Guest Editorial:
Special Issue on “Industrial Applications of Distributed Intelligent Systems”

The complexity of automation and control applications in manufacturing systems, in the power and energy domain as well as in logistic environments increase steadily. Various actuators, sensors, and measurement units connected to control devices from different vendors have to work together with supervisory control and management systems, often in heterogeneous communication networks. The automation concepts and tools used in these areas, therefore, have to deal with a complex structure of distributed and autonomously acting units [1]–[3]. Recent trends in research community indicate that such devices and units are becoming increasingly intelligent so that they can perform tasks autonomously, and are usually equipped with powerful computing resources. In order to master the complexity of such highly interconnected and collaborative devices which can be considered as “Distributed Intelligent Systems”, advanced methods and concepts encompassing their life cycle of planning/engineering, operation, and reconfiguration/adaptation are needed. [4]–[7]

This special issue—organized by the IEEE SMC TC on Distributed Intelligent Systems—targets recent research results, trends, and practical developments of distributed intelligent systems that accomplish advanced tasks in the industrial areas of manufacturing, power and energy, and logistics. Five high-quality contributions to this special issue have been selected in a strict peer review process supported by reputed international experts. Three submissions focus mainly on technical aspects related to the design, development and validation process of distributed, intelligent automation systems, whereas the other two papers treat application-related topics.

A self-organizing approach for distributed manufacturing resources using service-oriented and peer-to-peer architectures is presented by W. Zhang et al. in the first paper of this special issue. W. Dai et al. discuss the usage of semantic technologies and methods for transforming IEC 61131-3 PLC-based control software into the IEC 61499 reference model for distributed automation. Moreover, a survey and an approach of applying the model-driven design paradigm for control software in distributed automation and control environments is presented and discussed by C.-H. Yang et al.

The next paper by E. Mojica-Nava et al. describes an approach of applying game-theory for the optimal dispatch in power distribution systems, especially for microgrids. Finally, in the last paper—also related to the challenging field of power and energy systems—P. Palensky et al. analyze challenges, tools and methods for simulating cyber-physical energy systems in order to design and validate complex control and management concepts.

The guest editors would like to thank all authors of the submitted papers and the reviewers for their support and constructive comments to this special issue. Special thanks go to Prof. V. Marik, past Editor-in-Chief of the TSMC-Part C, providing us the opportunity to organize this special issue. Moreover, we would like to express our gratitude to Dr. H. Krautwurmova, past Editorial Assistant of the TSMC-Part C, for her support and advice.

Finally, the guest editors wish you an enjoyable reading of the contributions to this special issue related to distributed intelligent systems in industrial environments.

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