Editors: Myriam Lazard, Andris Buikis, Yuriy S. Shmaliy, Roberto Revetria, Nikos Mastorakis, Olga Martin, Gabriella Bognar, Siavash H. Sohrab, Daniel N. Riahi, Gilbert-Rainer Gillich

RECENT ADVANCES IN SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY AND SYSTEMS THEORY

- Proceedings of the 11th WSEAS International Conference on Signal Processing, Computational Geometry and Artificial Vision (ISCGAV '11)
- Proceedings of the 11th WSEAS International Conference on Systems Theory and Scientific Computation (ISTASC '11)

UNIVERSITÀ DEGLI STUDI DI GENOVA

WSEAS

Florence, Italy, August 23-25, 2011

ISBN: 978-1-61804-027-5

RECENT ADVANCES IN SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY AND SYSTEMS THEORY

RECENT ADVANCES in SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and SYSTEMS THEORY

Proceedings of the 11th WSEAS International Conference on SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and ARTIFICIAL VISION (ISCGAV '11)
Proceedings of the 11th WSEAS International Conference on SYSTEMS THEORY AND SCIENTIFIC COMPUTATION (ISTASC '11)

Florence, Italy
August 23-25, 2011

Published by WSEAS Press
www.wseas.org
ISBN: 978-1-61804-027-5

RECENT ADVANCES in SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and SYSTEMS THEORY

Proceedings of the 11th WSEAS International Conference on SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and ARTIFICIAL VISION (ISCGAV '11)
Proceedings of the 11th WSEAS International Conference on SYSTEMS THEORY AND SCIENTIFIC COMPUTATION (ISTASC '11)

Florence, Italy
August 23-25, 2011

Published by WSEAS Press
www.wseas.org

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: http://www.worldses.org/review/index.html

ISBN: 978-1-61804-027-5

World Scientific and Engineering Academy and Society

Universita degli Studi di Genova

RECENT ADVANCES in SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and SYSTEMS THEORY

Proceedings of the 11th WSEAS International Conference on SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and ARTIFICIAL VISION (ISCGAV '11)
Proceedings of the 11th WSEAS International Conference on SYSTEMS THEORY AND SCIENTIFIC COMPUTATION (ISTASC '11)

Florence, Italy
August 23-25, 2011

Georgios B. Giannakis, USA
Nikolaos G. Bourbakis, USA
Brian A. Barsky, USA
Tara Ali-Yahiya, FRANCE
Akos Zarandy, HUNGARY
Ana Rusu, SWEDEN
Guy Pujolle, FRANCE
Michel Riguidel, FRANCE
Angel Rodriguez-Vazquez, SPAIN
Jussi Ryynanen, FINLAND
Lars Svensson, SWEDEN
Ryszard S. Choras, POLAND
Jae Choi, USA
Min-Hyung Choi, USA
Edward J. Delp, USA
Ge Jin, USA
M. H. Kim, SOUTH KOREA
Sean Mooney, USA
John Quackenbush, USA
Daniel Rubin, USA
Joel Saltz, USA
Y. Shin, SOUTH KOREA
Alexandros Stamatakis, SWITZERLAND
Ivona Brandic, AUSTRIA
Frederic Desprez, FRANCE
Simon Dobson, UK
Ada Gavrilovska, USA
Keith Jeffery, UK
Dan Marinescu, USA
Omer Rana, UK
Ryan Riley, QATAR
Mikhail Smirnov, GERMANY
Jerrerson Tan, AUSTRALIA
Albert Zomaya, AUSTRALIA
Houman Houmayun, USA
Per Gunnar Kjeldsberg, NORWAY
Fadi Kurdahi, USA
Walid Najjar, USA
Salwa Nassar, EGYPT
Preeti R. Panda, INDIA
Calvin Ribbens, USA
Rishad A. Shafik, UK
Christos Papadopoulos, USA
Mohamed Riduan Abid, MOROCCO
Josephine Antoniou, CYPRUS
George Atia, USA
Ezedin Baraka, UAE
Ossi Mokryn, ISRAEL
Andreas Pitsillides, CYPRUS
Kamil Sarac, USA
Abd-Elhamid Taha, CANADA
Zouheir Trabels, UAE
Jong-Kook Kim, KOREA
Ishfaq Ahmad, USA
Yoongeun Choi, SOUTH KOREA
Youngsun Han, SOUTH KOREA
Alex Jones, USA
Sherif Khattab, EGYPT
Hwangnam Kim, SOUTH KOREA
Israel Koren, USA
Sangheon Pack, SOUTH KOREA
Sanjay Ranka, USA
Sehyun Yang, SOUTH KOREA
Dakai Zhu, USA
Ophir Frieder, USA
Aris Anagnostopoulos, ITALY
Ranieri Baraglia, ITALY
Luca Becchetti, ITALY
Steve Beitzel, USA
Roi Blanco, SPAIN
FRANCEsco Bonchi, SPAIN
Berkant Barla Cambazoglu, SPAIN
Rebecca Cathey, USA
Abdur Chowdhury, USA
Fabio Crestani, SWITZERLAND
Debora Donato, USA
Bin Gao, CHINA
Nazli Goharian, USA
Gregory Grefenstette, FRANCE
Stefano Leonardi, ITALY
Claudio Lucchese, ITALY
Salvatore Orlando, ITALY
Iadh Ounis, UK
Gabriella Pasi, ITALY
Raffaele Perego, ITALY
Diego Puppin, USA
Greg Pfister, USA
Nicola Tonellotto, ITALY
Rossano Venturini, ITALY
Wai Gen Yee, USA
Jay Smith, USA
Chaker El Amrani, MOROCCO
Shoukat Ali, IRELAND
Othmane Bouhali, QATAR
Luis D. Briceno, USA
Florian Feldhaus, GERMANY
Stefan Freitag, GERMANY
Jaafar Gaber, FRANCE
Muthucumaru Maheswaran, CANADA
Tomas Fernandez Pena, SPAIN
Jerry Potter, USA
Francisco Fernandez Rivera, SPAIN
John Antonio, USA
Amr Bayoumi, Egypt
Hazem Abbas, Egypt
Juergen Becker, GERMANY
Ali Elmorsy, UAE
Kris Gaj, USA
Benedict Gaster, USA
Reiner Hartenstein, GERMANY
Volodymyr Kindratenko, USA
Jose Nunez-Yanez, UK
Marco Platzner, GERMANY
Viktor Prasanna, USA

Preface

This year the 11th WSEAS International Conference on SIGNAL PROCESSING, COMPUTATIONAL GEOMETRY and ARTIFICIAL VISION (ISCGAV '11) and the 11th WSEAS International Conference on SYSTEMS THEORY AND SCIENTIFIC COMPUTATION (ISTASC '11) were held in Florence, Italy, August 23-25, 2011. The conferences provided a platform to discuss filter design and structures, higher order spectrum analysis, cyclostationary signal analysis, speech production and perception, active noise reduction, machine vision, computed imaging, image filtering, computational geometry, robotics, virtual reality, soft computing, genetic algorithms, hybrid systems, game theory, real time systems, multilinear algebra, convergence problems, software development, functional languages, enumeration problems, communication protocols 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 indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in 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

Table of Contents

Plenary Lecture 1

Robustness of Unbiased FIR Estimators against Outliers and Temporary Uncertainties

Professor Yuriy S. Shmaliy
Department of Electronics
DICIS, Guanajuato University
Salamanca, 36855, Mexico
E-mail: shmaliy@salamanca.ugto.mx

Abstract: In this lecture, we examine recently developed the p-shift finite impulse response (FIR) unbiased estimator (UE) intended for filtering ($p = 0$), p-step prediction ($p > 0$), and p-lag smoothing ($p < 0$) of linear discrete time-varying state-space models. The estimator is investigated for robustness in Gaussian and non-Gaussian noise environments with outliers and temporary uncertainties in a comparison to the Kalman filter. The FIR UE algorithm is designed to have no requirements for noise and initial conditions and thus has strong engineering features. It is first presented in a batch form and then developed in the computationally efficient iterative Kalman-like one having the guarantied bounded input/bounded output (BIBO) stability, unlike the Kalman filter. Owing to the imbedded BIBO stability and without any other special solutions, such as those used in robust filtering, the FIR UE is show to have better robustness than the Kalman filter against the heavy-tailed noise and Gaussian noise with outliers. It is also shown to have a bit better robustness against temporary model uncertainties. Errors in the Kalman-like FIR UE are compared to the error bound (EB) specified via the noise power gain (NPG) serving as a limiter of errors in transversal estimators. We show that the EB specialized via the NPG in the three-sigma sense can also be useful in Kalman filtering. Examples of applications are taken from signal and image processing, clock synchronization, and control. Based upon these examples, we demonstrate that the Kalman-like FIR UE overperforms the Kalman filter one if the noise covariances and initial conditions are not known exactly, the noise constituents are not white sequences, and both the system and measurement noise components need to be filtered out. Otherwise, the errors are similar.

Brief Biography of the Speaker:
Dr. Yuriy S. Shmaliy is Full Professor in Electrical Engineering of the University of Guanajuato, Mexico, since 1999. He received the B.S., M.S., and Ph.D. degrees in 1974, 1976 and 1982, respectively, from the Kharkiv Aviation Institute, Ukraine. In 1992 he received the Dr.Sc. degree from the Kharkiv Railroad Institute. In March 1985, he joined the Kharkiv Military University. He serves as Full Professor beginning in 1986 and has a certificate of Professor from the Ukrainian Government in 1993. In 1993, he founded and, by 2001, had been a director-collaborator of the Scientific Center “Sichron” (Kharkiv, Ukraine) working in the field of precise time and frequency. His books Continuous-Time Signals (2006) and Continuous-Time Systems (2007) were published by Springer, New York. His book GPS-based Optimal FIR Filtering of Clock Models (2009) was published by Nova Science Publ., New York. He also contributed to several books with invited chapters. Dr. Shmaliy has 262 Journal and Conference papers and 80 patents. He is IEEE Fellow; was rewarded a title, Honorary Radio Engineer of the USSR, in 1991; was listed in Marquis Who's Who in the World in 1998; was listed in Outstanding People of the 20th Century, Cambridge, England in 1999; and was listed in The Contemporary Who’s Who, American Bibliographical Institute, 2003. He is currently an Associate Editor of Recent Patents on Space Technology. He is a member of the Organizing and Program Committees of various Int. Symposia. His current interests include statistical signal processing, optimal estimation, and stochastic system theory.

Plenary Lecture 2

Diagnosis of Flexible Artificial Social Systems

Associate Professor Calin I. Ciufudean
"Stefan Cel Mare" Universtity of Suceava
Faculty of Electrical Engineering and Computer Science
Department of Automatics and Computers
9, University str., RO720225, Suceava
ROMANIA
E-mail: ciufudean.calin@yahoo.com

Abstract: A major consideration in designing a flexible manufacturing system is its availability. When a machine or any other hardware component of the system fails, the system reconfiguration is often less than perfect. It is shown that, if these imperfections constitute even a very small percent of all possible system faults, the availability of the system may be considerably reduced. A state is operational when its performance is better than a threshold value. In order to calculate the availability of a manufacturing system, its states (each corresponding to an acceptable system level) are determined. A system level is acceptable when its production capacity is satisfied. To analyze the system with failure/repair processes, Petri nets and Markov models are often used. As a manufacturing system includes a large number of components with failure/repair processes, the system-level discrete event model becomes computationally intractable. Our approach for the analysis of manufacturing systems assumes that the systems are decomposed in manufacturing cells. We focus on the diagnosis of the performance characteristics of workflows cells modelled with stochastic Petri nets (SPNs). This goal is achieved by using a new model for Artificial Social Systems (ASSs) behaviours, and by introducing equivalent transfer functions for SPNs.
ASSs exist in practically every multi-agent system, and play a major role in the performance and effectiveness chart of the agents. This is the reason why we introduce a suggestive model for ASSs. To model complex systems, such as flexible manufacturing ones, a class of Petri nets is developed, and briefly introduced.
This class allows representing the flow of physical resources and control information data of the Flexible Artificial Social Systems (FASSs) components. In the analysis of SPN we use simulations in respect to timing parameters in a generalized semi-Markov process (GSMP). By using existing results on perturbation analysis (e.g., delays in supply with raw materials, equipment failure, etc.), and by extending them to new physical interpretations, we address unbiased sensitivity estimators correlated with practical solutions in order to attenuate the perturbations.
The novelty of the approach is that the construction of large Markov chains is not required. Using a structural decomposition, the construction system is divided into cells. We can simplify the structure of the SPN using the presented approach, which is useful when we deal with complex Petri nets, and we need to simplify these structures (e.g. graphs) in order to analyze them properly. For each cell a Markov model was derived and the probability was determined for at least Ni working machines in cell i, for i = 1,2,..,n and Mj , where j=1, ..., m, working material handling system (MHS) at time t, where Ni and Mj satisfy the system production capacity requirements. Intuitively, bottleneck (BN) of a production line is understood as a machine that impedes the system performance in the strongest manner. Identification of BNs and their optimal capacity for avoiding the machines downtime is considered as one of the most important problems in manufacturing systems. Some examples illustrate this approach.

Brief Biography of the Speaker:
• Academic Positions: Assoc. Professor Ph.D. Eng., Dept. of Automatics and Computers, Faculty of Electrical Engineering and Computer Science, "Stefan cel Mare" University of Suceava, Romania.
• Fields of Scientific Activities: Discrete Event Systems, Complex Measurement Systems, Reliability and Diagnosis of Control Systems, Environmental Management.
• He published 8 books and over 140 scientific papers in conference proceedings and journals.
• Honor Member of the Romanian Society of Electrical & Control Engineering - Member of the Romanian Technical Experts Corp.
• Technical Expert of the Romanian Ministry of Justice.
• President of the Romanian Society of Electrical & Control Engineering, Suceava Branch.
• He is a member of the editorial boards of several international scientific journals and conferences of control systems and electric engineering science. He was designated chairmen at 21 international conferences.

Plenary Lecture 3

Cooperated Output Regulation of Multi-Agent Systems: Theory and Applications

Professor Jie Huang
Department of Mechanical and Automation
The Chinese University of Hong Kong
Shatin, Hong Kong
E-mail: jhuang@mae.cuhk.edu.hk

Abstract: Output regulation has been one of the central problems in control theory and applications for a few decades. This problem not only needs to guarantee the stability of the closed-loop system, but also enable the output of the closed-loop system to asymptotically track a class of reference inputs and reject a class of disturbances. Thus this problem is more challenging than the stabilization problem. This problem can precisely formulate many complex control problems such as the vibration suppression of high speed trains, vertical take-off and landing of airplanes in a carrier, and robot control and manipulation, and is thus of practical interests. So far the output regulation problem is mainly studied via a centralized control approach. As the world becomes more and more interconnected, more and more practical control problems such as the coordination of a group of mobile robots, and the formation of a group of unmanned flight vehicles must be described by a multi-agent system. Therefore, in this talk, we will describe a framework for handling the output regulation problem for a multi-agent system. The core of this framework includes the establishment of the concepts of the distributed observer, and the distributed internal model. On one hand, we will show that this framework will set a stage for solving the asymptotic tracking and disturbance rejection problem in an uncertain multi-agent system via a distributed control approach. On the other hand, we will show that this framework contains many control problems of multi-agent systems such as consensus, synchronization, and formation as special cases, thus leading to a unified solution to several different control problems of multi-agent systems.

Brief Biography of the Speaker:
Jie Huang studied Power Engineering at Fuzhou University from 1977 to 1979 and Circuits and Systems at Nanjing University of Science and Technology (NUST) from 1979 to 1982. He got his Master's degree from NUST in 1982 and was a faculty member there from 1982 to 1986. He completed his Ph.D. study in automatic control at the Johns Hopkins University in 1990 and subsequently held a post-doctoral fellow position there until July 1991. From August 1991 to July 1995, he worked in industry in USA. In September 1995, he joined the Department of Mechanical and Automation Engineering, the Chinese University of Hong Kong. He is now a professor and also the director of Applied Control and Computing Laboratory there. He served as a Science Advisor to the Leisure and Cultural Services Department of Hong Kong Special Administrative Region, and Honorary Advisor to Hong Kong Science Museum. His research interests include control theory and applications, robotics and automation, neural networks and systems biology, and guidance and control of flight vehicles. He authored two books and numerous papers. He received China State Natural Science Award, Class II, in 2010, Croucher Senior Research Fellowship award in 2006, and the best paper award (with Zhiyong Chen) of the Eighth International Conference on Control, Automation, Robotics, and Vision in 2004. He is IFAC Fellow and IEEE Fellow. Jie Huang is / was editor, associate editor, guest editor of several journals. He was Distinguished Lecturer of IEEE Control Systems Society from 2005 to 2008, member of the Board of Governors of IEEE Control Systems Society from 2006 to 2007. He served as general chair, program chair in numerous international Conferences.

Plenary Lecture 4

Innovative Modeling Paradigms for Supporting Transition to Lean Healthcare

Professor Roberto Revetria
DIPTEM, Dipartimento di Ingegneria della Produzione
Termoenergetica e Modelli Matematici
Via all'Opera Pia, 15, 16145 Genova, GE
University of Genoa
ITALY
E-mail: roberto.revetria@unige.it

Abstract: Lean Healthcare, Kaizen and Six Sigma are rapidly transforming healthcare operations from 'new ideas' to a 'way of life', at the same time while the concepts of Lean are fairly straightforward, applying the tools to daily work can be counter-intuitive and thus require a credible model to be effectively applied. In traditional lean approach consultants take advantages from Value Stream Mapping, the adoption of 5-S and Visual Controls as well as batch reduction and cellular flow. Often these activities took very long time to be adopted mostly due to internal change resistance and lean implementation projects struggle for achieving their goals. In order to control budgets while ensuring proper level of assistance to their citizens a NHS requires modeling the various clinical processes (such as surgery, clinics, nursery) Modeling & Simulation Experts propose both very detailed and high fidelity discrete-events models and approximate Systems Dynamics micro-world. In the presenter experience none of such approaches definitively proven their superiority and a mixed approach has to be adopted. This talk presents an innovative approach where Systems Dynamics and State Transition Diagrams are integrated building a flexible and general model able to reproduce complex healthcare operations in a tradeoff between complexity and flexibility. The talk presents a complete case study applied to real life hospital. Methodology is presented and discussed.

Brief Biography of the Speaker:
He earned his degree in mechanical engineering at the University of Genoa and he completed his master thesis in Genoa Mass Transportation Company developing an automatic system integrating ANN (Artificial Neural Networks) and simulation with the ERP (Enterprise Resource Planning) for supporting purchasing activities. He had consulting experience in modeling applied to environmental management for the new Bosch plant facility TDI Common Rail Technology in construction near Bari. During his service in the Navy as officer, he was involved in the development of WSS&S (Weapon System Simulation & Service) Project. He completed is PhD in Mechanical Engineering in 2001 defending his Doctoral thesis on “Advances in Industrial Plant Management” by applying Artificial iontelligence and Distributed Simulation to several Industrial Cases. Since 1998 is active in Distributed Simulation by moving US DoD HLA (High Level Architecture) Paradigm from Military to Industrial application. In 2000 he succesfully led a research group first demonstrating practical application of HLA in not dedicated network involving a 8 International University Group. He is currently involved, as reseacher, in the DIP of Genoa University, working on advanced modeling projects for Simulation/ERP integration and DSS/maintenance planning applied to industrial case studies (Contracting & Engineering and Retail companies). He is active in developing projects involving simulation with special attention to Distributed Discrete Event and Agent Based Continuous Simulation (SwarmSimulation Agents). He is teaching Modelling & Simulation, VV&A, Distributed Simulation (HLA), Projecty management in Master Courses Worldwide and he is teaching Industrial Plants Design in University of Genoa Masters' Courses. He is Professor in Mechanical Engineering and Logistics.