



**Editors: Vladimir Vasek, Yuriy S. Shmaliy, Denis Trcek,
Nobuhiko P. Kobayashi, Ryszard S. Choras, Zbigniew Klos**

Recent Researches in Telecommunications, Informatics, Electronics & Signal Processing

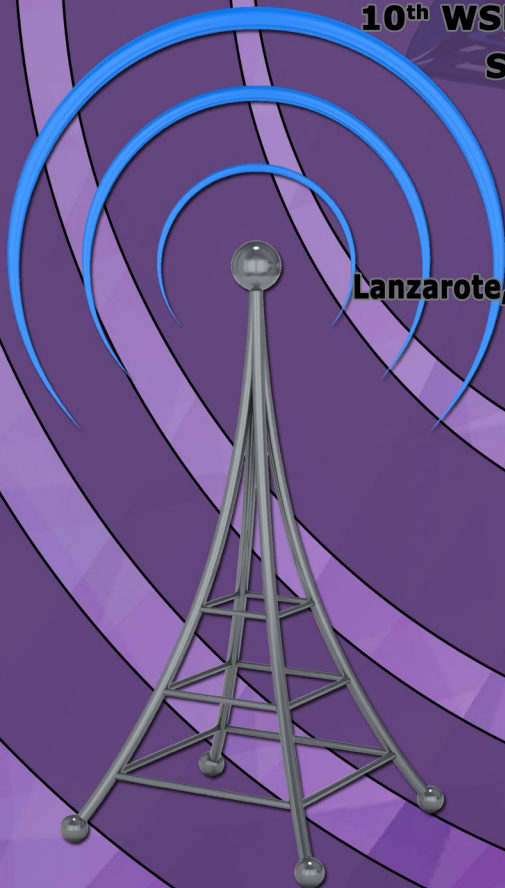
Recent Researches in Telecommunications, Informatics, Electronics & Signal Processing

**10th WSEAS International Conference on
Telecommunications and Informatics (TELE-INFO '11)**

**10th WSEAS International Conference on
Microelectronics, Nanoelectronics, Optoelectronics (MINO '11)**

**10th WSEAS International Conference on
Signal Processing (SIP '11)**

Lanzarote, Canary Islands, Spain, May 27-29, 2011



ISBN: 978-1-61804-005-3



RECENT RESEARCHES in TELECOMMUNICATIONS, INFORMATICS, ELECTRONICS and SIGNAL PROCESSING

**10th WSEAS International Conference on
TELECOMMUNICATIONS and INFORMATICS (TELE-INFO '11)
10th WSEAS International Conference on MICROELECTRONICS,
NANOELECTRONICS, OPTOELECTRONICS (MINO '11)
10th WSEAS International Conference on SIGNAL PROCESSING
(SIP '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 2011**

RECENT RESEARCHES in TELECOMMUNICATIONS, INFORMATICS, ELECTRONICS and SIGNAL PROCESSING

**10th WSEAS International Conference on
TELECOMMUNICATIONS and INFORMATICS (TELE-INFO '11)
10th WSEAS International Conference on MICROELECTRONICS,
NANOELECTRONICS, OPTOELECTRONICS (MINO '11)
10th WSEAS International Conference on SIGNAL PROCESSING
(SIP '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 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: 978-1-61804-005-3



World Scientific and Engineering Academy and Society

RECENT RESEARCHES in TELECOMMUNICATIONS, INFORMATICS, ELECTRONICS and SIGNAL PROCESSING

**10th WSEAS International Conference on
TELECOMMUNICATIONS and INFORMATICS (TELE-INFO '11)
10th WSEAS International Conference on MICROELECTRONICS,
NANOELECTRONICS, OPTOELECTRONICS (MINO '11)
10th WSEAS International Conference on SIGNAL PROCESSING
(SIP '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 2011**

Editors:

Prof. Vladimir Vasek, Tomas Bata University in Zlin, Czech Republic
Prof. Yuriy Shmaliy, Guanajuato University, Mexico
Prof. Denis Trcek, University of Ljubljana, Slovenia
Prof. Nobuhiko P. Kobayashi, University of California Santa Cruz, USA
Prof. Ryszard S. Choras, University of Technology & Life Sciences, Poland
Prof. Zbigniew Klos, Poznan University of Technology, Poland

International Program Committee Members:

Elsayed Atlam, JAPAN
Caner Akuner, TURKEY
Ognjen Kuljaca, UNITED STATES
Muhammed A. Ibrahim, IRAQ
Ismail Temiz, TURKEY
Bahadtin Ruzgar, TURKEY
Mawahib Sulieman, UNITED ARAB
EMIRATES
Hossein Shayeghi Moghanlou, IRAN
Abdullah Mamun, SINGAPORE
Keylan Alimhan, JAPAN
Luminita Giurgiu, ROMANIA
Andreas Terzis, GREECE
Onsen Toygar, TURKEY
Sina Khorasani, IRAN
Stefania Popadiuc, ROMANIA
Refik Samet, TURKEY
Mehmet Onder Efe, TURKEY
Francklin Rivas, VENEZUELA
Addison Rios-Bolivar, VENEZUELA
Victoria Rodellar, SPAIN
Mehmet Hakan Karaata, KUWAIT
Ichirou Takahashi, JAPAN
Kai Li, CHINA
Hwang-Cherng Chow, TAIWAN
Georgi Gluhchev, BULGARIA
Francesco Muzi, ITALY
Sajjad Mohsin, PAKISTAN
Yong Woo Lee, KOREA
Nasser Shahtahmasebi, IRAN
Saeed-Reza Sabbagh-Yazdi, IRAN
Frangiskos Topalis, GREECE
Boumchedda Khaled, ALGERIA
Kalle Kantola, FINLAND
Ismail Musirin, MALAYSIA
Helen Catherine Leligou, GREECE
Slobodan Babic, CANADA
Lambros Ekonomou, GREECE
Nam Tran, AUSTRALIA
Dorin Cismasiu, ROMANIA
Pooia Lalbakhsh, IRAN
Shabiul Islam, MALAYSIA
Florin Dragan, ROMANIA
Pelin Yildiz, TURKEY
Stelios Zimeras, GREECE
Rafic Bachnak, UNITED STATES
Hong-Tzer Yang, TAIWAN
Norman Mariun, MALAYSIA
Oscar Camacho, VENEZUELA
Chang-Biau Yang, TAIWAN
Sylvia Encheva, NORWAY
Rafic Bachnak, UNITED STATES
Samir Nejm, TUNISIA
Nicolae Popoviciu, ROMANIA
Yaw-Ling Lin, TAIWAN
PooGyeon Park, KOREA
Dana Petcu, ROMANIA
Yoonsik Choe, KOREA
Ioan Salomie, ROMANIA
Abdel-Latif Elshafei, EGYPT
Baki Koyuncu, TURKEY
Ouahdi Dris, ALGERIA
Zakir Husain, IRAN
Krishna Busawon, UNITED KINGDOM

Preface

This year the 10th WSEAS International Conference on TELECOMMUNICATIONS and INFORMATICS (TELE-INFO '11), the 10th WSEAS International Conference on MICROELECTRONICS, NANO ELECTRONICS, OPTOELECTRONICS (MINO '11) and the 10th WSEAS International Conference on SIGNAL PROCESSING (SIP '11) were held in Lanzarote, Canary Islands, Spain, May 27-29, 2011. The conferences provided a platform to discuss telecommunications, informatics, microelectronics, nanoelectronics, quantum electronics, biomolecular electronics, optoelectronics, filter design and structures, nonlinear signals and systems, signal and system modeling, image coding, computed imaging, robotics 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

<u>Plenary Lecture 1: Trust Management in Pervasive Computing Environments - From Cyber Environments to Mathematical Economy and Sociology</u>	12
<i>Denis Trcek</i>	
<u>Plenary Lecture 2: Nanostructured Materials in Solid State Devices for Energy</u>	13
<i>Nobuhiko P. Kobayashi</i>	
<u>Plenary Lecture 3: Optimal FIR Filtering of State-Space Models in non-Gaussian Environment with Uncertainties</u>	15
<i>Yuriy S. Shmaliy</i>	
<u>Plenary Lecture 4: The Challenge of Biometrics</u>	16
<i>Ryszard S. Choras</i>	
<u>Simplified Design Approach of Rectangular Spiral Antenna for UHF RFID Tag</u>	17
<i>Makroum El Mostafa, Rifi Mounir, Latrach Mohamed, Benbassou Ali</i>	
<u>Swarm Intelligence for Mixed Pixel Resolution</u>	24
<i>V. K. Panchal, Nitish Gupta</i>	
<u>Sorting Networks on FPGA</u>	29
<i>Devi Prasad, Mohamad Yusri Mohamad Yusof, Smruti Santosh Palai, Ahmad Hafez Nawwi</i>	
<u>Decision-Making Processes and their Implementation in Digital Accounting Practices</u>	32
<i>Laura-Diana Radu, Sabina-Cristiana Necula</i>	
<u>Regular Antenna Array Synthesis Using Neural Network</u>	37
<i>Maja Sarevska, Nikos Mastorakis</i>	
<u>The Cost of Migrating DBMS from a Conventional Environment to Virtual Machines</u>	41
<i>Mohamed Helmy Khafagy, Amr Ahmad Salem</i>	
<u>Smoothing of Ultrasound Images with the p-lag FIR Structures</u>	47
<i>L. J. Morales-Mendoza, Y. S. Shmaliy, R. F. Vazquez-Bautista, O. G. Ibarra-Manzano</i>	
<u>The Investigation of the Effect of Aging through Photoplethysmogram Signal Analysis of Erectile Dysfunction Subjects</u>	53
<i>Y. K. Qawqzeh, M. B. I. Reaz, O. Maskon, Kalaivani Chellappan, M. T. Islam, M. A. M. Ali</i>	
<u>Optimal and Suboptimal Reconstruction of Non Gaussian Realizations on the Output of Non Linear Converters</u>	59
<i>Vladimir Kazakov, Yair Olvera</i>	
<u>Unbiased Predictive Steering of Local Clocks Utilizing GPS 1PPS Time Signals</u>	65
<i>Luis Arceo-Miquel, Oscar Ibarra-Manzano, Yuriy S. Shmaliy</i>	

<u>Filtering of Discrete-Time State-Space models with the p-Shift Kalman-like Unbiased FIR Algorithm</u>	71
<i>Oscar Ibarra-Manzano</i>	
<u>Error Analysis at the Reception of SAW Sensors</u>	77
<i>G. Cerda-Villafana, Y. S. Shmaliy</i>	
<u>Increasing the Image Quality of Atomic Force Microscope by Using Improved Double Tapered Micro Cantilever</u>	83
<i>Ali Sadeghi</i>	
<u>Segmentation using Iso-Perimetric Algorithm</u>	88
<i>Arti Khaparde, J. Saritha, R. R. Vishnuvardhan</i>	
<u>Deploying IPv6 Service Across Local IPv4 Access Networks</u>	94
<i>Ala Hamarsheh, Marnix Goossens, Rafe' Alasem</i>	
<u>Next Generation Mobile Care Solution</u>	101
<i>Jithesh Sathyan, Manesh Sadasivan</i>	
<u>A Dynamic Programming based Technique for Optimal Allocation of Radio Resource in Multi-user Cellular Long-Term Evolution (LTE) Downlink</u>	107
<i>Abayomi M. Ajofoyinbo, Kehinde Orolu</i>	
<u>Simulation Algorithm for Error Analysis of SAW Sensors</u>	114
<i>G. Cerda-Villafana, Y. S. Shmaliy</i>	
<u>The Reconstruction of Gaussian Processes Realizations with an Arbitrary Set of Samples</u>	120
<i>Vladimir Kazakov</i>	
<u>FIR Filtering of State-Space Models in non-Gaussian Environment with Uncertainties</u>	126
<i>Yuriy S. Shmaliy</i>	
<u>The Necessity of Multicast for IPTV Streaming</u>	132
<i>Arianit Maraj, Adrian Shehu</i>	
<u>Analysis and Design of Microstrip to Balanced Stripline Transitions</u>	137
<i>Ruzhdi Sefa, Arianit Maraj</i>	
<u>Design of Back-To-Back Tapered Line Transition</u>	143
<i>Ruzhdi Sefa, Arianit Maraj</i>	
<u>A Total Variation-Morphological Image Edge Detection Approach</u>	148
<i>Peter Ndajah, Hisakazu Kikuchi, Shogo Muramatsu, Masahiro Yukawa, Francis Benyah</i>	
<u>Investigation of Post-Annealing Indium Tin Oxide for Future Electro-Optical Device Application</u>	154
<i>Ching-Yuan Ho, Tse-Yi Tu, Chun-Chieh Wang, Yuan Kang</i>	

<u>Study of Lanthanum Incorporated HfO₂ Nano-Scale High-K Dielectric using Dense Plasma Focus for Metal–insulator–metal Capacitor Applications</u>	159
<i>A. Srivastava, Y. Malhotra</i>	
<u>Digital Modulation Recognition Based on Feature, Spectrum and Phase Analysis and its Testing with Disturbed Signals</u>	162
<i>A. Kubankova, D. Kubanek</i>	
<u>OCR Systems in Language Specific Environments</u>	167
<i>Palka Jan, Palka Jiri, Navratil Milan</i>	
<u>Complexity Cutback of Multiple Antenna Channel Estimation Using Orthogonal Matrix Triangularization</u>	171
<i>Mohammad Tariqul Islam, Mostafa Wasiuddin Numan, Norbahiah Misran, M. B. I. Reaz, Ajmal Hussain Shah, Mohd. Alauddin Mohd. Ali, J. S. Mandeep</i>	
<u>Trust Management – From Pervasive Computing Environments to Mathematical Economy and Sociology</u>	175
<i>Denis Trcek</i>	
<u>Ocular Biometrics - Automatic Feature Extraction from Eye Images</u>	179
<i>Ryszard S. Choras</i>	
<u>Testing of Methods for Artery Section Area Detection</u>	184
<i>Kamil Riha, Radek Benes</i>	
<u>Blood Pressure Determination Using Analysis of Biosignals</u>	188
<i>Radim Ciz, Milan Chmelar</i>	
<u>Impulse Noise Suppression in Blind Channel Equalization</u>	194
<i>Rubaiyat Yasmin, Tetsuya Shimamura</i>	
<u>Measuring Transmitter Attack Time through Time-Frequency Representations</u>	201
<i>Leopoldo Angrisani, Massimo D’Apuzzo, Mauro D’Arco, Rosario Schiano Lo Moriello, Michele Vadursi</i>	
<u>Authors Index</u>	207

Plenary Lecture 1

Trust Management in Pervasive Computing Environments - From Cyber Environments to Mathematical Economy and Sociology



Professor Denis Trcek

Faculty of Computer and Information Sciences
University of Ljubljana
Slovenia

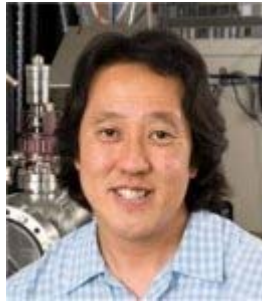
E-mail: denis.trcek@fri.uni-lj.si

Abstract: Trust management technologies are crucial for the further and wider acceptance of pervasive computing solutions. These solutions were first addressed some fifteen years ago, but the proposed approaches were actually tackling security and not trust. Later, more advanced methodologies emerged that were based on Bayesian statistics. These were followed by Dempster-Shafer theory of evidence and its derivatives. In addition, some game theory based methodologies were developed as well. But trust is a manifestation of justification and assessment processes, which can be rarely assumed to be e.g. only rational, therefore trust should be treated in accordance with this fact. This plenary lecture will therefore provide an extensive survey of existing methodologies, and results of recent research focused on appropriate mentally ergonomic methodologies. Finally, it will present one mentally ergonomic trust management methodology called Qualitative Assessment Dynamics that complements existing methodologies mentioned above.

Brief Biography of the Speaker: Prof. Dr. Denis Trcek is with Faculty of Computer and Information Sciences, University of Ljubljana, where he heads Laboratory of e-media. He has been involved in the field of IT security, privacy and trust for almost twenty years. He has taken part in various EU and national projects in government, banking and insurance sectors (projects under his supervision totaled to approx. one million EURs). His bibliography includes over one hundred titles, including monograph published by renowned publisher Springer. D. Trcek has served (or still serves) as a member of various international bodies and boards (MB of the European Network and Information Security Agency, etc.).

Plenary Lecture 2

Nanostructured Materials in Solid State Devices for Energy



Professor Nobuhiko P. Kobayashi
Electrical Engineering Department
Baskin School of Engineering
University of California Santa Cruz
Santa Cruz, California, U.S.A
E-mail: nobby@soe.ucsc.edu

Abstract: Designing solid-state devices is essentially limited by choosing available chemical elements found on the Periodic Table and forming various stable solid compounds made of these chemical elements. A key to developing novel solid-state devices is, therefore to find a route to combine a variety of such compounds that are often physically and/or chemically incompatible each other. In this talk, specific examples of "nanostructured materials" currently pursued at Nanostructured Energy Conversion Technology and Research of Advanced Studies Laboratories, University of California Santa Cruz and NASA Ames Research Center (<http://asl.ucsc.edu/contact.php>), will be presented with the view toward solid-state devices for energy harvesting and saving. The talk is divided into the following two topics.

Nanostructured materials for energy harvesting (photovoltaics and thermoelectrics)

Development of next-generation energy resources that are reliable and economically/environmentally acceptable is a key to harnessing and providing the resources essential for the life of mankind. Our research focuses on the development of novel nanostructured materials that would significantly benefit energy harvesting, in particular, from light and heat. In these critical applications, traditional semiconductor solid-state devices, such as photovoltaic (PV) and thermoelectric (TE) devices based on a stack of single-crystal semiconductor thin films or single-crystal bulk semiconductor have several drawbacks, for instance; scalability-limits when ultra-large-scale implementation is envisioned for PV devices and performance-limits for TE devices in which the interplay of both electronic and phonon systems is important. In our research, various types of nanostructured materials (e.g., nanowires and nanoparticles) coupled to or embedded within micrometer-scale semiconductor platforms are explored to build a variety of non-conventional PV and TE devices. Two core architectures are (1) single-crystal semiconductor nanowires electrically connected to amorphous semiconductor thin films and (2) semi-metallic nanoparticles embedded within a semiconductor thin film. These two architectures are studied within the context of their basic electronic, optical, and thermal properties, which will be further assessed and validated by comparison with theoretical approaches to draw comprehensive pictures of physicochemical properties of the nanostructured materials.

Nanostructured materials for energy saving (low-power electronics)

Fundamental building blocks of computers for the last half century have been based on three-terminal semiconductor electronic devices (i.e., transistors). Among various transistors, silicon metal oxide semiconductor field effect transistors (Si-MOSFETs) are the core devices for constructing prevailing CMOS logic families. Among many technical challenges in developing advanced Si-MOSFETs, reducing excessive heat generated by high performance CMOS chips ranks high. Lowering the operational voltage for a CMOS chip is one way to reduce the total electric power consumed by a CMOS chip while the size of Si-MOSFETs is scaled down, however, the lowering the operational voltage is negated by, for instance, the increase in off-state leakage current of smaller transistors. Replacing Si-MOSFETs with other types of devices that operate in ways fundamentally different from those of Si-MOSFETs will be the ultimate approach and could lead us to pave a entirely new way to construct computers in the future. We are currently developing unique two-terminal devices, resistors with memory functions "memristors", fabricated in sub-viral length scales to build memory and logic devices that can be operated at ultra-low power. A wide range of metal oxides that have been known to exhibit a variety of electrical properties including insulating, semiconducting, and metallic are used as core materials for memristors. Precise and reproducible control on thickness and chemical composition of metal oxide thin films is one of the critical factors in the fabrication of memristors. Among various fabrication techniques, we are currently employing atomic layer deposition (ALD) to develop variety of metal oxide thin films for memristors.

Brief Biography of the Speaker: Nobuhiko P. Kobayashi is a professor at the University of California Santa Cruz (UCSC) and a co-director of Advanced Studies Laboratories of UCSC and NASA Ames Research Center. Current research projects include synthesis and characterization of nanometer-scale materials and devices with emphasis on solid-state energy conversion (sponsored by Defense Advanced Research Program Agency, Office of Naval Research, U.S. Department of Energy, and NASA) and advanced computing systems (sponsored by Hewlett-Packard Laboratories and NASA). Prior to joining UCSC, Prof. Kobayashi was involved in developing electronic materials for ultra-high density electrical switches to build memories and logics required for future computing systems at Hewlett-Packard Laboratories. He was also involved in semiconductor nanowire photonics for optical interconnect necessary for advanced computing systems. Prior to Hewlett-Packard Laboratories, Prof. Kobayashi worked at Lawrence Livermore National Laboratory, developing semiconductor materials for both ultra-high speed diagnosis systems required for the National Ignition Facility funded by the U.S. Department of Energy and the optical code division multiple access (optical-CDMA) funded by Defense Advanced Research Project Agency. From 1999 to 2001, Prof. Kobayashi was at Agilent Laboratories, developing light emitting diodes, vertical cavity surface emitting lasers, and hetero bipolar transistors for both ultra-wide band fiber-optics and wireless communications. Prof. Kobayashi earned his M.S. and Ph.D. degrees in materials science from University of Southern California in 1994 and 1998. Prof. Kobayashi published over 100 journal and conference papers including more than 17 invited talks and papers and contributed to 4 book chapters. Prof. Kobayashi is currently serving on various program committee members/conference chairs/co-chairs at SPIE International Symposium on Defense, Security and Sensing, SPIE Optics and Photonics/Nanoscience and Engineering, WCECS ICCE, and ICCAS/Memristors and Memristive Systems.

Plenary Lecture 3

Optimal FIR Filtering of State-Space Models in non-Gaussian Environment with Uncertainties



Professor Yuriy S. Shmaliy

Department of Electronics

DICIS, Guanajuato University

Salamanca, 36855, Mexico

E-mail: shmaliy@salamanca.ugto.mx

Abstract: In industrial applications, optimal estimators of system state often face a necessity to work in non-Gaussian environment in the presence of uncertainties. This lecture introduces readers to the recently developed p-shift iterative Kalman-like finite impulse response (FIR) unbiased estimation (UE) algorithm intended for filtering ($p = 0$), prediction ($p > 0$), and smoothing ($p < 0$) under such conditions of linear discrete time-varying state-space models. The algorithm was designed with no requirements for noise and initial conditions and thus has strong engineering features. A solution is first found in a batch form and then represented in the computationally efficient iterative Kalman-like one with the following advantages peculiar to FIR structures: guaranteed bounded input/bounded output (BIBO) stability, better robustness against temporary model uncertainties and round-off errors, and low sensitivity to noise and initial conditions. It is shown that the estimator proposed overperforms the Kalman one when the noise covariances and initial conditions are not known exactly, if noise is not white sequence, and when both the system and measurement noise components need to be filtered out. Otherwise, the estimators produce similar errors. Extensive investigations of the FIR UE have been carried out for the standard Kalman filter regarding different models. Examples of applications have been taken from signal and image processing, clock synchronization, and control. All the way, we lay stress on the trade-off with the Kalman filter in the Gaussian and non-Gaussian environments allowing for temporary model and measurement uncertainties, as well as outliers.

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 4

The Challenge of Biometrics



Professor Ryszard S. Choras
Institute of Telecommunications
University of Technology & Life Sciences
Bydgoszcz, Poland
E-mail: choras@utp.edu.pl

Abstract: A biometric system is a pattern recognition system that recognizes a person on the basis of a feature vector derived from a specific physiological or behavioral characteristic that the person possesses.

Biometric systems have four main components: sensor, feature extraction, biometric database, matching-score and decision-making modules. The input subsystem consists of a special sensor needed to acquire the biometric signal. Invariant features are extracted from the signal for representation purposes in the feature extraction subsystem. During the enrollment process, a representation (called template) of the biometrics in terms of these features is stored in the system. The matching subsystem accepts query and reference templates and returns the degree of match or mismatch as a score, i.e., a similarity measure. A final decision step compares the score to a decision threshold to deem the comparison a match or non-match.

Since traditional biometric systems have many limitations a new approach in biometrics used different models of multimodal systems. Multimodal biometric systems improve the incompleteness of any unimodal system. In multimodal biometric system various levels of fusion the personal attributes information is performed.

The personal attributes used in a biometric identification system can be physiological, such as facial features, fingerprints, iris, retinal scans, hand and finger geometry; or behavioral, the traits idiosyncratic of the individual, such as voice print, gait, signature, and keystroking.

We have proposed biometric schemes to combine biometric data based on face and eye to identify a person.

Brief Biography of the Speaker: Ryszard S. Choras, He is currently Full Professor in the Institute of Telecommunications of the University of Technology & Life Sciences, Bydgoszcz, Poland. His research experience covers image processing and analysis, image coding, feature extraction and computer vision.

At present, he is working in the field of image retrieval and indexing, mainly in low- and high-level features extraction and knowledge extraction in CBIR systems. He is the author of Computer Vision. Methods of Image Interpretation and Identification (2005) and more than 163 articles in journals and conference proceedings.

He is the member of the Polish Cybernetical Society, Polish Neural Networks Society, IASTED, and the Polish Image Processing Association. Professor Choras is a member of the editorial boards of Machine Vision and Graphics, International Journal of Biometrics (IJBM), International Journal of Biology and Biomedical Engineering, Recent Patents On Signal Processing (Bentham Open). He is the editor-in-chief of WSEAS Transactions on Signal Processing Journal, Image Processing and Communications and associate editor-in-chief Computer Science Journals (CSC Journals) Image Processing (IJIP).

He has served on numerous conference committees, e.g., as Visualization, Imaging, and Image Processing (VIIP), IASTED International Conference on Signal Processing, Pattern Recognition and Applications (SPPRA) and International Conference on Computer Vision and Graphics in Warsaw, ICINCOICATE Conference.