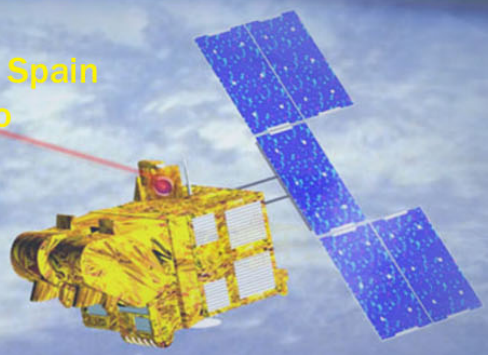

Recent Advances in Electrical Engineering
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# NEW ASPECTS OF COMMUNICATION

Proceedings of the 12th WSEAS International Conference on COMMUNICATIONS

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**Preface**

This book contains the proceedings of 12th WSEAS International Conference on COMMUNICATIONS (part of the 12th WSEAS CSCC Multiconference) which was held in Heraklion, Greece, July 23-25, 2008. This conference aims to disseminate the latest research and applications in Microwaves, Antennas, Radar, Satellite Communications, Optical Transmitters, Optical Receivers, Coherent Systems, Optical Switching and network elements, Telecommunications Standardization, Wireless LANS, Wireless Data Transmission, Wireless ATM, Solid State Electronics for Communications and other relevant topics and applications.

the friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. the WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

the contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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# CEREMONY for Prof. SIFAKIS

## Opening by the Deputy Minister of National Defence of GREECE
## Ioannis Plakiotakis
## (Biochemical Engineer, M.Sc and Economics, M.Sc.)

http://www.plakiotakis.gr

Born in 1968 in Sitia, in the prefecture of Lasithi on the island of Crete. Plakiotakis studied chemical engineering at the University of Wales and obtained a Master's degree in biochemical engineering at London University with an MBA from the City University Business School of London. He worked at Eurocontrol, an inter-country Organisation that regulates Air Circulation and the flight safety in Europe. He is a member of the New Democracy Party since 1987. He was an active member of New Democracy's Student Movement (DAP) and in 1999 became Vice-president of the Local Committee of N.D. in Sitia (Crete). From 1998 to 2002 he acted as Municipal Advisor in Sitia. On January 2001 he was appointed as a permanent member of the Committee of Tourism by the President of the Hellenic Republic. He is a member of the Association of graduates of Biochemical Engineering at the University of London, as well as at the City University Business School.

**Parliamentary- Governmental Activity:**

- Member of Parliament's Special Permanent Committee of Protection of the Environment.
- New Democracy's Assistant Supervisor of Tourism and member of the Parliamentary Delegates of Production and Trade, Protection of Environment and Orthodoxy.
- He was elected MP of Lasithi with the N.D. in 2004 and in 2007.
- On 19 October 2007 he was appointed Deputy Minister of Defense.

# KEYNOTE SPEAKER – TURING AWARD 2007

## Embedded Systems – Scientific Challenges and Work Directions

**Prof. Joseph Sifakis**
**Turing Award 2007,**
**http://www.acm.org/press-room/news-releases/turing-award-07/**
**1 hour Keynote Lecture (CONFERENCE ROOM 1),**
**Wednesday, July 23, 16:00-17:00**

**Nobel of Computing:**
**http://www.cmu.edu/homepage/practical/2008/winter/nobel-of-computing.shtml**
**Also: http://www-verimag.imag.fr/~sifakis/**

**Abstract:** Embedded systems are components integrating software and hardware that are jointly and specifically designed to provide given functionalities, which are often critical. They are used in a very wide array of application areas - including transport, consumer electronics / electrical appliances, energy distribution, manufacturing systems, etc.
Designing embedded systems requires techniques taking into account extra-functional requirements regarding optimal use of resources such as time, memory and energy while ensuring autonomy, reactivity and robustness. Jointly taking into account these requirements raises a grand scientific and technical challenge: extending Computer Science with paradigms and methods from Control Theory and Electrical Engineering. Computer Science is based on discrete computation models, which are by their nature are very different from the analytic models used in other engineering disciplines, because they do not encompass physical time and resources. We discuss the main aspects of this

challenge and their associated research directions for different areas such as modelling, programming, compilers, operating systems and networks.

**Biography:** Joseph Sifakis is CNRS researcher and the Founder of Verimag laboratory (http://www-verimag.imag.fr/), in Grenoble, France. He studied Electrical Engineering at the Technical University of Athens and Computer Science at the University of Grenoble.

Verimag is a leading research laboratory in the area of critical embedded systems. It developed the underlying theory and technology for the SCADE tool, used by Airbus for the design and validation of its critical real-time systems, and is becoming a de facto standard for aeronautics. Verimag has a lasting and strategic collaboration with ST Microelectronics, France Telecom R&D, and Airbus, through which numerous results on validation and testing have been transferred.

Joseph Sifakis is recognized for his pioneering work on both theoretical and practical aspects of Concurrent Systems Specification and Verification. He contributed to emergence of the area of model-checking, currently the most widely-used method for the verification of industrial applications. His current research activities include component-based design, modeling, and analysis of real-time systems with focus on correct-by-construction techniques (http://www-verimag.imag.fr/~sifakis/).

Joseph Sifakis has broad experience with industry, notably though joint projects with partners such as Astrium, the European Space Agency, France Telecom, ST Microelectronics and he has also been active for many years in consulting.

Joseph Sifakis is the Scientific Coordinator of the European Network of Excellence ARTIST2 on Embedded Systems Design. (http://www.artist-embedded.org/). This network gathers 35 of the best European teams in the area, and aims to produce innovative results for cost-effective design of dependable embedded systems. It will also promote innovative methods safe and secure systems, notably through cooperation with key European industrial partners such as Thalès, Airbus, Ericsson, Philips, and ST Microelectronics.

Joseph Sifakis is the chair of "Chamber B" (Public Research Organisations) of ARTEMISIA, which is the Industrial Association within the ARTEMIS European Technology Platform on Embedded Systems (http://www.cordis.lu/ist/artemis/).

Joseph Sifakis is the director of the CARNOT Institute "Intelligent Software and Systems" in Grenoble. Joseph Sifakis is a member of the editorial board of several journals, co-founder of the International Conference on Computer Aided Verification (CAV) and a member of the Steering Committee of the EMSOFT (Embedded Software) conference.

Joseph Sifakis has received with Ed Clark and Allen Emerson for their contribution to Model Checking, the Turing Award for 2007 (http://awards.acm.org/homepage.cfm?srt=all&awd=140). He is also the recipient of the CNRS Silver Medal in 2001.

## Keynote Lecture I

# Distributed Estimation Using Wireless Sensor Networks

**Professor Georgios B. Giannakis**
University of Minnesota
USA

E-mail: georgios@ece.umn.edu

**Abstract:** Envisioned applications of wireless sensor networks (WSNs) include surveillance, monitoring and tracking tasks. These motivate well decentralized estimation and smoothing of deterministic and (non)stationary random signals using (possibly correlated) observations collected across distributed sensors. In this talk we present state-of-the-art algorithms for consensus-based distributed estimation using ad hoc WSNs where sensors communicate over single-hop noisy links. the novel framework reformulates basic estimation criteria such as least-squares, maximum-likelihood, maximum a posteriori, and linear mean-square error, as decomposable, constrained, convex optimization problems that are amenable to distributed solutions. the resultant distributed estimators are provably convergent to their centralized counterparts and robust to communication noise. Besides stationary, the framework encompasses adaptive filtering and smoothing of non-stationary signals through distributed LMS and Kalman filtering.

**Brief Biography of the Speaker:** G. B. Giannakis received his B.Sc. in 1981 from the Ntl. Tech. Univ. of Athens, Greece and his M.Sc. and Ph.D. in Electrical Engineering in 1983 and 1986 from the Univ. of Southern California. Since 1999 he has been a professor with the Department of Electrical and Computer Engineering at the University of Minnesota, where he now holds an Endowed ADC Chair in Wireless Telecommunications. His general interests span the areas of communications, networking, signal processing, estimation and detection theory -- subjects on which he has published more than 270 journal papers, 450 conference papers, two research monographs and two edited books. Current research focuses on wireless networks, complex-field and space-time coding, ultra-wideband and cognitive radios, cross-layer designs and wireless sensor networks. He is the (co-) recipient of six best paper awards from the IEEE Signal Processing (SP) and Communications Societies (1992, 1998, 2000, 2001, 2003, 2004) and also received the SP Society's Technical Achievement Award in 2000 as well as the EURASIP Technical Achievement Award in 2005. He is an IEEE Fellow since 1997, a Distinguished Lecturer for 2007-08, and has served the IEEE in various editorial and organizational posts

# Keynote Lecture II
# Tyflos : A Wearable System-Prototype for Assisting Visually Impaired

**Dr. Nikolaos G. Bourbakis**
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Wright State University,College of Engineering and Computer Science
OBR Distinguished Professor of Information Technology
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**Abstract:** *Human eyes receive more than 75% of the total information accessible to the human senses.* "There are approximately 45 million blind individuals world-wide according to the World Health Report. Vision loss can be very traumatic, leading to frustration and depression. According to the American Foundation for the Blind (AFB), the rate of unemployment among legally blind individuals of working age residing in the United States (58%) is much greater than that of individuals with no functional limitations (18%). Employment opportunities and independence are scarce for visually impaired individuals. This is unfortunate in view of the fact that ingenious devices [IEEE Spectrum] and information technology (IT) strategies can be developed to help people overcome these barriers and to pursue educational opportunities that will allow them to become productive members of society." In this talk technological efforts are presented that have the same goal assisting and increasing the visual impaired people's independence in their working and living environment, and reducing their social neglect ness. In particular, the research effort (called Tyflos) is presented here that is an IT- based wearable system-prototype. It consists of a pair of dark glasses on which two tiny vision cameras, an ear speaker and a microphone are attached. the cameras are connected with a portable computer that carries intelligent software programs. the cameras, under the user's command, capture images from the surrounding and convert them via software programs into audio or vibrations. the current versions of Tyflos is used as 1) a reader by reading books or the blind user via audio conversion and 2) a navigation by converting 3D images into vibrations for navigation.

**Brief Biography of the Speaker:** Nikolaos G. BOURBAKIS (IEEE Fellow) received his PhD in computer engineering and informatics in 1983. He currently is the Associate Dean for Engineering Research, a Distinguished Professor of Informatics and the Director of the ATR Center at WSU. He has directed several research projects (Applied AI, Image Processing & Machine Vision, Visual Autonomous Navigation, Information Security, Bio-Informatics, Biomedical Engineering) funded by government and industry, and he has published near 300 papers in International refereed Journals, Conference proceedings and book-chapters. Previous working places: SUNY, IBM, UP, GMU. He is actively involved as an Associate Editor in several IEEE and International Journals and General Chair in numerous International IEEE Conferences. He is the EIC of the Artificial Intelligence Tools Int. Journal (WSP) and the new upcoming Bioinformatics Engineering Journal. He is an IEEE Computer Society Distinguished Speaker, and NSF University Research Programs Evaluator, an IEEE Computer Society Golden Core Member. He has received several high prestigious awards, some of them are: IBM Author recognition Award 1991, IEEE Computer Society Outstanding Contribution Award 1992, IEEE Outstanding Paper Award ATC 1994, IEEE Computer Society Technical Research Achievement Award 1998, IEEE I&S Outstanding Leadership Award 1998, IEEE ICTAI 10 years Research Contribution Award 1999, IEEE BIBE Leadership Award 2003, ASC Recognition Award 2005.

## Keynote Lecture III

# Algorithms for Rendering Depth of Field Effects for Synthetic Image Generation and Computational Photography

**Dr. Brian A. Barsky**
Professor of Computer Science
Affiliate Professor of Optometry and Vision Science
Member of Joint Graduate Group in Bioengeering, UCSF/UCB
Affiliate of Berkeley Center for New Media
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Web Page: http://www.cs.berkeley.edu/~barsky/

**Abstract:** Depth of field refers to the swath through a 3D scene that is imaged in acceptable focus through an optics system, such as a camera lens. It is a vitally important component of real photographs, and is useful as a tool for drawing the viewer's eye to the important part of the image. Depth of field is equally important for computer-generated images. This talk will provide an explanation of the phenomenon of depth of field and a survey of a variety of techniques to render depth of field effects in computer graphics, with particular attention devoted to the trade-offs between image quality and algorithm efficiency. Algorithms to render highly accurate depth of field effects, such as distributed ray tracing or the accumulation buffer, are sampling methods that use large numbers of samples, with high computational cost. Sampling is inherently slow because it effectively requires rendering the scene many times, which multiplies the render time by a potentially large factor. Faster algorithms are based on a post processing approach, which operates in image space. Post process methods operate on 2D images along with depth information, rather than working with a full 3D object representation as the sampling methods do. Consequently, post process methods struggle to accurately simulate the underlying optical process, and tend to suffer from artifacts or avoid those artifacts at a large cost. the talk will include an analysis of the nature of these artifacts.

**Brief Biography of the Speaker:** Brian A. Barsky is Professor of Computer Science and Affiliate Professor of Optometry and Vision Science at the University of California at Berkeley. He is a member of the Joint Graduate Group in Bioengineering, an interdisciplinary and inter-campus program, between UC Berkeley and UC San Francisco. He was a Directeur de Recherches at the Laboratoire d'Informatique Fondamentale de Lille (LIFL) of l'Université des Sciences et Technologies de Lille (USTL). He has been a Visiting Professor of Computer Science at the Hong Kong University of Science and Technology in Hong Kong, at the University of Otago in Dunedin, New Zealand, in the Modélisation Géométrique et Infographie Interactive group at l'Institut de Recherche en Informatique de Nantes and l'Ecole Centrale de Nantes, in Nantes, and at the University of Toronto in Toronto. Prof. Barsky was a Distinguished Visitor at the School of Computing at the National University of Singapore in Singapore, an Attaché de Recherche Invité at the Laboratoire Image of l'Ecole Nationale Supérieure des Télécommunications in Paris, and a visiting researcher with the Computer Aided Design and Manufacturing Group at the Sentralinsitutt for Industriell Forskning (Central Institute for Industrial Research) in Oslo. He attended McGill University in Montréal, where he received a D.C.S. in engineering and a B.Sc. in mathematics and computer science. He studied computer graphics and computer science at Cornell University in Ithaca, where he earned an M.S. degree. His Ph.D. degree is in computer science from the University of Utah in Salt Lake City. He is a Fellow of the American Academy of Optometry (F.A.A.O.). He is a co-author of the book An Introduction to Splines for Use in Computer Graphics and Geometric Modeling, co-editor of the book Making Them Move: Mechanics, Control, and Animation of Articulated Figures, and author of the book Computer Graphics and

Geometric Modeling Using Beta-splines. He has published 120 technical articles in this field and has been a speaker at many international meetings. Dr. Barsky was a recipient of an IBM Faculty Development Award and a National Science Foundation Presidential Young Investigator Award. He is an area editor for the journal Graphical Models. He is the Computer Graphics Editor of the Synthesis digital library of engineering and computer science, published by Morgan & Claypool Publishers, and the Series Editor for Computer Science for Course Technology, part of Cengage Learning. He was the editor of the Computer Graphics and Geometric Modeling series of Morgan Kaufmann Publishers, Inc. from December 1988 to September 2004. He was the Technical Program Committee Chair for the Association for Computing Machinery / SIGGRAPH '85 conference. His research interests include computer aided geometric design and modeling, interactive three-dimensional computer graphics, visualization in scientific computing, computer aided cornea modeling and visualization, medical imaging, and virtual environments for surgical simulation. He has been working in spline curve/surface representation and their applications in computer graphics and geometric modeling for many years. He is applying his knowledge of curve/surface representations as well as his computer graphics experience to improving videokeratography and corneal topographic mapping, forming a mathematical model of the cornea, and providing computer visualization of patients' corneas to clinicians. This has applications in the design and fabrication of contact lenses, and in laser vision correction surgery. His current research, called Vision-Realistic Rendering is developing new three-dimensional rendering techniques for the computer generation of synthetic images that will simulate the vision of specific individuals based on their actual patient data using measurements from a instrument a Shack-Hartmann wavefront aberrometery device. This research forms the OPTICAL (OPtics and Topography Involving Cornea and Lens) project.

# Plenary Lecture I
# Metamaterial Antennas and Finlines Using Full Wave Analysis

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Abstract: Metamaterials are been recently very used at telecommunications structures, and are defined as artificial effectively non-homogeneous electromagnetic materials with desired bi anisotropic dielectric and magnetic characteristics. In this paper the bilateral fin line and planar antennas with EBG – Electromagnetic Band Gap – metamaterial substrate is analyzed using the TTL - Transverse Transmission Line, concise full wave method. Fin lines are widely used as a millimeter wave component due to its various advantages such as reduced size, weight, and low cost and in addition because it interfaces easily with other millimeter wave circuits. This letter demonstrates an application of the EBG metamaterial: an efficient bilateral fin line and microstrip antennas. the analysis is made using the TTL method and the metamaterial substrates. This objective of this presentation is to show the effect of dielectric anisotropy on bilateral finlines shown in Fig. 1 and antennas. the paper discusses the effect of anisotropy, on effective dielectric constants, attenuation constant and the pattern E and H fields by applying the anisotropy one by one in all three directions. the EBG medium can not be characterized by assigning a single permittivity and permeability value for throughout the finite structure. In other words, the parameters depend on the spatial coordinates and this causes spatial dispersion. As a result of this, the medium will not be homogenous. for a non-homogeneous structure, the incident wave undergoes a process of multiple scattering. the substrate shown in region 2 of Fig.1 is modeled by utilizing bianisotropic tensor properties, which are expressed as:

To calculate the numerical results a computational program in Fortran PowerStation language, according to the theoretical analyses was developed. Compared to other full wave methods, the TTL is an efficient tool to determine the fin line and antennas characteristics, making possible a significant algebraic simplification of the equations involved in the process, and reducing the computational time.

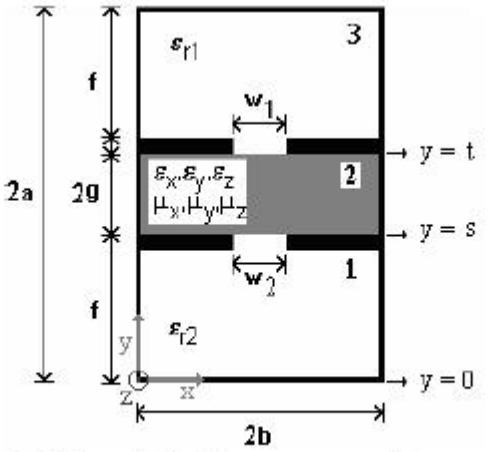


Fig. 1 – Transversal cut of a bilateral fin line structure with metamaterial EBG substrate.

the effective dielectric constant, the attenuation constant, and the pattern E and H fields are obtained. Comparison with the literature is presented. the new results obtained in 3D for these applications are presented at first time.

**Brief Biography of the Speaker:** Humberto Cesar Chaves Fernandes was born in Martins-RN, Brazil. He received with laude the B.S. in Electrical Engineering from the Federal University of Rio Grande do Norte-UFRN, Brazil in 1977, the M.S. (1980), PhD (1984) degrees and Postdoctoral program (1986) from the State University of Campinas-UNICAMP, San Paulo, Brazil. His current research interests are microwave, millimeter waves, smart antennas array, superconductivity, semiconductor, neural networks, electromagnetic, photonics, metamaterial, dynamic methods and applications. Prof. Fernandes has more then four hundred published works. Since 1978 he is at the Electrical Engineering Department from the UFRN, where he is a Senior Researcher and Titular Professor. Prof. Fernandes was General Chair of the ITS2002-SBrT/IEEE Consoc 2002, Natal-BR, SBT1993, Natal-BR, I,II, III and IV SPET, Natal-BR, TPC Chair of the IMOC/IEEE-MTT 1997, Natal-BR, SBMO2002, Recife-PE, BR, PIERS 2007, Beijing-China, PIERS 2007, Theca Republic, and member of various another National and International Committee Conferences, including WSEAS 2004, IMOC2001, IMOC2003, IMOC2005, IMOC2007, SBMO2000. Prof. Fernandes is member of the SBrT (Brazilian Telecommunications Society), IEEE CONSOC (USA), SBMO (Brazilian Microwave and Optoelectronics Society), SBPMat (Brazilian Materials Research Society) and Fellow of the Electromagnetics Academy (USA).

## Plenary Lecture II

# Queuing and Loss Network Models: Computational Algorithms and Asymptotic Analysis

**Professor Hisashi Kobayashi**
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**Abstract:** Queueing network theory has been successfully applied by computer and communication system modelers to represent the inherent contention and congestion in multiple resource systems, to identify the system bottlenecks, and to assess the performance limits. A queueing network model provides a suitable framework for analyzing the performance of "connection-less services" in a packet switched network. the so-called "product-form" networks such as Jackson network and its generalizations, allow such performance metrics as throughput and the mean delay to be represented by a ratio of the "normalization constants" with different arguments. Connection-oriented services, such as the conventional circuit-switched telephone networks and end-to-end flow connections over the Internet can be properly represented by loss network models. the loss network theory is a relatively recent development, and can be viewed as an extension of the classical Erlang and Engset loss models. We will discuss interesting relations between queueing networks and loss networks, and show that the computational algorithms developed for queueing networks are equally applicable to the normalization constants and performance metrics in loss networks as well. Finally, we will discuss the case of large systems, where even most efficient algorithms for exact solutions are computationally infeasible. Recent development for approximation techniques and asymptotic performance limits will be reviewed.

**Brief Biography of the Speaker:** Hisashi Kobayashi is the Sherman Fairchild University Professor of Electrical Engineering and Computer Science at Princeton University since 1986, when he joined the Princeton Faculty as Dean of the School of Engineering and Applied Science (1986-91). Prior to joining Princeton he worked for the IBM Research Division for 19 years (1967-86). He was the founding director of IBM Tokyo Research Laboratory (1982-86). He received his BS (1961) and MS (1963) from Tokyo University and his MA (1966) and Ph.D.(1967) from Princeton. He was a radar engineer at Toshiba, Japan (1963-65). His principal fields of research are system modeling and analysis, queuing theory and signal processing algorithms. He has also worked on data transmission theory, digital magnetic recording, optical network architectures, wireless geolocation algorithms, and network security. He was a recipient of the 2005 Eduardo Rhein Technology Award of Germany for his 1969 invention of a high-density digital recording scheme, now widely known as PRML (partial response coding, maximum likelihood decoding). He is an IEEE Fellow (1977), IEEE Life Fellow (2003), and IEICE Fellow (2004). He received the Humboldt Prize of West Germany (1979) and IFIPS Silver Core (1980), and is a member of Japan's National Academy of engineering (1992). He published "Modeling and Analysis" (Addison Wesley, 1978) , coauthored with Brian Mark a textbook "System Modeling and Analysis" (Pearson-Prentice Hall, 2008) and is currently working on "Probability, Random Processes and Statistical Analysis," to be published by Cambridge University Press in 2009.

## Plenary Lecture III

# Intrusion Detection in Modern Optical Networks and Countermeasures

**Professor Stamatios Kartalopoulos**
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**Abstract:** Optical networks are considered to be intrusion-resistant by virtue of the fiber medium. the common belief is that the optical fiber is difficult to tap, as compared to copper wire and to wireless media. In fact, this is a simplistic view because stripping a cable and tapping a fiber with tools that are commercially available is a relatively simple task to the sophisticated intruder. Moreover, because the fiber link is many kilometers long, the fiber cannot be guarded; this presents a tremendous opportunity and flexibility to the intruder to select the point of intrusion unnoticed. Therefore, it is important that the network is sophisticated enough to monitor and detect intrusions, differentiate from possible component failure and degradation, and upon detection of fiber attacks, it executes automatic countermeasures, outsmarting the intruder. In this talk, we describe automatic intrusion detection methods and countermeasure strategies in modern optical networks.

**Brief Biography of the Speaker:** Stamatios V. Kartalopoulos, PhD, is currently the Williams Professor in Telecommunications Networking at the University of Oklahoma. His research emphasis is on optical communication networks (FSO, long haul and FTTH), optical technology including optical metamaterials, and optical communications security including quantum cryptography and key distribution. Prior to this, he was with Bell Laboratories where he defined, led and managed research and development teams in the areas of DWDM networks, SONET/SDH and ATM, Cross-connects, Switching, Transmission and Access systems. He has received the President's Award and many awards of Excellence. He holds nineteen patents in communications networks, and he has published more than hundred scientific papers, seven reference textbooks important in advanced fiber optic communications, and has also contributed chapters to other books. He has been an IEEE and a Lucent Technologies Distinguished Lecturer and has lectured at international Universities, at NASA and conferences,. He has been keynote speaker of major international conferences, has moderated executive forums, has been a panelist of interdisciplinary panels, and has organized symposia, workshops and sessions at major international communications conferences. Dr Kartalopoulos is an IEEE Fellow, chair and founder of the IEEE ComSoc Communications & Information Security Technical Committee, member at large of IEEE New Technologies Directions Committee, and he has served as editor-in-chief of IEEE Press, chair of ComSoc Emerging Technologies and of SPCE Technical Committees, Area-editor of IEEE Communications Magazine/Optical Communications, member of IEEE PSPB, and VP of IEEE Computational Intelligence Society.

## Plenary Lecture IV

# Video and Audio Compressions and Human Perception Mechanism

**Professor Michael Bank**
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http://ofdma-manfred.websplanet.com/

**Abstract:** A proposal is put forward for a possible explanation of human perception algorithm. the main conclusion of different kinds of art perception examination is necessity of big part of signal redundancy. It turned out, that there are common methods of redundancy creation in different kinds of art like painting, architecture, music and speech. It is shown the common peculiarities of human processing of video and audio information. On the other hand, due to the limited bandwidth in communication channels, transmitted signals must be compressed. This begs the question – what should be transmitted in these types of signals, if a large part of them is removed by the system controlling the sensor-brain?

**Brief Biography of the Speaker:** Professor Michael Bank received the B.A and M.Sc. degrees in communicational engineering from the Leningrad Institute of Communications in 1960, received the Ph.D. degree in 1969 in the field of FM signal detection. He received Doctor of Science degree (Russian equivalent of professor) in 1990. Since 1992 he is a consultant in Israel communicational company Bezeq and a professor in the Holon Institute of Technology (HIT). His research interests include mobile communication systems theory and video and audio compression methods.

## Plenary Lecture V

# New Directions in the Design of Secure Wireless Systems Using Chaotic Signals and Interference Mitigation Techniques

**Professor Peter Stavroulakis**
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**Abstract:** One can say that the subject of security is as old as the subject of communications. In the area of wireless communications, Microwave radio from its introduction in the late 1940 to the present has become one of the primary media for transmitting information from point to point and from a point to a given area. the advent of Satellite communications technology in 1962 and consequent sharing of bands between satellite and radio relay coupled with the explosive growth of Microwave radio routes and mobile communications has led to increased sharing of frequency spectrum and to generation of increased mutual interference. This added interference is playing a dominant role in limiting the capacity, efficiency, reliability, security and cost of modern communication systems. Thus we now have an added problem in Wireless systems which for Satellite Communications has been coded as space security. Security is of major concern of the environment in which various communication systems coexist either in the same or adjacent frequency bands and is also caused by non-ideal mainly nonlinearity mechanisms utilized in the process of communication. the subject of interference has become again an important area of major concern in recent years related to Security due to the widespread use of mobile and wireless terrestrial systems for voice communication. Having studied and solved the problem of sending the information reliably, it was then necessary to study ways to transmit the information securely. for wireless mobile systems this problem was partially solved by using various encryption techniques. In this tutorial we shall present a review of the areas that require further study and we will show for the first time why the existing security mechanisms including cryptography do not necessarily solve the security problems in various wireless systems. We shall propose ways to move forward using as an example a new methodology based on Chaotic techniques. This methodology is based on two recent books by the author and an International Patent by the author which what was thought as an impossible task i.e to make chaotic signal based secure communications robust is now proved possible. This Tutorial will benefit young researchers, designers of large scale Secure Telecom Systems such as those used in World class events as are the Olympic Games and University Instructors who are seeking to put together instruction material for new courses.

**Brief Biography of the Speaker:** Peter Stavroulakis received his BS and Ph.D. degrees from New York University in 1969 and 1973 respectively and his MS degree from California Institute of Technology in 1970. He joined Bell Laboratories in 1973 and worked until 1979 when he joined Oakland University in Rochester Michigan as an associate Professor of Engineering. He worked at Oakland University until 1981 when he joined ATT International and subsequently NYNEX International until 1990. From 1990 to present he has been at Technical University of Crete. He joined the Technical University of Crete (TUC) Greece as a full Professor of Electrical Engineering in may 1990. His work at Bell Labs and Oakland University resulted in the publication of an IEEE reprint book on Interference Analysis of Communication Systems and the publication of a number papers in the general area of telecom systems. He is also the Author/Editor of twelve other Books in the general Area of Telecommunication Systems. He has presented many Tutorials in International Conferences on security Applications in Telecommunications the second. While at ATT and NYNEX he worked as a Technical Director whose responsibility was to lead a team dealing with techno-economic studies on various large National and International Telephone Systems and Data Networks. When he joined TUC, he led the team for the development of the

Technology Park of Chania and has had various administrative duties besides his teaching and research responsibilities. Prof. Stavroulakis is the founder of the Telecommunication Systems Institute of Crete, a research center for the training of Ph.D. students in Telecommunications, associated with and in close collaboration with various research centers and Universities in Europe and U.S.A. He now has a very large research team, the work of which is funded by various public and private sources including European Union. He is a member of the Editorial Board of the International Journal of Communications, International Journal of Satellite Systems and Networking and has been a reviewer for many Technical International Journals. His current research interests are focused on the application of various heuristic methods on Telecommunications, including Neural Networks, Fuzzy Systems and Genetic Algorithms and Chaos also in the development of new schemes to increase security in Mobile and Wireless Systems. Recently he has become Member of the Editorial Board of CHINA COMMUNICATIONS and a Leading Turkish Electronics Journal.

# Author Index


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