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Editorial

Challenges on Complexity and Connectivity in Embedded Systems

Wilfried Elmenreich,[1] Markus Kucera,[2] Bernhard Rinner,[1] Ralf Seepold,[3] and Volker Turau[4]

[1] *University of Klagenfurt, Insitute of Networked and Embedded Systems, 9020 Klagenfurt, Austria*
[2] *University of Applied Sciences Regensburg, 93049 Regensburg, Germany*
[3] *Universidad Carlos III de Madrid, 28903 Madrid, Spain*
[4] *Hamburg University of Technology, 21071 Hamburg, Germany*

Correspondence should be addressed to Wilfried Elmenreich, wilfried.elmenreich@uni-klu.ac.at

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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.

Wilfried Elmenreich
Markus Kucera
Bernhard Rinner
Ralf Seepold
Volker Turau

EURASIP Journal on Advances in Signal Processing

Special Issue on
Filter Banks for Next-Generation Multicarrier Wireless Communications

Call for Papers

Digital filter banks find various good applications in communications signal processing. In general, they can be used to obtain very sharp frequency selectivity to isolate different communications frequency channels from each other and from interfering spectral components. This can be done in a very flexible and dynamic manner. Thus, filter banks constitute a very powerful generic tool for software-defined radios and spectrally agile communication systems.

The theoretical capacity limits in communications can be approached by multicarrier techniques. With radio channels, multicarrier techniques can be combined with multiantenna transmitters and receivers to provide efficiency. Existing or planned transmission systems rely on the OFDM technique to reach these goals. However, OFDM has a number of drawbacks, such as the use of the cyclic prefix to cope with the channel impulse response which results in a loss of capacity and the requirement of block processing to maintain orthogonality among all the subcarriers. Furthermore, the leakage among frequency subbands has a serious impact on the performance of FFT-based spectrum sensing and OFDM-based cognitive radio in general.

So far, some attempts have been made to introduce filter bank multicarrier (FBMC) in the radio communications arena, in particular, the isotropic orthogonal transform algorithm (IOTA). However, the full exploitation and optimization of FBMC techniques in the context of radio evolution have not been considered sufficiently. Consequently, advances in communication aspects of FBMC are still required to make it useful for future radio systems.

This has motivated advanced research in the European ICT project PHYDYAS, which supports this special issue. Topics of interest include, but are not limited to:

- Filter bank-based multicarrier transmission and prototype filter design
- Filter bank-based signal processing for other communication waveforms
- Filter bank applications in software-defined radio
- Data-aided and blind techniques for synchronization and channel estimation
- Preamble and pilot-pattern design
- Equalization and demodulation
- FBMC MIMO techniques and beamforming
- Radio scene spectrum analysis and cognitive radio
- Interference management
- Interlayer optimization and FBMC-specific scheduling
- Filter bank for channel coding
- Filter bank in AD and DA conversions

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Lead Guest Editor

Markku Renfors, Department of Communications Engineering, Tampere University of Technology (TUT), 33720 Tampere, Finland; markku.renfors@tut.fi

Guest Editors

Pierre Siohan, Orange Labs 4, France Telécom, rue du Clos Courtel, BP 91226, 35512 Cesson Sévigné Cedex, France; pierre.siohan@orange-ftgroup.com

Behrouz Farhang-Boroujeny, Department of Electrical and Computer Engineering, University of Utah, 3280 MEB Salt Lake City, UT 84112, USA; farhang@ece.utah.edu

Faouzi Bader, Centre Tecnologic de Telecommunication de Catalunya (CTTC), Parc Mediterrani de la Tecnologia, Avenue Canal Olimpic, Casstelldefels, 08860 Barcelona, Spain; faouzi.bader@cttc.es

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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Lead Guest Editor

Máirtín O'Droma, Telecommunications Research Centre, University of Limerick, Ireland; mairtin.odroma@ul.ie

Guest Editors

Markus Rupp, Institute of Communications and Radio-Frequency Engineering, Vienna University of Technology, Gusshausstrasse 25/389, 1040 Vienna, Austria; mrupp@nt.tuwien.ac.at

Yevgeni Koucheryavy, Department of Communication Engineering, Tampere University of Technology, Korkeakoulunkatu 10, 33720 Tampere, Finland; yk@cs.tut.fi

Andreas Kassler, Computer Science Department, University of Karlstad, Universitetsgatan, 65188 Karlstad, Sweden; kassler@ieee.org

EURASIP Journal on Wireless Communications and Networking

Special Issue on Radar and Sonar Sensor Networks

Call for Papers

Although radar and sonar rely on two fundamentally different types of wave transmission, Radio Detection and Ranging (RADAR) and Sound Navigation and Ranging (SONAR), both are remote sensing systems with important military, scientific, and commercial applications. RADAR sends out electromagnetic waves, while active SONAR transmits acoustic (i.e., sound) waves. In both systems, these waves return echoes from certain features or targets that allow the determination of important properties and attributes of the target (i.e., shape, size, speed, distance, etc.). Because electromagnetic waves are strongly attenuated (diminished) in water, RADAR signals are mostly used for ground or atmospheric observations. Because SONAR signals easily penetrate water, they are ideal for navigation and measurement under water. The networking of radars or sonars is two emerging research areas, known as radar sensor networks and underwater sensor networks. The goal of the Special Issue is to publish the most recent results in the development of radar sensor networks and underwater sensor networks. Researchers and practitioners working in this area are expected to take this opportunity to discuss and express their views on the current trends, challenges, and state-of-the-art solutions addressing various issues in radar and sonar sensor networks. Review papers on radar sensor networks and/or underwater sensor networks are also welcome. Topics to be covered in this Special Issue include, but are not limited to:

- Waveform design and diversity
- UWB radar sensor networks
- Interferences analysis
- Coexistence with other sensor networks
- Network capacity
- MIMO radar
- MIMO radar
- Medium Access Control (MAC)
- Routing
- Underwater channel modeling
- Underwater communications
- Network coverage
- Energy efficiency
- Security and privacy
- Navigation and positioning (localization)
- Sensor fusion
- In-network information processing
- Target detection and tracking
- Other applications

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Lead Guest Editor

Qilian Liang, Department of Electrical Engineering, University of Texas at Arlington, Arlington, TX 76019-0016, USA; liang@uta.edu

Guest Editors

Xiuzhen (Susan) Cheng, Department of Computer Science, The George Washington University, Washington, DC 20052, USA; cheng@gwu.edu

Scott C.-H. Huang, Department of Computer Science, City University of Hong Kong, 83 Tat Chee Ave, Kowloon, Hong Kong; shuang@cityu.edu.hk

Sherwood W. Samn, Air Force Research Laboratory/RHX, Brooks City Base, San Antonio, TX 78235, USA; Sherwood.samn@brooks.af.mil

Lingming Wang, iBiquity Digital Corporation, 150 Allen Road, Suite 201, Basking Ridge, NJ 07920, USA; lwang@ibiquity.com

Zheng Zhou, School of Information and Telecommunications, Beijing University of Posts and Telecommunications, Beijing 100876, China; zzhou@bupt.edu.cn