Editors:

Prof. Valeri Mladenov, Technical University of Sofia, Bulgaria Prof. Milan Stork, University of West Bohemia, Czech Republic Prof. Ryszard Choras, University of Technology & Life Sciences, Poland

of my my

# Recent Researches in Circuits, Systems, Control and Signals

Proceedings of the 2<sup>nd</sup> International Conference on Circuits, Systems, Control, Signals (CSCS '11)



ISBN: 978-1-61804-035-0



# RECENT RESEARCHES in CIRCUITS, SYSTEMS, CONTROL and SIGNALS

Proceedings of the 2nd International conference on Circuits, Systems, Control, Signals (CSCS '11)

> Prague, Czech Republic September 26-28, 2011

ISBN: 978-1-61804-035-0

## **RECENT RESEARCHES in CIRCUITS, SYSTEMS, CONTROL and SIGNALS**

**Proceedings of the 2nd International conference on Circuits, Systems, Control, Signals (CSCS '11)** 

### Prague, Czech Republic September 26-28, 2011

Published by WSEAS Press www.wseas.org

#### Copyright © 2011, by WSEAS Press

All the copyright of the present book belongs to the World Scientific and Engineering Academy and Society Press. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Editor of World Scientific and Engineering Academy and Society Press.

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: 978-1-61804-035-0



Institute for Environment, Engineering, Economics and Applied Mathematics

### RECENT RESEARCHES in CIRCUITS, SYSTEMS, CONTROL and SIGNALS

Proceedings of the 2nd International conference on Circuits, Systems, Control, Signals (CSCS '11)

> Prague, Czech Republic September 26-28, 2011

#### **Editors:**

Prof. Valeri Mladenov, Technical University of Sofia, Bulgaria Prof. Milan Stork, University of West Bohemia, Czech Republic Prof. Ryszard Choras, University of Technology & Life Sciences, Poland

#### **International Program Committee Members:**

Nikos Mastorakis, BULGARIA Ronald Yager, USA Amauri Caballero, USA George Vachtsevanos, USA Robert Finkel, USA Demetrios Kazakos, USA Theodore Trafalis, USA Takis Kasparis, USA Zhiqiang Gao, USA Yan Wu, USA Spyros Tragoudas, USA Arkady Kholodenko, USA Gregory Baker, USA Galigekere Dattatreya, USA Caroline Sweezy, USA Asad Salem, USA Dian Zhou, USA Metin Demiralp, TURKEY Olga Martin, ROMANIA Panos Pardalos, USA Constantin Udriste, ROMANIA Kleanthis Psarris, USA Andrew D. Jones, USA Valeri Mladenov, BULGARIA Neri F., ITALY Chen S. Y., P. R. CHINA Shyi-Ming Chen, R.O.C. Yen K., USA Rong-Jyue Fang, TAIWAN Argyrios Varonides, USA Nikolai Kobasko, USA Xu Anping, P. R. CHINA Zhu H., JAPAN

### **Table of Contents**

Keynote Lecture 1: Dominating the Constancy in Enhanced Multivariance Product	10
<b>Representation (EMPR) Via Support Function Selection</b> Metin Demiralp	
<u>Plenary Lecture 1: On a State Space Energy Based Generalization of the Nose - Hoover Non -</u> <u>Hamiltonian Dynamics</u> <i>Milan Stork</i>	12
The Evaluation of the Error Characteristics of Multiple GPS Terminals Yuki Odaka, Shinya Takano, Yusuke In, Masakazu Higuchi, Hitomi Murakami	13
The Influence of the Noise on Localizaton by Image Matching Hiroshi Ito, Mayuko Kitazume, Shuji Kawasaki, Masakazu Higuchi, Atsushi Koike, Hitomi Murakami	22
<b>Electronically Adjustable Slot Function Equalization</b> Julius Foit, Jan Novak	31
<b>Dynamic Analysis of a Half-Car Model with Active Suspension</b> Catalin Alexandru, Petre Alexandru	36
<u>The Judgment of Document Similarities Using Various Orthogonal Transformations</u> Atraru Matsuzawa, Masakazu Higuchi, Gamba Jonah, Shuji Kawasaki, Hitomi Murakami	42
Decentralized Control Structure Design A Case Study S. Akraminejad, M. R. Hojjati, M. Razmdideh, A. Shokrgu	49
<u>Comic Image Category Classification Using Local Features</u> Yusuke In, Nakamura Kentaro, Masakazu Higuchi, Jonah Gamba, Atushi Koike, Hitomi Murakami	55
Selection of the Most Suitable Measurement Path for Router Abnormality Detection Atsuo Tachibana, Takashi Oie, Shigehiro Ano, Atsushi Koike, Hitomi Murakami	61
<b>Recognition System of Unknown Shape Rubbles for Withdrawal Works by Rescue Robots</b> <i>Masatoshi Hatano</i>	69
<b>About Structure Complex Error of Control System with Feedback</b> Oleg N. Agamalov	75
<u><b>Transmission Characteristics of the Human Body</b></u> Petr Kopecek	81
<b><u>Transfer of Information in Closed Regulated Circuit in Minimally Invasive Surgery</u></b> Vladimir Jehlicka	85

<b>Standardization of Semiconductor IP Coding, Evaluation, Specification, and Registration</b> 90
Seongsoo Lee, Soon-Il Yeo
<b>Tests and Measurements of Electrical and Optical Characteristics for CMOS Image Sensors</b> 94
Seongsoo Lee
<b><u>Performance Analysis of M-ary CSK Based Transform Domain Communication System</u> 99</b>
Haixin Sun, Guoan Bi, Yongliang Guan, Yaowu Shi
<b>Design of Context-Aware Exercise Measurement SoC Based on Electromyogram and</b> 105
Electrocardiogram
Seongsoo Lee
Lv's Distribution for Time-Frequency Analysis 110
Shan Luo. Xiaolei Lv. Guoan Bi
A Synthetic Impulse Noise Environment for DSL Access Networks 116
Radu Dragomir, Sorin Puscoci, Dorina Dragomir
Instrumentation & Control Architecture Applied for a Hydrogen Isotopes Storage System 120
Eusebiu Ilarian Ionete, Bogdan Monea
Nonlinear Feedback Model Predictive Control for Constrained Lur'e Systems 126
Ju H. Park, H. Y. Jung, S. M. Lee
Development of PE Energy Harvesting and Charging Circuits for Low Power Mobile Devices 131
Chang-Jun Ahn
A Buck Converter for DVS Compatible Processors in Mobile Computing Applications Using 135
<b>Fuzzy Logic Implemented in a RISC Based Microcontroller</b> Monaf S. Tapou, Hamed S. Al-Raweshidy, Maysam Abbod, Manal J. Al-Kindi
The Contours of Arterial Pulsations in the Blood Pressure Cuff are Hemodynamic Waveforms 140
J. Jilek, M. Stork
On State-Space Energy Based Generalization of Brayton-Moser Network Decomposition 144
J. Hrusak, M. Stork, D. Mayer
Accurate Modeling of Unusual Electronic Circuit Elements with Artificial Neural Networks 150
Ladislav Pospisil, Josef Dobes, Abhimanyu Yadav
Hydrogen and Deuterium Sorption on Titanium under Vacuum Conditions
Eusebiu Ilarian Ionete, Bogdan Monea, Marius Zamfirache
Calculation Methods for Costs Optimization and Process Modeling in Health Care: A 159 Preliminary View
B. Popesko, Z. Tuckova, J. Strouhal

The Portal Solution for Support of TBU Graduates' Employability in the Labour Market	164
D. Tucek, M. Mikeska	
Development of Advanced Driving Simulator: Steering Wheel and Brake Pedal Feedback	170
Petr Bouchner, Stanislav Novotny	
<u>The Compare of Several Variants of Flexible Members with Electromagnetic Elements for</u> <u>Robots with Variable Joint Stiffness</u>	175
P. Benes, J. Fort, M. Pittermann	
<u>Assessments of Grade Crossing Warning and Signalization Devices – Driving Simulator Study</u> Petr Bouchner, Stanislav Novotny, Roman Pieknik, Ondrej Sykora	179
Modification of the Segmentation Based on Graph Cut Method	184
Influence of Voltage Drop to Electric Drive with Induction Motor and Voltage Sourced Inverter P. Benes, J. Fort, M. Pittermann	189
<b>Nonlinear Models of Physiological Parameters Based on Exercise Spiroergometric Tests</b> <i>M. Stork, A. Khadour</i>	193
Authors Index	198

#### **Keynote Lecture 1**

#### Dominating the Constancy in Enhanced Multivariance Product Representation (EMPR) Via Support Function Selection



#### Professor Metin Demiralp Informatics Institute Istanbul Technical University TURKEY E-mail: metin.demiralp@be.itu.edu.tr

Abstract: Enhanced Multivariance Product Representation (EMPR) has been recently proposed by the "Group for Science and Methods of Computing" which is under leadership of Metin Demiralp. EMPR involves High Dimensional Model Representation (HDMR) which was proposed by I.M. Sobol and has been developed basically by H. Rabitz, M. Demiralp and their groups in last two decades. HDMR decomposes a multivariate function to components ordered in ascending multivariance starting from constancy. EMPR introduces "Support Functions" to multiply HDMR components such that the resulting representation becomes composed of terms which have same multivariance as the original function's. Support functions are particularly chosen univariate functions each of which depends on a separate independent variable. The constant component is multiplied by all support function factors while the univariate components are multiplied by all support functions except the one depending on the same independent variable as the relevant univariate component's. As we proceed to higher multivariate components the number of the support function factors decreases because of the discarded factors of same independent variables as the relevant component's. Regarding to this definition HDMR corresponds to the EMPR case where all the support functions are unit constant functions. EMPR, like HDMR, is composed of 2N terms for a multivariate function of N variables. The words "term" and "component" have different meanings in contrast to HDMR. Component implies the function showing a specific multivariance whereas term means the product of the component under consideration by the relevant support functions. The first term of EMPR is the product of the constant component by the all support functions. The next N terms are composed of univariate components multiplied by the corresponding (N ?1) number of support function. The following N(N ?1)/2 terms are composed of the products of the bivariate components with the relevant support functions and so on. The kth group of terms are composed of the product of the kth component by the relevant support functions. Thus, EMPR is also a finite term involving decomposition like HDMR. Despite this finiteness, the number of the terms may grow undesiredly when N tends to grow unboundedly. Hence, not the whole decomposition but its truncations at some multivariate components like preferably constant, more meaningfully univariate, or at most, bivariate ones are desired to be used in practical applications. EMPR components, as in HDMR, are mutually orthogonal, under an appropriately given weight and over a specified orthogonal geometrical hypervolume, and, this permits us to define some functionals we call "Additivity Measurers" or "Quality Measurers", to estimate how constant, univariate or bivariate EMPR is. They reflect the contributions of some level truncations to the target function in norm square. Of course the most lovely case is the constant function although it is somehow trivial. If the constancy can not be achieved exactly then constancy dominancy is sought. Quality measurers form a well ordered sequence between 0 and 1 inclusive, and, the closer constancy measurer to 1 the better numerical efficiency in the truncation at the constant component. Even though there is almost nothing to do for having constant term dominancy in HDMR except the weight function selection, EMPR has more flexibilities, the support functions to this end. By appropriately choosing them it is possible to maximize the contribution of the constant component to the target function in norm square. As proven by us, the constancy of HDMR approaches to 1 when its geometry suppressed to 0 in size, so does the EMPR's. This brings the idea of choosing support functions in such a way that the considered function's weighed integral, giving EMPR's constant component, becomes having asymptotically flat kernel, that is, some number of first derivatives of the kernel vanish at a specified point in the domain of EMPR. Presentation will focus on these issues by also emphasizing on certain practicality aspects.

#### Brief Biography of the Speaker:

Metin Demiralp was born in Turkey on 4 May 1948. His education from elementary school to university was entirely in Turkey. He got his BS, MS, and PhD from the same institution, Istanbul Technical University. He was originally chemical engineer, however, through theoretical chemistry, applied mathematics, and computational science years he was mostly working on methodology for computational sciences and he is continuing to do so. He has a group (Group for Science and Methods of Computing) in Informatics Institute of Istanbul Technical University (he is the founder of this institute). He collaborated with the Prof. Herschel A. Rabitz's group at Princeton University (NJ, USA)

at summer and winter semester breaks during the period 1985–2003 after his 14 months long postdoctoral visit to the same group in 1979–1980. Metin Demiralp has more than 90 papers in well known and prestigious scientific journals, and, more than 170 contributions to the proceedings of various international conferences. He gave many invited talks in various prestigious scientific meetings and academic institutions. He has a good scientific reputation in his country and he is one of the principal members of Turkish Academy of Sciences since 1994. He is also a member of European Mathematical Society and the chief–editor of WSEAS Transactions on Computers currently. He has also two important awards of turkish scientific establishments. The important recent foci in research areas of Metin Demiralp can be roughly listed as follows: Fluctuation Free Matrix Representations, High Dimensional Model Representations, Space Extension Methods, Data Processing via Multivariate Analytical Tools, Multivariate Numerical Integration via New Efficient Approaches, Matrix Decompositions, Multiway Array Decompositions, Enhanced Multivariate Product Representations, Quantum Optimal Control.

#### **Plenary Lecture 1**

#### On a State Space Energy Based Generalization of the Nose - Hoover Non - Hamiltonian Dynamics



#### Professor Milan Stork Department of Applied Electronics and Telecommunications Faculty of Electrical Engineering and Regional Innovation Centre for Electrical Engineering, University of West Bohemia, Plzen (RICE) P.O. Box 314 30614 Plzen, Czech Republic E-mail: stork@kae.zcu.cz

Abstract: Experimental investigations of molecular dynamics at constant temperature for many-particle systems have been strongly influenced by introduction of the Nose-Hoover thermostat dynamic's in 1980's. At low energy levels the dynamic behavior is known to be regular. At higher energy levels the regular motion is destroyed by perturbations, as follows from Kolmogorov-Arnold-Moser theory. The resulting chaotic behavior has traditionally been analyzed by means of the Lyapunov exponents. It will be demonstrated in the proposed contribution that such a behavior is typical for a broad class of interconnected oscillators with at least one non-linear element. A new concept of abstract state space energy for a broad class of dissipative system representations, including such as the recently introduced non-Hamiltonian Nose-Hoover thermostat system will be presented as a limiting case too. The questions of system instability, dissipativity, conservativity, asymptotic stability, state and parameter minimality, and many other related structural properties, are traditionally described in physical terms and are known to be closely related to the total system energy evolution. In contrary, the presented paper deals exclusively with an abstract state space energy measure for a broad class of finite dimensional strictly causal systems described in state-space representation form. The resulting energy metric function is induced by the observed output signal power of an abstract dissipative system representation in such a way that a form of abstract conservation law holds. The concept of the state space energy is defined by power integration. Using abstract form of the energy conservation principle a specific structure of the corresponding class of physically correct system representations is derived. The same technique is applied for continuous-time as well as for discrete-time systems. Some typical examples of linear and nonlinear causal systems are investigated from the proposed state space energy point of view, too. The system simulation results will also be presented in the lecture. The obtained results of a number of simulation experiments are compared with classical dynamics based techniques as well as with recently published Nose-Hoover dynamics related results.

#### Brief Biography of the Speaker:

Milan Stork received the M.Sc. degree in electrical engineering from the Technical University of Plzen, Czech Republic at the department of Applied electronics in 1974. He specialized in electronics systems and control in research institute in Prague. Since 1977 he worked as

lecturer on University of West Bohemia in Plzen. He received Ph.D. degree in automatic control systems at the Czech Technical University in Prague in 1985. In 1997, he became as Associate Professor and in 2007 full professor at the Department of Applied Electronics and Telecommunication, faculty of electrical engineering on University of West Bohemia in Plzen, Czech Republic. He has numerous journal and conference publications. He is member of editorial board magazine "Physician and Technology". His research interest includes analog/digital linear, nonlinear and chaotic systems, control systems, signal processing and biomedical engineering, especially cardiopulmonary stress exercise systems.