

Guest Editors' Introduction: SBCCI 2018

Michael Hübner

Brandenburg University of Technology

Jose Luis Guntzel

Federal University of Santa Catarina

■ **IN THIS SPECIAL** issue, the combination of image processing and corresponding hardware architectures and EDA tools was presented in six manuscripts. The articles have been selected as the best articles of the 31st Symposium on Integrated Circuits and Systems Design which was held in Bento Gonçalves, Rio Grande do Sul, Brazil, on August 27–31, 2018.

Embedded systems and cyber-physical systems (CPSs), especially in relation to image and signal processing, are a big step forward from the basic data-gathering networks, and they are said to be the fourth industrial revolution. Therefore, the important contribution of CPS is its integration and connection of the hardware elements, for example, sensors, actuators, and computing units, with the software functionalities, for example, automated routines and supervisor software, to perform energy efficiency and simultaneously keeping safety requirements. Many fields employ CPS in their operations, for example, transportation, defense, energy and industrial automation, health and biomedical, agriculture, and critical infrastructure, to automate the processes, the data gathering, and the actions it can perform, while also lowering the quantity of man-made errors during run time. Furthermore, critical applications that must deal with several challenges find in CPS a powerful ally, since the system's level of automation and independence is higher than those of basic manually supervised networks.

Real-time image processing plays a major role in several applications in the academic and industrial fields. For example, the application in modern industrial environment includes camera data to handle the production of complex components. In robotics,

real-time image processing is crucial to enable a fast movement of robot arms. Last but not least, advanced driver assistance systems in the automotive domain and recent achievements for autonomous driving would not be possible without real-time image processing. This special issue collects recent research results in this domain of research and presents scientific achievements regarding the algorithms and architectures for image processing and also the hardware platforms and the required EDA tools.

The special issue includes six excellent articles. Three of them focus on high-efficiency video coding (HEVC) and provide novel approaches for optimizing the algorithms, hardware architecture, and applications. Ucker et al. in “High-Throughput Hardware for 3D-HEVC Depth-Map Intraprediction” focus on the optimization of the throughput. A novel heuristic was used as a base to propose a hardware design with a 45-nm ASIC. To accelerate the HEVC algorithm, a 20-core parallel hardware was used by Sanchez et al. in “Multicore Parallelism Exploration Targeting 3D-HEVC Intraframe Prediction.” Perleberg et al. in “High-Throughput Hardware Design for 3D-HEVC Disparity Estimation” describe a specific hardware for disparity estimation in HEVC.

Fast hybrid (FH) morphological reconstruction algorithm using an FPGA architecture is the topic of the article titled “Hardware-Based Fast Hybrid Morphological Reconstruction” by Anaconda-Mosquera et al. In this case, a reconfigurable hardware has been deployed to accelerate the algorithm efficiently.

An algorithm that is able to return the division that yields the minimum possible energy dissipation while considering a minimum throughput restriction for partially reversible pipelined quantum-dot cellular automata (QCA) devices is presented in “Optimal Energy Efficiency and Throughput on

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Partially Reversible Pipelined QCA Circuits" by Ribeiro et al.

To improve the benchmarking of the novel hardware architecture, in "Exact Benchmark Circuits for Logic Synthesis" Neto et al. present an approach to find the difference between the obtained solutions and the optimal circuit building.

The contributions span an excellent view over a highly important topic which will even increase the impact in future applications, for example, coming

from the domain of machine learning and its deployment in the industrial Internet of Things applications.

WE THANK ALL authors and reviewers for their excellent work and contributions to this outstanding special issue. ■

■ Direct questions and comments about this article to Michael Hübner, Department of Computer Science, Brandenburg University of Technology, 03046 Cottbus, Germany; huebner@b-tu.de.