WiFi networking, and the corresponding technical advances in the design and deployment of feasible network architectures and protocols, and to present novel results and solutions to solve various problems and challenges foreseen in WiMAX, LTE, and WiFi interworking. The special issue will cover the following topical areas but are not limited to them:

- WiMAX, WiBro, MobileFi, LTE, and WiFi communications systems
- Single/dual radio handover
- Network architecture alternatives for interworking and integration
- Heterogeneous wireless networks
- Seamless vertical handover and session continuity
- Multiradio coexistence and power management
- Authentication, authorization, and accounting
- Security issues
- Common charging and billing
- Quality of services (QoS)
- Interworking using IMS, SIP, MIH, VCC, and UMA
- IEEE802.11u, IEEE802.16g/j/m/h
- Scenarios and usage cases
- WiMAX,WiBro, LTE, and WiFi Interworking Testbed
- Hybrid wireless mesh network
- Applications, VOIP, video streaming, and so forth
- IP Mobile, roaming, and mobility management
- Core network architecture
- Fixed-mobile convergence (FMC)
- PHY, MAC, IP, and upper layers issues

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Manuscript Due	October 1, 2009
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Special Issue on
Selected Papers from MultiMedia Modeling Conference 2009

Call for Papers

The 15th International Multimedia Modeling Conference (MMM2009) was held January 7–9, 2009 at EURECOM, Sophia-Antipolis, France. MMM is a leading international conference for researchers and industry practitioners to share their new ideas, original research results, and practical development experiences from all multimedia-related areas. MMM2009 is held in co-operation with the ACM Special Interest Group on MultiMedia (ACM SIGMM). This 15th edition of MMM marks the return of the conference to Europe after numerous years of activity in Asia, and we are proud to organize such a prestigious conference on the French Riviera.

MMM2009 features a comprehensive program including three keynote talks, six oral presentation sessions, three poster sessions, and one demo session. The 135 submissions included a large number of high-quality papers in multimedia content analysis, indexing, coding, as well as applications and services. We thank our 153 Technical Program Committee members and reviewers who spent many hours reviewing papers and providing valuable feedbacks to the authors. Based on the 3 or 4 (sometimes even 5) reviews per paper, the Program Chairs decided to accept only 22 as oral papers and 20 as poster papers. The acceptance rate of 32% follows the MMM tradition of accepting only the papers of the highest technical quality. Additionally, one award for the best paper was chosen.

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Special Issue on
Advances in Signal Processing for Maritime Applications

Call for Papers

The maritime domain continues to be important for our society. Significant investments continue to be made to increase our knowledge about what "happens" underwater, whether at or near the sea surface, within the water column, or at the seabed. The latest geophysical, archaeological, and oceanographical surveys deliver more accurate global knowledge at increased resolutions. Surveillance applications allow dynamic systems, such as marine mammal populations, or underwater intruder scenarios, to be accurately characterized. Underwater exploration is fundamentally reliant on the effective processing of sensor signal data. The miniaturization and power efficiency of modern microprocessor technology have facilitated applications using sophisticated and complex algorithms, for example, synthetic aperture sonar, with some algorithms utilizing underwater and satellite communications. The distributed sensing and fusion of data have become technically feasible, and the teaming of multiple autonomous sensor platforms will, in the future, provide enhanced capabilities, for example, multipass classification techniques for objects on the sea bottom. For such multiplatform applications, signal processing will also be required to provide intelligent control procedures.

All maritime applications face the same difficult operating environment: fading channels, rapidly changing environmental conditions, high noise levels at sensors, sparse coverage of the measurement area, limited reliability of communication channels, and the need for robustness and low energy consumption, just to name a few. There are obvious technical similarities in the signal processing that have been applied to different measurement equipment, and this Special Issue aims to help foster cross-fertilization between these different application areas.

This Special Issue solicits submissions from researchers and engineers working on maritime applications and developing or applying advanced signal processing techniques. Topics of interest include, but are not limited to:

- Sonar applications for surveillance and reconnaissance
- Radar applications for measuring physical parameters of the sea surface and surface objects
- Nonacoustic data processing and sensor fusion for improved target tracking and situational awareness
- Underwater imaging for automatic classification
- Signal processing for distributed sensing and networking including underwater communication
- Signal processing to enable autonomy and intelligent control

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