Mathematics and Coputers in Science Engineering
A Series of Reference Books and Textbooks

NEW ASPECTS OF SYSTEMS

Heraklion, Crete Island, Greece, July 22-25, 2008

Proceedings of the 12th WSEAS International Conference on SYSTEMS

ISBN: 978-960-6766-83-1
ISSN 1790-2769

Published by WSEAS Press
www.wseas.org

NEW ASPECTS OF SYSTEMS

Proceedings of the 12th WSEAS International Conference on SYSTEMS

Heraklion, Greece, July 22-24, 2008

Mathematics and Computers in Science Engineering
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

ISBN: 978-960-6766-83-1
ISSN: 1790-2769

NEW ASPECTS OF SYSTEMS

Proceedings of the 12th WSEAS International Conference on SYSTEMS

Heraklion, Greece, July 22-24, 2008

Mathematics and Computers in Science Engineering
A Series of Reference Books and Textbooks

Published by WSEAS Press
www.wseas.org

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

ISBN: 978-960-6766-83-1
ISSN: 1790-2769

World Scientific and Engineering Academy and Society

NEW ASPECTS OF SYSTEMS

Proceedings of the 12th WSEAS International Conference on SYSTEMS

Heraklion, Greece, July 22-24, 2008

Editors:

Prof. Nikos E. Mastorakis, MIUE (ASEI), Hellenic Naval Academy, Greece
Prof. Valeri Mladenov, Technical University of Sofia, Bulgaria
Prof. Zoran Bojkovic, Technical University of Belgrade, Serbia
Prof. Dana Simian, University Lucian Blaga of Sibiu, Romania
Prof. Stamatios Kartalopoulos, University of Oklahoma, USA
Prof. Argyrios Varonides, University of Scranton, USA
Prof. Constantin Udriste, University Politehnica of Bucharest, Romania
Prof. Eugene Kindler, University of Ostrava, Czech Republic
Prof. S. Narayanan, Wright State University, U.S.A.
Prof. Jaime Lloret Mauri, Polytechnic University of Valencia, Spain
Prof. Hamed Parsiani, University of Puerto Rico, Puerto Rico
Dr. Ka Lok Man, Politecnico di Torino, Italy

International Program Committee Members:

Irwin W. Sandberg, USA
Asad A. Abidi, USA
Andreas Antoniou, USA
Antonio Cantoni, AUSTRALIA
Lotfi Zadeh, USA
George Szentirmai, USA
Michael Peter Kennedy, IRELAND
Paresh C. Sen, CANADA
Michel Gevers, BELGIUM
James S. Thorp, USA
Armen H. Zemanian, USA
Guanrong Chen, HONG KONG
Edgar Sanchez-Sinencio, USA
Jim C. Bezdek, USA
A. J. van der Schaft, the NETHERLANDS
Istvan Nagy, Hungary
Wasfy B. Mikhael, USA
M. N. S. Swamy, CANADA
M. Araki, JAPAN
Abbas El Gamal, USA
Franco Maloberti, Italy
Alan N. Willson Jr., USA
Yoji Kajitani, JAPAN
Mohammed Ismail, USA
Kemin Zhou, USA
Ruey-Wen Liu, USA
Nabil H. Farhat, USA
John I. Sewell, UK
Jerry M. Mendel, USA
Magdy A. Bayoumi, USA
Bertram E. Shi, HONG KONG
M. Omair Ahmad, CANADA
N. K. Bose, USA
Igor Lemberski, LATVIA
Alfred Fettweis, GERMANY
Brockway McMillan, USA
H. J. Orchard, USA
Jacob Katzenelson, ISRAEL
Vincent Poor, USA
Abraham Kandel, USA
Bor-Sen Chen, CHINA
C. S. George Lee, USA
Hamid R. Berenji, USA
Kevin M. Passino, USA
Lawrence O. Hall, USA
Ronald R. Yager, USA
Witold Pedrycz, CANADA
Agoryaswami J. Paulraj, USA
Ahmed H. Tewfik, USA
Alan V. Oppenheim, USA
Alfonso Farina, ITALY
Alfred O. Hero, USA
Ali H. Sayed, USA
Anders Lindquist, SWEDEN
Arthur B. Baggeroer, USA
Arye Nehorai, USA
Benjamin Friedlander, USA
Bernard C. Levy, USA
Bhaskar D. Rao, USA
Bin Yu, USA
Boualem Boashash, AUSTRALIA
Brian D. O. Anderson, AUSTRALIA
Bruce A. Francis, CANADA
C. Richard Johnson, USA
C. Sidney Burrus, USA
Charles M. Rader, USA
Desmond P. Taylor, NEW ZEALAND
Donald L. Duttweiler, USA
Donald W. Tufts, USA
Douglas L. Jones, USA
Earl E. Swartzlander, USA
Ed F. Deprettere, the NETHERLANDS
Edward A. Lee, USA
Edward J. Powers, USA
Ehud Weinstein, ISRAEL
Eli Brookner, USA
Ezio Biglieri, Italy
Faye Boudreaux-Bartels, USA
Georgios B. Giannakis, USA
Gonzalo R. Arce, USA
H. Vincent Poor, USA
Hagit Messer, ISRAEL
John V. McCanny, UK
Joos Vandewalle, BELGIUM
Jose C. Principe, USA
Jose M. F. Moura, USA
K. J. Ray Liu, USA
Kaushik Roy, USA
Kenneth Rose, USA
Keshab K. Parhi, USA
Kon Max Wong, CANADA
Kung Yao, USA
Louis L. Scharf, USA
Martin Vetterli, USA
Mati Wax, USA
Meir Feder, ISRAEL
Michael C. Wicks, USA
Michael D. Zoltowski, USA
Michael T. Orchard, USA
Michael Unser, SWITZERLAND
Miguel Angel Lagunas, SPAIN
Moeness G. Amin, USA
Mohamed Najim, FRANCE
Neil J. Bershad, USA
P. P. Vaidyanathan, USA
Patrick Dewilde, NETHERLANDS
Peter Willett, USA
Petre Stoica, SWEDEN
Phillip A. Regalia, FRANCE
Pierre Duhamel, FRANCE
Pierre Moulin, USA
Pramod K. Varshney, USA

HJ Kadim, UNITED KINGDOM
Rihard Karba, SLOVENIA
Stephen Karungaru, JAPAN
Theodore Kaskalis, GREECE
Victor Kasyanov, RUSSIA
Osamu Kata,i JAPAN
Demetrios Kazakos, UNITED STATES
Vladimir Kazakov, MEXICO
Ahad Kazemi, IRAN
Evangelos Kehris, GREECE
Mohamad Khaldi, LEBANON
George Kliros, GREECE
Peter Kokol, SLOVENIA
Samad Kolahi, NEW ZEALAND
Stavros Konstantinidis, CANADA
Karamanos Konstantinos, BELGIUM
Chorng-shiuh Koong, TAIWAN
Guennadi Kouzaev, NORWAY
Aphrodite Ktena, GREECE
Deniss Kumlander, ESTONIA
Cheng-chien Kuo, TAIWAN
Ioannis Kyprianidis, GREECE
Dan Lascu, ROMANIA
Mihaela Lascu, ROMANIA
Ljubomir Lazic, YUGOSLAVIA
Minh Hung Le, AUSTRALIA
Shih-kai Lee, TAIWAN
Dong-liang Lee, TAIWAN
Seongkee Lee, KOREA
Ioannis Gonos, GREECE
Yong Woo Lee, KOREA
Huey-Ming Lee, TAIWAN
Somchai Lekcharoen, THAILAND
Vrasidas Leopoulos, GREECE
Stephen C. H. Leung, HONG KONG S.A.R.
Sheng-Tun Li, TAIWAN
Chunshien Li, TAIWAN
Ying Li, TAIWAN
Ioannis Stathopulos, GREECE
Yiming Li, TAIWAN,
Wen-Yew Liang, TAIWAN
Ioan Lie, ROMANIA
S. S. Lin, TAIWAN
Wilfred Lin, HONG KONG S.A.R.
Lily Lin, TAIWAN
Nikos Bardis, GREECE
Hongbo Liu, CHINA
Ismael Lopez-Juarez, MEXICO
Ye Lu, CHINA
Xiaolin Lu, CHINA
Dan Macodiyo, JAPAN
Zaigham Mahmood, UNITED KINGDOM
Bang-on Makdee, THAILAND
Mrinal Manda,l CANADA
Athanassios Manikas, UNITED KINGDOM
Umar Manzoor, PAKISTAN
Marius Marcu, ROMANIA
Ioannis Mavridis, GREECE
Yulin Mei, CHINA
Elisabeth Metais, FRANCE
Liying Mi, JAPAN
Angelos Michalas, GREECE
Hannah Michalska, CANADA
Wasfy Mikhael, UNITED STATES
Manki Min, UNITED STATES
Huang Minhuan, CHINA
Mihai Mitrea, FRANCE
Payman Moallem, IRAN
Nermin Mohamed, EGYPT
Bouhdai Mohamed, MOROCCO
Farah Mohammadi, CANADA
S. Amirhassan Monadjemi, IRAN
Bartolomeo Montrucchio, ITALY
Eduardo Mosqueira-rey, SPAIN
FRANCEsco Muzi, ITALY
Ibtissem Nafkha, TUNISIA
Benedek Nagy, HUNGARY
Sang-Won Nam, KOREA
Hamed Nassar, EGYPT
Pavel Nevriva, CZECH REPUBLIC
Cat Ho Nguyen, VIETNAM
Elena Niculescu, ROMANIA
Vincenzo Niola, ITALY
Javad Nourinia, IRAN
Juan Jesus Ocampo-Hidalgo, MEXICO
Koji Ohashi, JAPAN
Roland Olsson, NORWAY
Igor Ozimek, SLOVENIA
António Pacheco, PORTUGAL
Zeljko Panian, CROATIA (HRVATSKA)
Eunkwang Park ,SINGAPORE
Jin Park, UNITED STATES
Federico Perez, SPAIN
Anna Perez, VENEZUELA
Sakthivel Periyasamy, INDIA
Pisit Phokharatkul, THAILAND
Olivier Ponsini, FRANCE
Mircea Popa, ROMANIA
Dan Popescu, ROMANIA
Mihaela Popescu, ROMANIA
Nenad Popovich NEW ZEALAND
Serafim Poriazis, GREECE
Ali Pouyan, IRAN
Marius Preda, FRANCE
Kostas Psannis, GREECE
Sorapak Pukdesri, THAILAND
Ioannis Stephanakis, GREECE
Mohammadreza Rafiei, IRAN
Dejan Rancic, YUGOSLAVIA
Nicolas Ratier, FRANCE
Rabin Raut, CANADA
Fuji Ren, JAPAN
Dimitrios Rigas, UNITED KINGDOM
Addison Rios-Bolivar, VENEZUELA

Francklin Rivas, VENEZUELA
Mercedes Ruiz, SPAIN
Jean Saade, LEBANON
Raafat Saade, CANADA
Mohammad Ali Sadrnia, IRAN
Ma Sadrnia, IRAN
Iwata Sakagami, JAPAN
Bouhouche Salah, ALGERIA
Enrique San Millán, SPAIN
Usiel Sandler, ISRAEL
Oscar SanJuan, SPAIN
Michael Schwarz, GERMANY
Milos Seda, CZECH REPUBLIC
Tsang-Ling Sheu, TAIWAN
Chao-Cheng Shih, TAIWAN
Khalil Shihab, OMAN
YUE Shihong, CHINA
JeongYon Shim, KOREA
Young-chul Shim, KOREA
Jungpil Shin, JAPAN
Vairis Shtrauss, LATVIA
Carmen Simion, ROMANIA
Dharmender Singh Kushwaha, INDIA
Efstratios Skafidas, AUSTRALIA
Suripon Somkuarnpanit, THAILAND
Hua Song, CHINA
Arnd Steinmetz, GERMANY
Rodica Stoian, ROMANIA
Mu-Chun Su, TAIWAN
Pushpa Suri, INDIA
Miroslav Svítek, CZECH REPUBLIC
Feruglio Sylvain, FREANCE
Sabin Tabirca, IRELAND
Razvan Tanasie, ROMANIA
Shaohua Tang, CHINA
Wang Tao, CHINA
Stanislaw Tarasiewicz, CANADA
Domenico Tegolo, ITALY
Kah leng Ter, SINGAPORE
Spyros Tragoudas, UNITED STATES
Issa Traore, CANADA
Tsung-Han Tsai, TAIWAN
Ruey-Chyn Tsaur, TAIWAN
Shian-Shyong Tseng, TAIWAN
John Tsiligaridis, UNITED STATES
Kazuhiko Tsuda, JAPAN
Hassan Ugail, UNITED KINGDOM
George Vachtsevanos, UNITED STATES
Hans Vandierendonck, BELGIUM
Ioannis Vardiambasis, GREECE
Francisco Vasques, PORTUGAL
Andreas Veglis, GREECE
Carlos Velez, COLOMBIA
Fernando Vidal, SPAIN
Aristidis Vlachos, GREECE
Luige Vladareanu, ROMANIA
Mirela-Catrinel Voicu, ROMANIA
Konstantinos Voudouris, GREECE
Toshio Wakabayashi, JAPAN
Shuming Wang, TAIWAN
Yi-shun Wang, TAIWAN
Ruye Wang, UNITED STATES
Lin Wilfred, HONG KONG S.A.R.
Kenneth K.Y. Wong, HONG KONG S.A.R.
Lai Wuxing, CHINA
Tianbing Xia, AUSTRALIA
Weiwen Xu, FRANCE
Koichi Yamada, JAPAN
Kiyotaka Yamamura, JAPAN
Thomas Yang, UNITED STATES
Hung-Jen Yang, TAIWAN
Sheng-Yuan Yang, TAIWAN
Kapseung Yang, KOREA
Shun-Ren Yang, TAIWAN
Hung-Jen Yang, TAIWAN
Ping-Jer Yeh, TAIWAN
Jyh-haw Yeh, UNITED STATES
Hsu-Chun Yen, TAIWAN
Eng-Thiam Yeoh, MALAYSIA
Huifen Ying, CHINA
Tetsuya Yoshida, JAPAN
Enhai Yu, CHINA
Jian Yu ,CHINA
Eugen Zaharescu, ROMANIA
Nadia Zanzouri, TUNISIA
Daniel Zapico, SPAIN
Malika Zazi, MOROCCO
Wenyu Zhang, CHINA
Hong Zheng, CHINA
Hong Zhu, UNITED KINGDOM
Stelios Zimeras, GREECE
Blaz Zmazek, SLOVENIA

Preface

This book contains the proceedings of the 12th WSEAS International Conference on SYSTEMS which was held in Heraklion, Greece, July 22-24, 2008. This conference aims to disseminate the latest research and applications in Systems Theory, Dynamical Systems, Control Systems, Control Engineering, Decision Support Systems, Hierarchical Control Systems, Aerospace Systems, Multidimensional Systems, Multivariable systems, Hybrid Systems, Systems Techniques for Wireless Applications, Computational and Applied Mathematics 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.

Table of Contents

PART II:

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
Director, Information Technology Research Institute
Wright State University,College of Engineering and Computer Science
OBR Distinguished Professor of Information Technology
Department of Computer Science and Engineering
3640 Colonel Glenn Highway
Dayton, Ohio 45435-0001
United States of America

Phone: (937) 775-5138 Fax: (937) 775-5127
E-mail: nikolaos.bourbakis@wright.edu
URL: http://www.cs.wright.edu/itri/bourbakis/

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
Member of Berkeley Institute of Design
University of California, Berkeley
tel +1 (510) 642-9838
E-mail: barsky@cs.berkeley.edu
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
Electromagnetic Low Frequency Radiation from Natural Phenomena - Data Analysis and Modelling

Professor Ernst D. Schmitter
University of Applied Sciences
Department of Engineering and Computer Sciences
Albrechtstr. 30, 49076 Osnabrueck
GERMANY

Abstract: Can severe weather conditions, volcanic eruptions or even earthquakes be predicted from monitoring and analyzing electromagnetic radiation especially in very and ultra low frequency ranges? What signatures in this frequency range leave solar wind, solar flare eruptions or gamma ray bursts from distant stars within the earths magnetosphere and ionosphere? The propagation properties of very low, extremeley low and ultra low frequency radiation (VLF/ELF/ULF, i.e. 30 kHz down to some milliHz) within the earths magnetosphere, ionosphere and lithosphere allow to deal with these questions and a lot of research has been done during the last decades. In some cases the generating physical process is obvious – as for example VLF sferic signals from lightnings. In other cases reliable modelling and confirmation is due yet - as with electromagnetic earthquake precursor signals. This survey will try to mediate some aspects of the advanced data analysis and data modelling procedures used to gain information out of the received signals despite of a usually very noisy background. Fourier- and wavelet transform based as well as statistically based features are used as input to neuro-fuzzy classifiers together with physical process models to form hybrid approaches to these complex systems.

Brief Biography of the Speaker: Dr. Schmitter is professor for mathematics and software technology at the University of Applied Sciences Osnabrueck, Germany since 1990. He is a member of the faculty of Engineering and Computer Sciences and teaches courses on applied mathematics, simulation (for example Finite-Element-Methods) and data analysis. He wrote several books in the computational intelligence area and published papers on data and signal analysis and modelling topics applied to material sciences and geophysics.

Plenary Lecture II

Application of Adaptive Cerebellar Model Articulation Controller in Control Problem

Prof. Chih-Min Lin
Chairman and Professor
Department of Electrical Engineering, Yuan-Ze University
Chung-Li, Tao-Yuan, 320, Taiwan
Tel: 886-3-4638800 ext 2418
Fax: 886-3-4639355
E-mail:cml@saturn.yzu.edu.tw

Abstract: Based on biological prototype of human brain and improved understanding of the functionality of the neurons and the pattern of their interconnections in the brain, a theoretical model used to explain the information-processing characteristics of the cerebellum was developed independently by Marr (1969) and Albus (1971). Cerebellar model articulation controller (CMAC) was first proposed by Albus. CMAC is a learning structure that imitates the organization and functionality of the cerebellum of the human brain. That model revealed the structure and functionality of the various cells and fibers in the cerebellum. The core of CMAC is an associative memory which has the ability to approach complex nonlinear functions. CMAC takes advantage of the input-redundancy by using distributed storage and can learn nonlinear functions extremely quickly due to the on-line adjustment of its system parameters. CMAC is classified as a non-fully connected perceptron-like associative memory network with overlapping receptive-fields. It has good generalization capability and fast learning property and is suitable for on-line application of control systems. This talk introduces several CMAC-based adaptive control systems; these control systems combine the advantages of CMAC identification, adaptive control and robust control techniques. In these systems, the on-line parameter training methodology, using the gradient descent method and the Lyapunov stability theorem, is proposed to increase the learning capability. Moreover, the applications of these systems in control problems are demonstrated. Simulation results illustrate that the introduced CMAC-based control systems can achieve favorable control performance.

Brief Biography of the Speaker: Prof. Chih-Min Lin is currently a Professor and the Chairman of the Department of Electrical Engineering, Yuan-Ze University, Taiwan. He also serves as the Committee Member of National Science Council, Control Branch; Chinese Automatic Control Society; Taiwan Fuzzy System and Science Society; and Taiwan Systems Engineering Society. During 1986-1992, he was with the Chung Shan Institute of Science and Technology as a Deputy Director of system engineering. He joined the faculty of the Department of Electrical Engineering, Yuan-Ze University, Taiwan, in 1993. During 1997-1998, he was the honor research fellow in the University of Auckland, New Zealand. He has served as the Deputy Chairman of IEEE Control Systems Society, Taipei Chapter in 1999-2000, now he is an IEEE Senior Member. Prof. Lin's research interests include fuzzy neural network, cerebellar model articulation controller, control system and systems engineering. He has published 84 journal papers and 120 conference papers. He has been awarded with the outstanding research professor and chair professor. He has given several plenary lectures and invited talks and served as the committee member in several international conferences. Now he also serves as the editorial board of 4 international journals.

Plenary LectureIII

on Dynamical Systems Describing Tumor Growth under Novel Therapies

Professor Urszula Ledzewicz
Department of Mathematics and Statistics,
Southern Illinois University Edwardsville,
Edwardsville, Illinois, USA

E-mail: uledzew@siue.edu

Co-Author

Professor Heinz Schattler
Department of Electrical and Systems Engineering,
Washington University,
St. Louis, Missouri, USA

Abstract: In this talk dynamical systems arising in biomedicine describing various treatments of cancer will be discussed. Mathematical models for cancer treatments have a long history, but with the development of medicine new challenges in modeling and the analysis of these models are appearing. Here novel cancer treatments and the mathematical models that describe their dynamics as systems of nonlinear ordinary differential equations will be presented. The focus primarily will be on mathematical models for tumor anti-angiogenesis. The importance of this novel treatment is that by targeting the cells of the vascularization of the tumor rather then the tumor itself, it is not prone to drug resistance and as such has been a topic of active research both in medicine and mathematical biology. In the talk a class of mathematical models for anti-angiogenesis will be analyzed. The nonlinear dynamics in these models illustrates the growth of the primary tumor volume and its corresponding vasculature as well as the effect of the control functions representing anti-angiogenic treatment on this growth. Following the analysis of this system with constant doses of the drug, the optimal control problem of how to schedule an a priori given amount of angiogenic inhibitors so as to minimize the primary tumor volume will be considered. Examples of optimal protocols resulting from the analysis will be given. Then, following medical research on so-called combination therapies, the model will be augmented to include the effect of traditional chemotherapy on the system. Due to the multi-control aspect, even with simplified dynamical equations, this becomes a challenging problem mathematically and some initial results about the structure of optimal controls will be presented.

Brief Biography of the Speaker: Urszula Ledzewicz received her Ph. D in 1984 from the University of Lodz, Poland. Since 1986 she has been holding academic positions in the United States, first as a visiting faculty at Louisiana State University, Baton Rouge, and then at Southern Illinois University, as a tenured faculty in the rank of the Full Professor since 1995. Her research area is primarily control theory and optimization, but in more recent years she became interested in applications of the methods of optimal control and systems theory to biomedicine. Currently her main direction of research includes analysis of systems describing dynamics of cancer growth under various treatments like chemotherapy or anti-angiogenesis. She is a member of five editorial boards including Discrete and Continuous Dynamical Systems, Series B, and Mathematical Biosciences and Engineering and author or co-author of close to 100 publications in refereed journals and proceedings of international conferences. She was invited to present lectures at various mathematical and engineering oriented conferences as well as was a member of the organizing committees or co-organized sessions or mini-symposia at several of them like IEEE Conferences on Decision and Control (CDC), Mathematical Theory of Network and Systems (MTNS) or World Congress of Nonlinear Analysts (WCNA). For her research she was awarded several grants from the National Science Foundation, NATO and her university.

Plenary LectureIV

Dissipation Normal Forms and Further Applications of Lyapunov-Tellegen's Principle

Prof. Milan Stork
Department of Applied Electronics and Telecommunications
Faculty of Electrical Engineering
University of West Bohemia
P.O. Box 314
30614 Plzen, Czech Republic
Email: stork@kae.zcu.cz

Abstract: Almost in any field of science and technology some sort of stability problem can appear. Instability and chaos are certainly the most important phenomena which should be treated before any other aspect of reality will be attacked. Hence it is not very surprising that a broad variety of approaches to the problem of stability, instability and analysis of chaotic phenomena exists. Many of the most popular techniques in the field of stability and chaos are in a certain sense related to the work of A.M.Lyapunov and can be seen as energy oriented. The Tellegen's theorem is one of the well known forms of energy conservation statement in the field of electrical engineering. The most important feature of Tellegen's approach is the fact that the energy conservation principle holds without any regard to physical nature of constituent network elements. This is the key idea of the proposed approach to problems of dissipativity and chaos. The first situation arises if an energy function E[x(t)] of a given system is known in a mathematical form. In such example the time evolution of internal energy along any system motion can be described, and an energy monotonicity test can be used. In the proposed lecture a physically motivated signal-system-theoretic approach, based on a generalisation of the well known Tellegen's principle of electrical circuits will be presented. Two fundamental concepts are of crucial importance in the proposed approach. The first one is the concept of strongly non-linear power-informational interactions, and the second one is the notion of state space energy vector, inducing the system state-space topology. All computations, including numerical solutions of differential equations, were done using MATLAB.

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 and 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 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 and nonlinear systems, control systems, signal processing and biomedical engineering, especially cardiopulmonary stress tests systems.

Plenary Lecture V

Controllability and observability of multi-time linear PDE systems

Professor Constantin Udriste
University Politehnica of Bucharest
Faculty of Applied Sciences
Department of Mathematics
Splaiul Independentei 313
060042, Bucharest, ROMANIA
Email: udriste@mathem.pub.ro,
c_udriste@yahoo.com

Abstract: Since the obstruction of complete integrability conditions (path independent curvilinear integrals) is very strong, the control problems for multi-time first order PDEs were studied only in the discrete context. Now, to preserve the geometrical character of the problem, we present a continuous approach for the controllability and observability properties of multi-time completely integrable linear PDEs systems (holonomic evolution), overcoming the extant mathematical prejudices regarding the importance of a multi-time evolution. Our geometrical arguments show that each basic theorem has a correspondent in the case of single-time linear controlled ODEs system. The main results include controllability criteria and the equivalence between controllability of a PDEs system and the observability of the dual PDEs system. All of these show that the passing from controlled single-time evolution to the controlled multi-time evolution is not trivial. Changing the geometrical language, the case of nonholonomic evolution can be recovered easily from our theory.

Brief Biography of the Speaker: Constantin Udriste was born in Turceni, Gorj, Romania on January 22, 1940. He earned his professor title from University of Timisoara in 1963 and his PhD from University Babes-Bolyai from Cluj-Napoca in 1971. Now he is Full Professor of Mathematics and Dean of the Faculty of Applied Sciences at University Politehnica of Bucharest. Also it is President of Balkan Society of Geometers. Udriste has served on many advisory committees and editorial boards, and was the main organizer of over 10 International Mathematical Meetings. He is author and contributor of over 40 books, over 200 articles to mathematical journals and over 200 papers to mathematical meetings. Topics: group of motion, properties of the tangent bundle, almost coquaternion metric manifolds, variational calculus on Riemannian manifolds, Finsler-Lagrange-Hamilton manifolds, Riemannian convexity and optimization, magnetic dynamical systems, geometric dynamics and optimal control, the theory of spatial mechanisms, solar tower concentrator. A person of incredible energy and entusiasm, Udriste has trained 12 PhD students, many of whom are now faculty members. Udriste has been the recipient of the following honors and awards: Dragomir Hurmuzescu Prize, Academy of Romania, 1985; Award for Distinguished Didactic and Scientific Activity, Ministry of Education and Instruction of Romania, 1988; Correspondent Member of the Academia Peloritana dei Pericolanti, 1997-; Member Research Board of Advisors, ABI, 1999-. Prize COPIRO - 2000 for Exact Sciences; Premio Anassilaos International 2002, Arte Cultura Scienze.

Plenary Lecture VI

Advances in Brain Research through Systems Science and Engineering Methods

Professor George Vachtsevanos
School of Electrical and Computer Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332-0250
Phone: (404) 894-6252
Fax: (404) 894-7583
Email: gjv@ece.gatech.edu,

Abstract: This plenary talk will present research advances in neurotechnology that are aiming to improve the quality of life of patients suffering from neurological disorders. We will focus on epilepsy as a typical severe disorder. Enabling technologies will be discussed that begin with intracranial monitoring techniques, such as IEEGs, and the analysis of signals to determine precursors to an epileptic seizure. The intent is to detect but primarily to predict in advance the seizure initiation. Upon detection/prediction, an electrical signal is transmitted to the areas of the brain suspected as the seizure source in order to terminate the seizure before is affects the patient. We will describe clinical results of an implantable device currently under development to implement the monitoring, signal analysis and intervention methods.

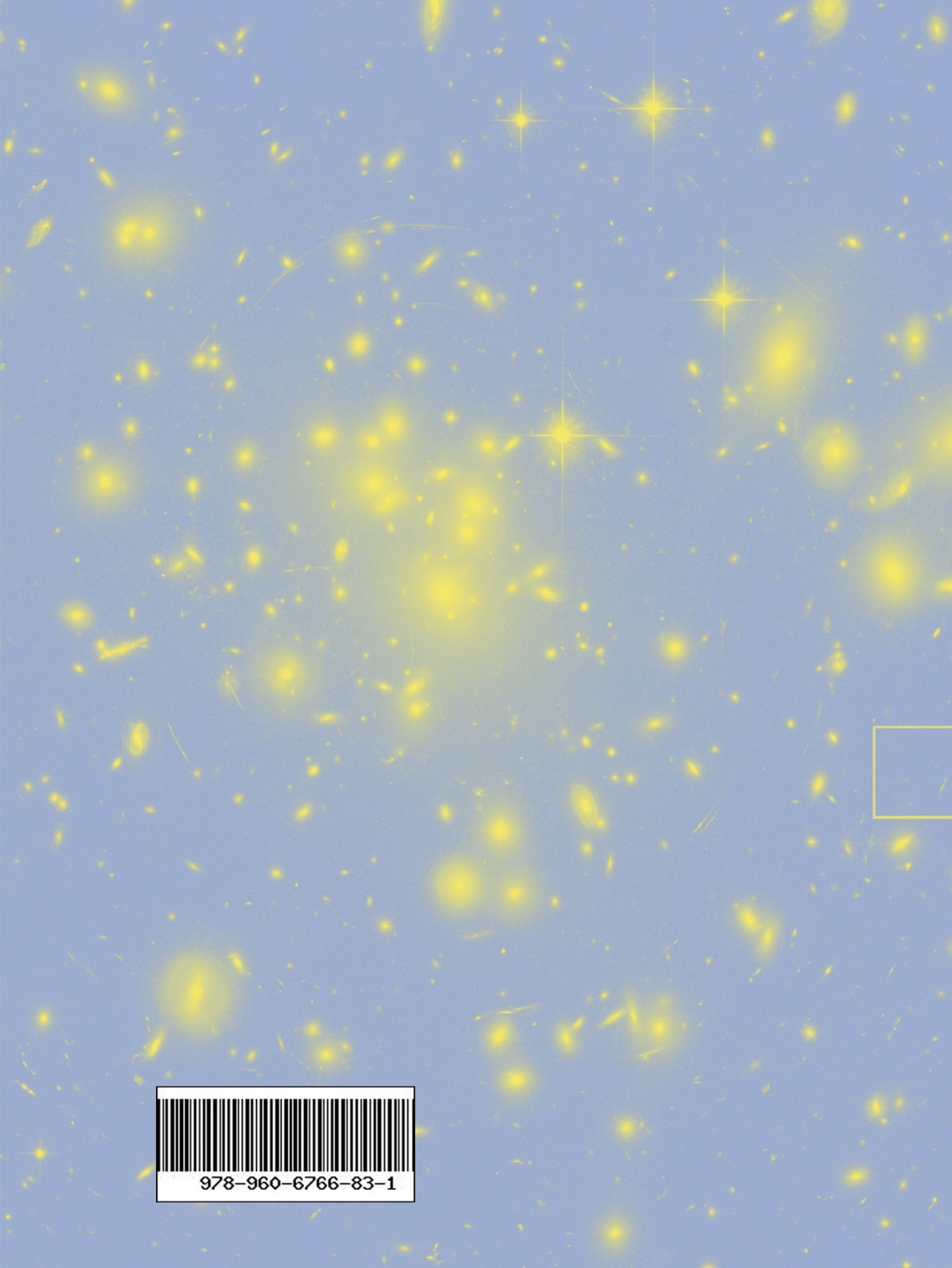
Brief Biography of the Speaker: George Vachtsevanos is a Professor Emeritus of Electrical and Computer Engineering at the Georgia Institute of Technology. He was awarded a B.E.E. degree from the City College of New York in 1962, a M.E.E. degree from New York University in 1963 and the Ph.D. degree in Electrical Engineering from the City University of New York in 1970. He directs the Intelligent Control Systems laboratory at Georgia Tech where faculty and students are conducting research in intelligent control, neurotechnology and cardiotechnology, fault diagnosis and prognosis of large-scale dynamical systems and control technologies for Unmanned Aerial Vehicles. His work is funded by government agencies and industry. He has published over 240 technical papers and is a senior member of IEEE. Dr. Vachtsevanos was awarded the IEEE Control Systems Magazine Outstanding Paper Award for the years 2002-2003 (with L. Wills and B. Heck). He was also awarded the 2002-2003 Georgia Tech School of Electrical and Computer Engineering Distinguished Professor Award and the 2003-2004 Georgia Institute of Technology Outstanding Interdisciplinary Activities Award.

Author Index

Author Index

Author Index

Author Index


978-960-6766-83-1