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Santorini Island, Greece, July 17-21, 2014
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Plenary Lecture 1

Floating Offshore Wind Turbines: The Technologies and the Economics

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Abstract: Wind is a vast, renewable and clean energy source that stands to be a key contributor to the world energy mix in the coming decades. The horizontal axis three-bladed wind turbine is a mature technology and onshore wind farms are cost competitive with coal fired power plants equipped with carbon sequestration technologies and in many parts of the world with natural gas fired power plants.

Offshore wind energy is the next frontier. Vast sea areas with higher and steadier wind speeds are available for the development of offshore wind farms that offer several advantages. Visual, noise and flicker impacts are mitigated when the wind turbines are sited at a distance from the coastline. A new generation of 6-10MW wind turbines with diameters exceeding 160m have been developed for the offshore environment. They can be fully assembled at a coastal facility and installed by a low cost float-out operation. Floater technologies are being developed for the support of multi-megawatt turbines in waters of moderate to large depth, drawing upon developments by the offshore oil & gas industry.

The state of development of the offshore wind energy sector will be discussed. The floating offshore wind turbine technology will be reviewed drawing upon research carried out at MIT since the turn of the 21st century. Floating wind turbine installations worldwide and planned future developments will be presented. The economics of floating offshore wind farms will be addressed along with the investment metrics that must be met for the development of large scale floating offshore wind power plants.

Brief Biography of the Speaker: Paul D. Sclavounos is Professor of Mechanical Engineering and Naval Architecture at the Massachusetts Institute of Technology. His research interests focus upon the marine hydrodynamics of ships, offshore platforms and floating wind turbines. The state-of-the-art computer programs SWAN and SML developed from his research have been widely adopted by the maritime, offshore oil & gas, and wind energy industries. His research

activities also include studies of the economics, valuation and risk management of assets in the crude oil, natural gas, shipping and wind energy sectors. He was the Georg Weinblum Memorial Lecturer in 2010-2011 and the Keynote Lecturer at the Offshore Mechanics and Arctic Engineering Conference in 2013. He is a member of the Board of the North American Committee of Det Norske Veritas since 1997, a member of the Advisory Committee of the US Navy Tempest program since 2006 and a member of the Advisory Board of the Norwegian Center for Offshore Wind Energy Technology since 2009. He has consulted widely for the US Government, shipping, offshore, yachting and energy industries.
http://meche.mit.edu/people/?id=76

Keynote Lecture 2

Detecting Critical Elements in Large Networks

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Abstract: In network analysis, the problem of detecting subsets of elements important to the connectivity of a network (i.e., critical elements) has become a fundamental task over the last few years. Identifying the nodes, arcs, paths, clusters, cliques, etc., that are responsible for network cohesion can be crucial for studying many fundamental properties of a network. Depending on the context, finding these elements can help to analyze structural characteristics such as, attack tolerance, robustness, and vulnerability. Furthermore we can classify critical elements based on their centrality, prestige, reputation and can determine dominant clusters and partitions.

From the point of view of robustness and vulnerability analysis, evaluating how well a network will perform under certain disruptive events plays a vital role in the design and operation of such a network. To detect vulnerability issues, it is of particular importance to analyze how well connected a network will remain after a disruptive event takes place, destroying or impairing a set of its elements. The main goal is to identify the set of critical elements that must be protected or reinforced in order to mitigate the negative impact that the absence of such elements may produce in the network. Applications are typically found in homeland security, energy grid, evacuation planning, immunization strategies, financial networks, biological networks, and transportation.

From the member-classification perspective, identifying members with a high reputation and influential power within a social network could be of great importance when designing a marketing strategy. Positioning a product, spreading a rumor, or developing a campaign against drugs and alcohol abuse may have a great impact over society if the strategy is properly targeted among the most influential and recognized members of a community. The recent emergence of social networks such as Facebook, Twitter, LinkedIn, etc. provide countless applications for problems of critical-element detection.

In addition, determining dominant cliques or clusters over different industries and markets via critical clique detection may be crucial in the analysis of market share concentrations and debt

concentrations, spotting possible collusive actions or even helping to prevent future economic crises.
This presentation surveys some of the recent advances for solving these kinds of problems including heuristics, mathematical programming, dynamic programming, approximation algorithms, and simulation approaches. We also summarize some applications that can be found in the literature and present further motivation for the use of these methodologies for network analysis in a broader context.

Brief Biography of the Speaker: Panos M. Pardalos serves as Distinguished Professor of Industrial and Systems Engineering at the University of Florida. He is also an affiliated faculty member of the Computer and Information Science Department, the Hellenic Studies Center, and the Biomedical Engineering Program. He is also the Director of the Center for Applied Optimization. Dr. Pardalos is a world leading expert in global and combinatorial optimization. His recent research interests include network design problems, optimization in telecommunications, e-commerce, data mining, biomedical applications, and massive computing.
Full CV: http://www.ise.ufl.edu/pardalos/files/2011/08/CV_Dec13.pdf
Recent Achievments: http://www.eng.ufl.edu/news/first-engineering-chair-appointed-under-ufs-preeminence-initiative-goes-to-big-data-expert/
Profile in Scholar Google: scholar.google.com/scholar?q=P+Pardalos&btnG=&hl=en&as_sdt=0,5

Plenary Lecture 3

Overview of the Main Metaheuristics used for the Optimization of Complex Systems

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Abstract: For complex systems such as in planning and scheduling optimization, the complexity which corresponds usually to hard combinational optimization prevents the implementation of exact solving methodologies which could not give the optimal solution in finite time. It is the reason why engineers prefer to use metaheuristics which are able to produce good solutions in a reasonable computation time. Two types of metaheuristics are presented here:
* The local searchs, such as: Tabu Search, Simulated Annealing, GRASP method, Hill Climbing, Tunnelling...
* The global methods which look for a family of solutions such as: Genetic or Evolutionary Algorithms, Ant Colony Optimization, Particle Swarm Optimization, Bees algorithm, Firefly algorithm, Bat algorithm, Harmony search....

Brief Biography of the Speaker: Pierre BORNE received the Master degree of Physics in 1967 and the Master of Electrical Engineering, the Master of Mechanics and the Master of Applied Mathematics in 1968. The same year he obtained the Diploma of "Ingénieur IDN" (French "Grande Ecole"). He obtained the PhD in Automatic Control of the University of Lille in 1970 and the DSc in physics of the same University in 1976. Dr BORNE is author or co-author of about 200 Publications and book chapters and of about 300 communications in international conferences. He is author of 18 books in Automatic Control, co-author of an english-french, french-english « Systems and Control » dictionary and co-editor of the "Concise Encyclopedia of Modelling and Simulation" published with Pergamon Press. He is Editor of two book series in French and co-editor of a book series in English. He has been invited speaker for 40 plenary lectures or tutorials in International Conferences. He has been supervisor of 76 PhD Thesis and member of the committee for about 300 doctoral thesis . He has participated to the editorial board of 20 International Journals including the IEEE, SMC Transactions, and of the Concise Subject Encyclopedia . Dr BORNE has organized 15 international conferences and symposia, among them the 12th and the 17 th IMACS World Congresses in 1988 and 2005, the IEEE/SMC Conferences of 1993 (Le Touquet – France) and of 2002 (Hammamet - Tunisia) , the CESA IMACS/IEEE-SMC multiconferences of 1996 (Lille – France) , of 1998 (Hammamet – Tunisia) , of 2003 (Lille-France) and of 2006 (Beijing, China) and the 12th IFAC LSS symposium (Lille France, 2010) He was chairman or co-chairman of the IPCs of 34 international conferences (IEEE, IMACS, IFAC) and member of the IPCs of more than 200 international conferences. He was the

editor of many volumes and CDROMs of proceedings of conferences. Dr BORNE has participated to the creation and development of two groups of research and two doctoral formations (in Casablanca, Morocco and in Tunis, Tunisia). twenty of his previous PhD students are now full Professors (in France, Morocco, Tunisia, and Poland). In the IEEE/SMC Society Dr BORNE has been AdCom member (1991-1993 ; 1996-1998), Vice President for membership (1992-1993) and Vice President for conferences and meetings (1994-1995, 1998-1999). He has been associate editor of the IEEE Transactions on Systems Man and Cybernetics (1992-2001). Founder of the SMC Technical committee « Mathematical Modelling » he has been president of this committee from 1993 to 1997 and has been president of the « System area » SMC committee from 1997 to 2000. He has been President of the SMC Society in 2000 and 2001, President of the SMC-nomination committee in 2002 and 2003 and President of the SMC-Awards and Fellows committee in 2004 and 2005. He is member of the Advisory Board of the "IEEE Systems Journal" . Dr. Borne received in 1994, 1998 and 2002 Outstanding Awards from the IEEE/SMC Society and has been nominated IEEE Fellow the first of January 1996. He received the Norbert Wiener Award from IEEE/SMC in 1998, the Third Millennium Medal of IEEE in 2000 and the IEEE/SMC Joseph G. Wohl Outstanding Career Award in 2003. He has been vice president of the "IEEE France Section" (2002-2010) and is president of this section since 2011. He has been appointed in 2007 representative of the Division 10 of IEEE for the Region 8 Chapter Coordination sub-committee (2007-2008) He has been member of the IEEE Fellows Committee (2008- 2010) Dr BORNE has been IMACS Vice President (1988-1994). He has been co-chairman of the IMACS Technical Committee on "Robotics and Control Systems" from 1988 to 2005 and in August 1997 he has been nominated Honorary Member of the IMACS Board of Directors. He is since 2008 vice-president of the IFAC technical committee on Large Scale Systems. Dr BORNE is Professor "de Classe Exceptionnelle" at the "Ecole Centrale de Lille" where he has been Head of Research from 1982 to 2005 and Head of the Automatic Control Department from 1982 to 2009. His activities concern automatic control and robust control including implementation of soft computing techniques and applications to large scale and manufacturing systems. He was the principal investigator of many contracts of research with industry and army (for more than three millions €) Dr BORNE is "Commandeur dans l'Ordre des Palmes Académiques" since 2007. He obtained in 1994 the french " Kulman Prize". Since 1996, he is Fellow of the Russian Academy of Non-Linear Sciences and Permanent Guest Professor of the Tianjin University (China). In July 1997, he has been nominated at the "Tunisian National Order of Merit in Education" by the Republic of Tunisia. In June 1999 he has been nominated « Professor Honoris Causa » of the National Institute of Electronics and Mathematics of Moscow (Russia) and Doctor Honoris Causa of the same Institute in October 1999. In 2006 he has been nominated Doctor Honoris Causa of the University of Waterloo (Canada) and in 2007 Doctor Honoris Causa of the Polytechnic University of Bucharest (Romania). He is "Honorary Member of the Senate" of the AGORA University of Romania since May 2008 He has been Vice President of the SEE (French Society of Electrical and Electronics Engineers) from 2000 to 2006 in charge of the technical committees. He his the director of publication of the SEE electronic Journal e-STA and chair the publication committee of the REE Dr BORNE has been Member of the CNU (French National Council of Universities, in charge of nominations and promotions of French Professors and Associate Professors) 1976-1979, 1992-1999, 2004-2007 He has been Director of the French Group of Research (GDR) of the CNRS in Automatic Control from 2002 to 2005 and of a "plan pluriformations" from 2006 to 2009. Dr BORNE has been member of the Multidisciplinary Assessment Committee of the "Canada Foundation for Innovation" in 2004 and 2009. He has been referee for the nominations of 24 professors in USA and Singapore. He is listed in the « Who is Who in the World » since 1999.

Plenary Lecture 4

Minimum Energy Control of Fractional Positive Electrical Circuits

Professor Tadeusz Kaczorek (Fellow IEEE)
Warsaw University of Technology
Poland

Abstract: The talk will consist of two parts. In the first part the minimum energy control of standard positive electrical circuits will be discussed and in the second part the similar problem for fractional positive electrical circuits. Necessary and sufficient conditions for the positivity and reachability of electrical circuits composed of resistors, coils and capacitors will be established. The minimum energy control problem for the standard and fractional positive electrical circuits will be formulated and solved. Procedures for computation of the optimal inputs and minimal values of the performance indeces will be given and illustrated by examples of electrical circuits.

Brief Biography of the Speaker: Prof. Tadeusz Kaczorek graduated from the Faculty of Electrical Engineering Warsaw University of Technology in 1956, where in 1962 he defended his doctoral thesis. In 1964, he received a postdoctoral degree. In the years 1965-1970 he was head of the Department of Electronics and Automation, 1969-1970, and Dean of the Faculty of Electrical Engineering University of Warsaw. In the years 1970-1973 Vice-Rector of the Technical University of Warsaw in the years 1970-1981 the director of the Institute of Control and Industrial Electronics Warsaw University of Technology. He was also head of the Department of Control of the above Institute. In 1971 he received the title of Professor and Associate Professor of Warsaw University of Technology. In 1974 he received the title of professor of Warsaw University of Technology. In 1987-1988 he was chairman of the Committee for Automation and Robotics. Since 1986, corresponding member, and since 1998 member of the Polish Academy of Sciences. In 1988-1991 he was Head of the Scientific Academy in Rome. For many years a member of the Foundation for Polish Science. From June 1999 ordinary member of the Academy of Engineering. He is currently a professor at the Faculty of Electrical Engineering of Bialystok and Warsaw University of Technology. Since 1991 he is a member, and now chairman of the Central Commission for Academic Degrees and Titles (Vice-President in 2003-2006). In 2012 he was chairman of the Presidium of the Scientific Committee of the conference devoted to research crash of the Polish Tu-154 in Smolensk methods of science.
Scientific achievements
His research interests relate to automation, control theory and electrical engineering, including analysis and synthesis of circuits and systems with parameters determined and random polynomial methods for the synthesis of control systems and singular systems. Author of 20 books and monographs and over 700 articles and papers in major international journals such as

IEEE Transactions on Automatic Control, Multidimensional Systems and Signal Processing, International Journal of Control, Systems Science and Electrical Engineering Canadian Journal.
He organized and presided over 60 scientific sessions at international conferences, and was a member of about 30 scientific committees. He has lectured at over 20 universities in the United States, Japan, Canada and Europe as a visiting professor. He supervised more than 60 doctoral dissertations completed and reviewed many doctoral theses and dissertations. His dozens of alumni received the title of professor in Poland or abroad.
He is a member of editorial boards of journals such as International Journal of Multidimensional Systems and Signal Processing, Foundations of Computing and Decision Sciences, Archives of Control Sciences. From 1 April 1997, is the editor of the Bulletin of the Academy of Technical Sciences.
Honours, awards and honorary doctorates.
Honours
Tadeusz Kaczorek has been honored with the following awards:
* Officer's Cross of the Order of Polonia Restituta Polish
* Meritorious Polish
* Medal of the National Education Commission
Honorary doctorates
He received honorary degrees from the following universities:
Silesian University of Technology (2014)
Rzeszow University of Technology (2012)
Poznan University of Technology (2011)
Opole University of Technology (2009)
Technical University of Lodz (3 December 2008)
Bialystok University of Technology (August 20, 2008)
Warsaw University of Technology (22 December 2004)
Szczecin University of Technology (November 8, 2004)
Lublin University of Technology (13 May 2004)
University of Zielona Gora (27 November 2002)
Honorary Member of the Hungarian Academy of Sciences and the Polish Society of Theoretical and Applied Electrical (1999). He received 12 awards of the Minister of National Education of all levels (including 2 team).

Plenary Lecture 5

Unmanned Systems for Civilian Operations

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Abstract: In this plenary talk we will introduce fundamental concepts of unmanned systems (Unmanned Aerial Vehicles and Unmanned Ground Vehicles) and their emerging utility in civilian operations. We will discuss a framework for multiple UAVs tasked to perform forrest fire detection and prevention operations. A ground station with appropriate equipment and personnel functions as the support and coordination center providing critical information to fire fighter as derived from the UAVs. The intent is to locate a swarm of vehicles over a designated area and report at the earliest the presence of such fire precursors as smoke, etc. the UAVs are equipped with appropriate sensors, computing and communications in order to execute these surveillance tasks accurately and robustly. Meteorological sensors monitor wind velocity, temperature and other relevant parameters. The UAV observations are augmented, when appropriate, with satellite data, observation towers and human information sources. Other application domains of both aerial and ground unmanned systems refer to rescue operations, damage surveillance and support for areas subjected to earthquakes and other natural disasters, border patrol, agricultural applications, traffic control, among others.

Brief Biography of the Speaker: Dr. George Vachtsevanos is currently serving as Professor Emeritus at the Georgia Institute of Technology. He served as Professor of Electrical and Computer Engineering at the Georgia Institute of Technology from 1984 until September, 2007. Dr Vachtsevanos directs at Georgia Tech the Intelligent Control Systems laboratory where faculty and students began research in diagnostics in 1985 with a series of projects in collaboration with Boeing Aerospace Company funded by NASA and aimed at the development of fuzzy logic based algorithms for fault diagnosis and control of major space station subsystems. His work in Unmanned Aerial Vehicles dates back to 1994 with major projects funded by the U.S. Army and DARPA. He has served as the Co-PI for DARPA's Software Enabled Control program over the past six years and directed the development and flight testing of novel fault-tolerant control algorithms for Unmanned Aerial Vehicles. He has represented Georgia Tech at DARPA's HURT program where multiple UAVs performed surveillance, reconnaissance and tracking missions in an urban environment. Under AFOSR sponsorship, the Impact/Georgia Team is developing a biologically-inspired micro aerial vehicle. His research work has been supported over the years by ONR, NSWC, the MURI Integrated Diagnostic program at Georgia Tech, the U,S. Army's Advanced Diagnostic program, General Dynamics,

General Motors Corporation, the Academic Consortium for Aging Aircraft program, the U.S. Air Force Space Command, Bell Helicopter, Fairchild Controls, among others. He has published over 300 technical papers and is the recipient of the 2002-2003 Georgia Tech School of ECE Distinguished Professor Award and the 2003-2004 Georgia Institute of Technology Outstanding Interdisciplinary Activities Award. He is the lead author of a book on Intelligent Fault Diagnosis and Prognosis for Engineering Systems published by Wiley in 2006.

Plenary Lecture 6

Iterative Extended UFIR Filtering in Applications to Mobile Robot Indoor Localization

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Abstract: A novel iterative extended unbiased FIR (EFIR) filtering algorithm is discussed to solve suboptimally the nonlinear estimation problem. Unlike the Kalman filter, the EFIR filtering algorithm completely ignores the noise statistics, but requires an optimal horizon of N points in order for the estimate to be suboptimal. The optimal horizon can be specialized via measurements with much smaller efforts and cost than for the noise statistics required by EKF. Overall, EFIR filtering is more successful in accuracy and more robust than EKF under the uncertain conditions. Extensive investigations of the approach are conducted in applications to localization of mobile robot via triangulation and in radio frequency identification tag grids. Better performance of the EFIR filter is demonstrated in a comparison with the EKF. It is also shown that divergence in EKF is not only due to large nonlinearities and large noise as stated by the Kalman filter theory, but also due to errors in the noise covariances ignored by EFIR filter.

Brief Biography of the Speaker: Dr. Yuriy S. Shmaliy is a full professor in Electrical Engineering of the Universidad de 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. (technical) degree from the Soviet Union Government. 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 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 edited a book Probability: Interpretation, Theory and Applications (Nova Science Publ., New York, 2012) and contributed to several books with invited chapters. Dr. Shmaliy has authored more than 300 Journal and Conference papers and 80 patents. He is IEEE Fellow; was rewarded a title, Honorary Radio Engineer of the USSR, in 1991; and was listed in Outstanding People of the 20th Century, Cambridge, England in 1999. He is currently an Associate Editor for Recent Patents on Space Technology. He serves on the Editorial Boards of several International Journals and 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.