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Editorial

Challenges on Complexity and Connectivity in Embedded Systems

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Technology advances and a growing field of applications have been a constant driving factor for embedded systems over the past years. However, the increasing complexity of embedded systems and the emerging trend to interconnections between them lead to new challenges. Intelligent solutions are necessary to solve these challenges and to provide reliable and secure systems to the customer under a strict time and financial budget.

Typically, intelligent solutions often come up with an orthogonal and interdisciplinary approach in contrast to traditional ways of engineering solutions. Many possible intelligent methods for embedded systems are biologically inspired, such as neural networks and genetic algorithms. Multiagent systems are also prospective for an application for nontime critical services of embedded systems. Another field is soft computing which allows a sophisticated modeling and processing of imprecise (sensory) data.

Thus, as expected, we received a variety of papers with interesting solutions within the topic of the special issue. We hope that this special issue will be as inspiring as it was for the editorial team.

In This Issue. The articles in this special issue cover several aspects of intelligent solutions for embedded systems. We have identified three major topics that are applications, platforms, and tools as well as aspects of theory and fundamental concepts. The following eight articles are included in this special issue.

Traction Control System for Motorcycles. Conti et al. describe a solution for traction control for motocross and supermotard motorcycles. Traction control systems for four-wheel vehicles and some heavy road motorcycles are widely used, but not for small motorcycles. The authors present an algorithm and a low-cost real-time hardware implementation as a prototype.

Evaluation of a "Smart" Pedestrian Counting System Based on Echo State Network. In this article, Mathews and Poigné present a pedestrian counting system using distributed sensing. According to its performance, the system is a better alternative to existing low-cost pedestrian counting systems. The motion pattern is recorded using a set of passive infrared (PIR) sensors. Attached to these, a wireless sensor node processes the data and transmits it to a base station. There a recurrent neural network called Echo State Network predicts the pedestrian count from the input patterns.

Differential Bearing Estimation for RF Tags. Localization and tracking using wireless communication have been an active research area, yet a universal solution has not emerged so far. Ledeczi et al. present a novel method for bearing estimation based on a rotating antenna generating a Doppler-shifted RF signal. The small frequency change can be measured even on low-cost resource constrained nodes using a radio interferometric technique. With a few such measurements a node can be accurately localized.

An Embedded Software Platform for Distributed Automotive Environment Management. Vehicle platforms become more and more extended by features for driving safety. Additions are usually dedicated sensor systems, which are hardly extensible or scalable. As a possible solution Seepold et al. propose an embedded OSGi-based UPnP platform in order

to manage the vehicle components heterogeneity and to provide a plug and play support. The proposed approach is expected to ease setup, service provisioning, and enable connections to external and remote network services.

Time-Predictable Computer Architecture. Today's general purpose processors have been optimized towards maximum throughput, using features like pipelines with instruction dependencies, caches, branch prediction, and out-of-order execution. However, these features make it very difficult to perform a safe and tight worst-case execution time (WCET) analysis of programs running on such a processor. In this article Schoeberl describes the concepts for a time-predictable computer architecture. As a case study, the concepts are evaluated in a Java-optimized processor.

Microcontroller Based Process Monitoring Using Petri-Nets. Petri-nets have been previously largely used in the areas of systems modelling and simulation. In this article Prickett et al. employ this concept as a process monitoring and management application. The monitoring system can be deployed on an embedded microcontroller, thus depicting a small implementation footprint for presented framework.

Towards Preserving Model Coverage and Structural Code Coverage. Embedded systems, especially when used in safety-critical applications require a thorough testing with good coverage of the code. However, due to compiler optimizations, the code coverage achieved at machine code level might not be given even though the test case cover the high-level program representation well. In this article Kirner addresses this problem, and discusses methods for preserving code coverage achieved at source-code level and introduce a notation for formalizing structural code-coverage. These notations also serve to express testdata independent criteria for preserving the code coverage. Thus, it can be proven if given program transformation does always preserve the structural code coverage of interest or not.

Firefly Clock Synchronization in an 802.15.4 Wireless Network. The Firefly synchronization approach is a bioinspired synchronization method which is totally distributed, robust against erroneous nodes, and simple to implement. In this article, the Leidenfrost and Elmenreich present an adaptation of the Firefly algorithm for a wireless network. The used reach-back modification of the original approach is analyzed and explained. A case study implemented on 802.15.4 Zigbee scheduling and coordinated duty cycling in order to enhance the battery lifetime of the nodes.

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EURASIP Journal on Wireless Communications and Networking

Special Issue on

Advances in Quality and Performance Assessment for Future Wireless Communication Services

Call for Papers

Wireless communication services are evolving rapidly in tandem with developments and vast growth of heterogeneous wireless access and network infrastructures and their potential. Many new, next-generation, and advanced future services are being conceived. New ideas and innovation in performance and QoS, and their assessment, are vital to the success of these developments. These should be open and transparent, with not only network-provider-driven but also service-provider-driven and especially user-driven, options on management and control to facilitate always best connected and served (ABC&S), in whatever way this is perceived by the different stake holders. To wireless communication services suppliers and users, alike the complexity and integrability of the immense, diverse, heterogeneous wireless networks' infrastructure should add real benefits and always appear as an attractive user-friendly wireless services enabler, as a wireless services performance enhancer and as a stimulant to wireless services innovation. Effecting the integration of services over a converged IP platform supported by this diverse and heterogeneous wireless infrastructure presents immense QoS and traffic engineering challenges. Within this context, a special issue is planned to address questions, advances, and innovations in quality and performance assessment in heterogeneous wireless service delivery.

Topics of interest include, but are not limited to:

- Performance evaluation and traffic modelling
- Performance assessments and techniques at system/flow level, packet level, and link level
- Multimedia and heterogeneous service integration-performance issues, tradeoffs, user-perceived QoS, and quality of experience
- Network planning; capacity; scaling; and dimensioning
- Performance assessment, management, control, and solutions: user-driven; service-provider-driven; network-provider-driven; subscriber-centric and consumer-centric business model dependency issues
- Wireless services in support of performance assessment, management, and control of multimedia service delivery
- Performance management and assessment in user-driven live-access network change and network-driven internetwork call handovers
- Subscriber-centric and consumer-centric business model dependency issues for performance management, control, and solutions
- Simulations and testbeds

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EURASIP Journal on Wireless Communications and Networking

Special Issue on Femtocell Networks

Call for Papers

Recently, there has been a growing interest in femtocell networks both in academia and industry. They offer significant advantages for next-generation broadband wireless communication systems. For example, they eliminate the deadspots in a macrocellular network. Moreover, due to short communication distances (on the order of tens of meters), they offer significantly better signal qualities compared to the current cellular networks. This makes high-quality voice communications and high data rate multimedia type of applications possible in indoor environments.

However, this new type of technology also comes with its own challenges, and there are significant technical problems that need to be addressed for successful deployment and operation of these networks. Standardization efforts related to femtocell networks in 3GPP (e.g., under TSG-RAN Working Group 4 and LTE-Advanced) and IEEE (e.g., under IEEE 802.16m) are already underway.

The goal of this special issue is to solicit high-quality unpublished research papers on design, evaluation, and performance analysis of femtocell networks. Suitable topics include but are not limited to the following:

- Downlink and uplink PHY/MAC design for femtocells in 3G systems, WiMAX systems, and LTE systems
- Interference analysis, avoidance, and mitigation
- Coexistence between a macrocellular network and femtocell network
- Resource allocation techniques
- Closed subscriber group (CSG) versus open-access femtocells
- Power control and power saving mechanisms (e.g., sleep/idle mode etc.)
- Mobility support and handover
- Time synchronization
- Multiple antenna techniques
- Tradeoffs between femtocells, picocells, relay networks, and antenna arrays
- Comparison with other fixed-mobile convergence (FMC) approaches such as UMA/GAN and dual-mode terminals
- Self-organizing networks and issues in self maintenance and self install
- Issues related to enterprise femtocells

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EURASIP Journal on Advances in Signal Processing

Special Issue on Robust Processing of Nonstationary Signals

Call for Papers

Techniques for processing signals corrupted by non-Gaussian noise are referred to as the robust techniques. They are established and used in science in the past 40 years. The principles of robust statistics have found fruitful applications in numerous signal processing disciplines especially in digital image processing and signal processing for communications. Median, myriad, meridian, L filters (with their modifications), and signal-adaptive realizations form a powerful toolbox for diverse applications. All of these filters have lowpass characteristic. This characteristic limits their application in analysis of diverse nonstationary signals where impulse, heavy-tailed, or other forms of the non-Gaussian noise can appear: FM, radar and speech signal processing, and so forth. Recent research activities and studies have shown that combination of nonstationary signals and non-Gaussian noise can be observed in some novel emerging applications such as internet traffic monitoring and digital video coding.

Several techniques have been recently proposed for handling the signal filtering, parametric/nonparametric estimation, feature extraction of nonstationary and signals with high-frequency content corrupted by non-Gaussian noise. One approach is based on filtering in the time-domain. Here, the standard median/myriad forms are modified in such a manner to allow negative- and complex-valued weights. This group of techniques is able to produce all filtering characteristics: highpass, stopband, and bandpass. As an alternative, the robust filtering techniques are proposed in spectral (frequency- Fourier, DCT, wavelet, or in the time-frequency) domain. The idea is to determine robust transforms having the ability to eliminate or surpass influence of non-Gaussian noise. Then filtering, parameter estimation, and/or feature extraction is performed using the standard means. Other alternatives are based on the standard approaches (optimization, iterative, ML strategies) modified for nonstationary signals or signals with high-frequency content.

Since these techniques are increasingly popular, the goal of this special issue is to review and compare them, propose new techniques, study novel application fields, and consider their implementations.

Topics of interest include, but are not limited to:

- Robust statistical signal processing (estimation, detection, decisions)
- Robust tracking, classification and control
- Performance analysis, comparison, benchmark setting, and achievable bounds
- Robust parametric/non-parametric estimation, filtering, and feature extraction of nonstationary signals
- Robust learning and adaptive robust techniques
- Fast software and hardware realizations
- Applications

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