Guest Editorial
Special Section on Industrial Control

INDUSTRIAL control addresses the use of sensors, metrology, and algorithms to monitor equipment, processes, products and to provide actionable information for maintenance and control. This Special Section of nine papers builds on and extends the contributions of the track on "Industrial Automation Systems and Controls" at the IEEE International Conference on Emerging Technology and Factory Automation (ETFA) held in Hamburg, Germany, 15–18 September 2008.

A. Applications

The successful application of industrial control draws from the domain expertise of multiple disciplines that are typically responsible for delivering separate elements of the complete solution such as IT/Factory Automation, Process Technology, Control Engineering, Yield Management, and Metrology. In this Special Section, industrial control application examples in manufacturing and chemical processing on annealing, refinery, semiconductor manufacturing, and debutanizer can be found in the following four papers respectively:

- Decentralized Fault Diagnosis of Large-Scale Processes Using Multiblock Kernel Partial Least Squares.
- Data-Driven Soft Sensor of Approach for Quality Prediction in a Refining Process.
- Fault Detection Based on Statistical Multivariate Analysis and Microarray-Type Visualization.
- A Hybrid FLC-EKF Scheme for Temperature Control of a Refinery Debutanizer Column.

B. Industrial Informatics

Advances in computing, communication, and sensing systems provide us with an enormous amount of good quality information that was in the past unimaginable. One challenge now is to make use of industrial informatics technology to analyze, manipulate and distribute the information in the manufacturing process to improve product quality and yield – some issues in this area are addressed in the following five papers:

- Decentralized Fault Diagnosis of Large-Scale Processes Using Multiblock Kernel Partial Least Squares.
- Data-Driven Soft Sensor of Approach for Quality Prediction in a Refining Process.
- Fault Detection Based on Statistical Multivariate Analysis and Microarray-Type Visualization.
- Nonlinear Dynamic Process Monitoring Using Canonical Variate Analysis and Kernel Density Estimations.
- Kalman Predictive Redundancy System for Fault Tolerance of Safety-Critical Systems.
- Bidirectional Branch and Bound for Controlled Variable Selection Part III: Local Average Loss Minimization.

C. Control Over Network

The rapid growth of communication networks provides several major opportunities and challenges for control. The decentralized nature of the control over network poses several problems. Stability is complicated by the presence of varying time delays, and the effect of a local control action can be felt over the network after substantial delay. Uncertainty and variation in the network, through network topology, transmission channel characteristics, traffic demand, available resources, and the like, may change constantly and unpredictably. The issue of time delay encountered in control over network is addressed in the following two papers:

- H-infinity State Feedback Control for a Class of Networked Cascaded Control Systems With Uncertain Delay.
- Design the Remote Control System with Time-Delay Estimator and the Adaptive Smith Predictor.

D. Concluding Remarks

As a concluding remark, industrial control must continue to embrace cutting-edge industrial informatics technology and open up new applications that can impact industrial control systems. Many people have contributed to the success of this Special Section and we would like to take this opportunity to thank them: authors of papers submitted for considerations, reviewers for their thoughtful reports which contributed significantly to the quality of this Special Section, and finally, Prof. Richard Zurawski, Editor-in-Chief, for his guidance in the preparation of this Special Section.

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Digital Object Identifier 10.1109/TII.2009.2038616

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