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

Recent Researches in Telecommunications, Informatics, Electronics & Signal Processing

10th WSEAS International Conference on
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10th WSEAS International Conference on
Microelectronics, Nanoelectronics, Optoelectronics (MINO '11)
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Signal Processing (SIP '11)

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Preface

This year the 10th WSEAS International Conference on TELECOMMUNICATIONS and INFORMATICS (TELE-INFO '11), the 10th WSEAS International Conference on MICROELECTRONICS, NANOELECTRONICS, 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

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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.).

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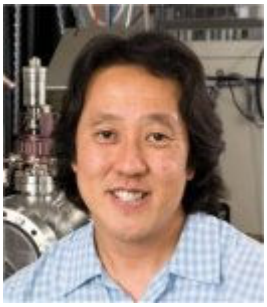
Plenary Lecture 2

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, resisters 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.

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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 ICCCAS/Memristors and Memristive Systems.

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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: guarantied 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.

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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, ICINCO\ICATE Conference.

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