Introduction to the Special Issue on Real-Time aspects in Cyber-Physical Systems

As embedded platforms are becoming more and more powerful, affordable, and portable, networked smart devices have been widely deployed in real life to provide health services, enhance factory automation, and enable smart transportation, smart cities, and smart grids. These systems fall within the class of Cyber-Physical Systems (CPSs), which involve tight integration of cyber (computation) and physical domains. CPSs rely on highly internetworked, heterogeneous, and often large-scale platforms, and must often address real-time requirements to produce timely reactions in the physical world. Focusing on this strong demand for timeliness in CPSs, this special issue presents recent advances on real-time aspects in Cyber-Physical Systems.

The special issue received 10 submissions from worldwide research groups, including extended versions of best papers presented in the 23rd IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (IEEE RTCSA 2017). All the submissions were reviewed by experts in the relevant fields, and every submission was reviewed by at least three reviewers. Among the submissions, five papers were selected for inclusion in this special issue.

The article “[CSIP: A Synchronous Protocol for Automated Vehicles at Road Intersections](#)” by Aoki and Rajkumar presents an intersection management protocol that guarantees a minimum configurable gap between vehicles to meet safety requirements in the presence of GPS inaccuracies and control failures. The article “[Accounting for Reliability in Unacknowledged Time-Constrained WSNs](#)” by Parsch and Masrur proposes a medium access control (MAC) protocol that can be configured to meet reliability requirements in the absence of acknowledgments. The article “[Extensive Analysis of a Real-Time Dense Wired Sensor Network Based on Traffic Shaping](#)” by Loureiro et al. tackles the issue of deterministic behavior of XDense and presents a methodology that uses traffic shaping heuristics to guarantee bounded communication delays and the fulfillment of memory requirements. The article “[Determining Timing Parameters for the Code Generation from Platform-Independent Timed Models](#)” by Kim et al. presents a framework that can systematically expose platform-specific I/O interaction details to the platform-independent model and automatically adjust timing parameters for the generated code to meet the delay bound inclusion constraint. The article “[Real-Time Middleware for Cyber-Physical Event Processing](#)” by Wang et al. introduces the Cyber-Physical Event Processing (CPEP) middleware that features configurable operations, prioritization, time consistency enforcement, efficient memory management, and concurrent processing for real-time cyber-physical event processing.

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