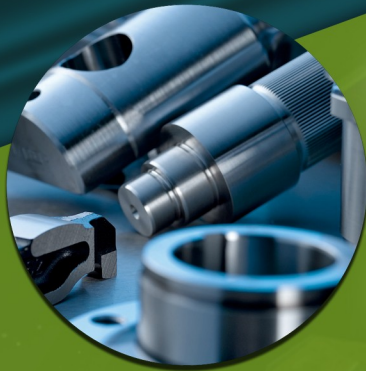


## Editors

Vincenzo Niola  
Zoran Bojkovic  
M. Isabel Garcia-Planas



# Recent Researches in Circuits, Systems, Multimedia & Automatic Control



**Proceedings of the 11<sup>th</sup> WSEAS International Conference on  
Instrumentation, Measurement, Circuits and Systems (IMCAS '12)**  
**Proceedings of the 12<sup>th</sup> WSEAS International Conference on  
Robotics, Control and Manufacturing Technology (ROCOM '12)**  
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**Rovaniemi, Finland, April 18-20, 2012**



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**Preface**

This year the 11th WSEAS International Conference on Instrumentation, Measurement, Circuits and Systems (IMCAS '12), the 12th WSEAS International Conference on Robotics, Control and Manufacturing Technology (ROCOM '12) and the 12th WSEAS International Conference on Multimedia Systems & Signal Processing (MUSP '12) were held in Rovaniemi, Finland, April 18-20, 2012. The conferences provided a platform to discuss instrumentation, real-time systems, optoelectronics, mechatronics, parallel programming, power systems, computer graphics and computational geometry, image sequence processing, network robotics, cybernetics, remote sensing, hybrid systems, intelligent control, sensors, aerospace and naval applications, speech analysis, multidimensional systems, biomedical processing etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors





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## Plenary Lecture 1

### Efficient isolated DC-DC converters with maximum integration scale



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**Abstract:** Certain system or safety requirements may impose the use of isolated DC-DC converters for powering the electronic circuitry in various applications. Typical examples are the power supplies in central-office ADSL and VDSL telecommunication equipment or the power supply units in Power-over-Ethernet devices. Widely used isolated converter topologies are the flyback, the forward and the combined forward-flyback architectures, where the driving electronics at the primary side of the pulse transformer and the rectifying electronics at the secondary side are employing discrete power transistors and/or diodes. This talk will show how the electronics at both sides of the pulse transformer can be integrated into a monolithic IC in an advanced smart-power technology, leading to a very compact isolated converter solution consisting of only 4 components: the pulse transformer, 2 chips (1 at each side) and an opto-coupling device, and this for output power levels up to 100W. New techniques for reducing the silicon cost and for achieving maximum power efficiency will be presented. This includes the use of active-clamping H-bridge driving, synchronous rectification with reduced driving voltage and active voltage clamping. Specific monolithic IC implementations for telecommunication applications will be analyzed and experimental data will be discussed. Finally, this monolithic approach will be benchmarked against existing discrete solutions.

**Brief Biography of the Speaker:** Prof. Jan Doutreloigne obtained his Master and PhD degrees in electronic engineering from the University of Gent (Belgium) in 1987 and 1992 respectively. His PhD research dealt with the development of a complementary TFT technology for the integration of driver circuits on active matrix LCDs. From 1992 to 1998, he was a full-time lecturer at the University of Cuenca (Ecuador) in the area of electronics, telecommunications and computer sciences. In 1998, he joined the Centre for Microsystems Technology (CMST), which is a research facility at the University of Gent as well as an associated laboratory of the Inter-university MicroElectronics Centre (IMEC). Prof. Jan Doutreloigne is appointed as full-time professor at the University of Gent, responsible for conducting research in the area of advanced electronic microsystems and teaching courses in the field of microelectronics. At the same time he is also an R&D manager at IMEC, responsible for leading and coordinating national and European research projects related to microelectronic design. He is currently leading a research team at the CMST laboratory, specialized in the full-custom design of mixed analog-digital integrated circuits and the development of advanced high-voltage transistors in smart-power technologies. He is author or co-author of more than 100 papers in international technical journals and conference proceedings, and is inventor of several patents.

## Plenary Lecture 2

### A Framework for Physical Interaction and its Execution based on Multiple Sensors



#### Professor Angel P. del Pobil

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Director, UJI Robotic Intelligence Laboratory

Universitat Jaume-I

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**Abstract:** Autonomous robot manipulation is one of the most important challenges in robotics. It involves three challenges: versatility, defined as the capability to adapt to different situations, instead of being limited to a particular task; autonomy, that concerns the level of independence in the robot operation, and dependability, that refers to the capability of successfully completing an action even under important modeling errors or inaccurate sensor information. A complete manipulation task involves two sequential actions: that of achieving a suitable grasp or contact configuration, and the subsequent motion required by the task. We propose a unified framework with the introduction of task-related aspects into the classical knowledge-based grasp concept, leading to task-oriented grasps. In a similar manner, grasp-related issues are also considered during the execution of a task, leading to grasp-oriented tasks. We call this unified representation physical interaction. In the talk I will first present a theoretical framework for the integrated specification of physical interaction tasks, supporting a great variety of actions. Next, the problem of autonomous planning of physical interaction tasks will be addressed. I will then focus on the dependable execution of these tasks, and adopt a sensor-based approach with three different types of sensor feedback: force, vision and tactile. The methods proposed provide important advances with respect to the state-of-the-art versatility, autonomy and dependability of robotic manipulation, allowing to address a wide range of tasks. All these contributions are validated with several experiments using different real robots placed on household environments. The talk will be based on my latest book titled *Robot Physical Interaction through the combination of Vision, Tactile and Force Feedback: Applications to Assistive Robotics*, to be published in the Springer Tracts in Advanced Robotics (STAR) series, co-authored by Mario Prats and Pedro J. Sanz. This research was recipient of various awards, including the Georges Giralt European Award and the Robotdalen Scientific Award Honorary Mention.

**Brief Biography of the Speaker:** Angel Pasqual del Pobil is Professor of Computer Science and Artificial Intelligence at Jaume I University (Spain), founder director of the UJI Robotic Intelligence Laboratory, and a WCU Visiting Professor at Sungkyunkwan University (Korea). He holds a B.S. in Physics (1986) and a Ph.D. in Engineering (1991), both from the University of Navarra. His Ph.D. Thesis was the winner of the National Award of the Spanish Royal Academy of Doctors. He has been Co-Chair of two Technical Committees of the IEEE Robotics and Automation Society, he is Board member of EURON, the European Robotics Research Network, since 2001 and he has been Vice President of the International Society of Applied Intelligence. He has over 200 refereed publications, including ten books.

Prof. del Pobil was organizer of some 37 workshops and tutorials at ICRA, IROS, RSS, HRI and other major conferences. He was Program Co-Chair of the 11th International Conference on Industrial and Engineering Applications of Artificial Intelligence, and General Chair of five editions of the International Conference on Artificial Intelligence and Soft Computing (2004-2008). He is Associate Editor for ICRA (2009-2011) and IROS (2007-2011) and has served on the program committees of over 100 international conferences. His research interests include: humanoid and service robots, multimodal sensorimotor transformations, robot physical and human interaction, robot learning, and the interplay between neurobiology and robotics. Professor del Pobil has been invited speaker of 49 tutorials, plenary talks, and seminars in 14 countries.

## Plenary Lecture 3

### Evaluation of the Mean Cycle Time in Stochastic Discrete Event Dynamic Systems



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**Abstract:** Actual systems in engineering, manufacturing, management, and other areas is frequently modeled as stochastic discrete event dynamic systems with their dynamics described by recursive equations for a set of state variables representing the occurrence time of system events. For many systems, the state evolution can be written in vector form with a state transition matrix through a vector equation that is linear in the sense of an idempotent semiring. The problem of interest is to evaluate, under various assumptions on the matrix entries, the mean system operation cycle time defined as the mean growth rate of state vector in the system.

We start with motivating examples drawn from manufacturing and telecommunications. We give an overview of early results of calculating the mean cycle time for systems with second-order matrices where the entries have exponential, continuous uniform, Bernoulli, geometric, and discrete uniform distributions. Furthermore, recent results are outlined which provide solutions when the entries in the system matrix include both exponentially distributed random variables and nonnegative constants. Finally, we present new results for matrices that have one random entry whereas the other entries may be arbitrary constants. We show that a particular form of the matrices makes it possible to obtain solution in a general form that does not rely on exponential distribution assumptions. As examples, the mean cycle time is calculated in the case when the random entries have exponential and continuous uniform distributions.

**Brief Biography of the Speaker:** Nikolai Krivulin received a university degree in applied mathematics and operations research in 1983 from St. Petersburg State University (SPbSU). He got his Ph.D. degree in 1990 and D.Sc. degree in 2010 both in applied mathematics from SPbSU. In 1983 he joined the Computer Center at SPbSU as a system software engineer, and in 1985 started his Ph.D. study. In 1987 he joined the Faculty of Mathematics and Mechanics at SPbSU as an Assistant Professor, and became an Associate Professor there in 1990. From 1999 to 2002 he was the head of the Department of Information Management at the Graduate School of Management of SPbSU.

Nikolai Krivulin is currently an Associate Professor of the Department of Statistical Modelling at St. Petersburg State University. His research interests include theory and applications of idempotent algebra, modelling and performance evaluation of queueing systems, methods of optimization, computational statistics and computer simulation. He is an author and coauthor of more than 70 publications including papers in reviewed journals and conference proceedings, books chapters, textbooks, and a monograph. He was a grantee of national and international foundations, including the Russian Foundation for Basic Research, the Russian Foundation for Humanities Research, the NATO Science Foundation, the USIA and Eurasia Foundation (USA), and the Royal Society (UK). He served as a member of program and organizing committees of international conferences on mathematics, computer sciences, and information technology. He is a member of the St. Petersburg Mathematical Society, AMS, and SIAM.

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