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Editorial

Special Issue on Scalable Cyber–Physical Systems

Cyber–Physical Systems (CPSs) are characterized by the strong interactions among cyber components and dynamic physical components. CPS is expected to play a major role in the development of next-generation smart energy systems, especially for the large scale power systems. Due to the deeply complex intertwining among different components, CPS poses fundamental challenges in multiple aspects, such as real-time data processing, distributed computing, data sensing and collection, and efficient parallel computing. Innovative technologies addressing CPS challenges in smart energy systems, such as the fast growth in system scale and complexity, the distributed control and real-time interaction between dynamic environments and physical systems, and the efficiency issues in smart homes, buildings, communities and connected vehicle systems together with their reliability, are highly desirable. In particular, studying the merging and communication between information-centric and node-centric systems from a CPS perspective is extremely promising.

This special issue aims to gather recent research work in design/development of scalable computing systems for smart energy CPSs and discuss, evaluate, and improve the novel approaches of energy-aware CPSs. Our primary focus is to address novel power saving mechanisms in CPS, advanced deployments for large scaled CPS, energy-aware solutions for heterogeneous CPS, and new efficient lower power strategy of CPS. Among total 17 manuscripts submissions, we accepted 11 quality work via a careful peer-to-peer review process, which covered four dimensions of CPS, including CPS framework, attack detection systems in CPS, system state and access control, and CPS performance enhancement.

First, in the dimension of the CPS framework, two papers were accepted. Paper 1: Xiang et al. in their paper entitled *A CPS Framework based Perturbation Constrained Buffer Planning Approach in VLSI Design*, propose an efficient, perturbation constrained buffer planning algorithm to maximize the candidate buffer holes with regarding to the feature of CPS based buffering design framework. Instead of directly moving buffers to the existing available buffer holes, the proposed algorithm changes the original placement to provide more flexibility for buffer insertion. The integer linear programming based technique is designed for the physical design flow which allows small moving range of gates. Paper 2: Hossain et al., in their paper entitled *Cyber–Physical Cloud-Oriented Multi-Sensory Smart Home Framework for Elderly People: An Energy Efficiency Perspective*, propose an energy-efficient cyber–physical smart home system for monitoring the elderly that uses the potential of cloud computing and big data technologies.

The next two papers address a significant aspect of securing CPS that are designing the approaches of detecting attacks in CPS. Paper 3: Yan et al., in their paper entitled *A Hybrid Approach of Mobile Malware Detection in Android*, propose a novel hybrid approach for mobile malware detection by adopting both dynamic analysis and static analysis, and uses a dynamic method to collect its system calling data to detect an unknown app. Paper 4: Li et al., in their paper entitled *Distributed Host-based Collaborative Detection for False Data Injection Attacks in Smart Grid Cyber–Physical System*, propose a novel distributed host-based collaborative detection method in order to address the challenges of False Data Injection (FDI). The proposed approach uses a conjunctive rule based majority voting algorithm to collaboratively detect false measurement data inserted by compromised Phasor Measurement Units (PMUs).

Furthermore, the performance of CPS is an important cube for delivering services within a networking-based environment, such as real-time processing or smart data transmissions. Four quality work addressing the issue of CPS performance were selected by this special issue. Paper 5: Cui et al., in their paper entitled *A Novel Oriented cuckoo search algorithm to Improve DV-Hop Performance for Cyber–Physical Systems*, designed a new evolutionary algorithm named Oriented Cuckoo Search (OCS) algorithm to solve the problem of estimation precision when applying Distance Vector-Hop (DV-Hop) method. Paper 6: Cui et al., in their paper entitled *A Novel Multi-Objective Evolutionary Algorithm for Recommendation Systems*, propose a novel multi-objective evolutionary algorithm for recommendation systems, called PMOEA, that presents a new probabilistic genetic operator. Paper 7: Niu et al., in their paper entitled *Energy-aware Scheduling on Heterogeneous Multi-Core Systems with Guaranteed Probability*, addressed another aspect, which adopts a Directed Acyclic Graph (DAG) to represent the dependent relation between tasks and develop a Minimum-Energy Model to find the optimal tasks assignment. The heterogeneous multi-core architectures can execute tasks under different voltage levels with Dynamic Voltage and Frequency Scaling (DVFS) which leads to different execution time and different consumption energy. Paper 8: Gan et al., in their paper entitled *Delay Analysis and Optimization for Inter-Core Interference in Real-Time Embedded Multicore Systems*, proposed a finer grained approach to analyze the inter-core interference (bank conflict and bus access interference) on multi-core platforms with the Interference-Aware Bus Arbiter

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(IABA) and bank-column cache partitioning, and our approach can reasonably estimate interference delays based on request timing.

Finally, the researches of the CPS state estimations and access control mechanisms have become popular in securing CPS recently. Four papers were selected to address this research direction from various perspectives. Paper 9: Dai et al., in their paper entitled *A Chaos-oriented Prediction and Suppression Model to Enhance the Security for Cyber–Physical Power Systems*, present a CPPS model with the improved chaos prediction and suppression methods to enhance the security with the abilities to avoid and eliminate chaos and its main process is "prediction-quantization-control". Paper 10: Chen et al., in their paper entitled *EPLS: A novel feature extraction method for migration data clustering,* propose a novel numerical feature extraction approach EPLS that is an integration of the Ensemble Empirical Mode (EEMD), Principal Component Analysis (PCA) and Least Square (LS) method. Paper 11: Ma et al., in their paper entitled *Research on Semantic of Updatable Distributed Logic and Its Application in Access Control*, present a distributed logic UD-Datalog whose advantage lies that it extends U-Datalog to distributed environment but still keeps the logic semantic and evaluation method of U-Datalog, which is a new approach to define update in distributed environment based on non-immediate update semantics which distinguishes the language from other distributed datalog. A Modeling Language to Describe Massive Data Storage Management in Cyber–Physical Systems proposes a modeling language to describe the management programs in Massive Data Storage Systems (MDSSs).

We hope the work selected in this special issue will be of timely value to readers of the Journal of Parallel and Distributed Processing.

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