IntelliCIS COST ACTION IC0806

Intelligent Monitoring, Control and Security of Critical Infrastructure Systems

2nd Action Workshop

17-18 May 2010, Budapest, Hungary

INTELLICIS ACTION IC0806 – PROGRAM-AT-A-GLANCE

Monday, 17 May 2010	
09:00 – 10:00	**KEYNOTE LECTURE 1: Erol Gelenbe**
10:00 – 10:15	COFFEE BREAK
10:15 – 11:30	**Intelligent System-Theoretic Approaches for Critical Infrastructure Systems**
11:30 – 12:45	**Reliable Management and Control of Electric Power Systems**
12:45 – 14:00	LUNCH
14:00 – 16:00	**Breakout sessions**
16:00 – 18:00	**IC0806 Management Committee Meeting**
19:00 – 22:00	DINNER

Tuesday, 18 May 2010	
09:00 – 10:00	**KEYNOTE LECTURE 2: Damir Novosel**
10:00 – 10:15	COFFEE BREAK
10:15 – 11:30	**Reliable Management and Control of Telecommunication Networks**
11:30 – 12:45	**Health Monitoring and Control of Water Systems**
12:45 – 14:00	LUNCH
14:00 – 16:00	**Breakout sessions**

INTELLICIS ACTION IC0806 – DETAILED PROGRAM

Monday, May 17

9:00 AM - 10:00 AM

KEYNOTE LECTURE 1

"The Random Neural Network and some of its Applications," Erol Gelenbe (Imperial College London, United Kingdom)

Room A

Chair: Elias Kyriakides (University of Cyprus, Cyprus)

10:00 AM -10:15 AM

COFFEE BREAK

10:15 AM - 11:30 AM

Intelligent System-Theoretic Approaches for Critical Infrastructure Systems

Room A

Chair: Marios Polycarpou (University of Cyprus, Cyprus)

Computational Intelligence for Data-Intensive Security
Rodolfo Zunino (Universita di Genova, Italy)

Morphogenetic Self-Organization of Collective Systems
Jaochu Jin (Honda Research Institute Europe, Germany)

Smart Grids Need Robust Distributed Control
Geert Deconinck (Katholieke Universiteit Leuven, Belgium)

WSAN4CIP: Wireless Sensor and Actuator Networks for Critical Infrastructure Protection
Levente Buttyan (Budapest University of Technology and Economics, Hungary)

11:30 AM – 12:45 PM

Reliable Management and Control of Electric Power Systems

Room A

Chair: Vladimir Terzija (University of Manchester, United Kingdom)

Measurements Get Together
Vladimir Terzija (University of Manchester, United Kingdom)

Reliable Management and Control of Power Grids under Vulnerable Operating Conditions
Chen-Ching Liu (University College Dublin, Ireland)

Frequency Measurement and Estimation
Mihaela Albu (University Politehnica of Bucharest, Romania)

Reliability Assessment and Quality of Supply of Transmission Systems in the Competitive Environment of Electric Energy Market
Evangelos Dialynas (National Technical University of Athens, Greece)

12:45 PM – 2:00 PM

LUNCH

2:00 PM – 4:00 PM

Breakout sessions

Breakout session 1: Smart Grids in Light of the EU Road Map as Shaped by the SET Plan
Room A
Chair: Mihaela Albu (University Politehnica of Bucharest, Romania)

Breakout session 2: Real-time Water Quality Management in Water Distribution Networks
Room D
Chairs: Marios Polycarpou (University of Cyprus, Cyprus) and Dragan Savic (University of Exeter, United Kingdom)

4:00 PM –6:00 PM

IC0806 Management Committee Meeting

Room B

7:00 PM – 10:00 PM

DINNER

Tuesday, May 18

9:00 AM - 10:00 AM

KEYNOTE LECTURE 2

"New Frontiers in Revitalizing the Power Grid," Damir Novosel (Quanta Technology LLC, USA)

Room A

Chair: Elias Kyriakides (University of Cyprus, Cyprus)

10:00 AM - 10:15 AM

COFFEE BREAK

10:15 AM – 11:30 PM

Reliable Management and Control of Telecommunication Networks

Room A

Chair: René Serral-Graciá (Technical University of Catalunya, Spain)

Overview of Fault Protection Methods in Mesh Optical Networks
George Ellinas (University of Cyprus, Cyprus)

Quality of Experience enforcement in wireless networks
René Serral-Graciá (Technical University of Catalunya, Spain)

Wisense®, a Real-Time Remote Monitoring Platform for Wireless Sensor Networks
Tasos Kounoudes (SignalGeneriX, Cyprus)

Localization in Communication and Sensor Networks
Tolga Eren (Kirikkale University, Turkey)

11:30 AM – 12:45 PM

Health Monitoring and Control of Water Systems

Room A

Chair: Dragan Savic (University of Exeter, United Kingdom)

Supervision and Control Reconfiguration of Networked Distributed Systems and Application to Hydrographical Systems Risk-based Methodology for Monitoring and Operational Management of Water Distribution Systems
Philippe Charbonnaud (University of Toulouse, France)

Control of Integrated Quality and Quantity in DWDS and Application to Gdynia Case -Study
Wojtek Kurek (Gdansk University of Technology, Poland)

Anomaly Detection in Water Distribution Networks
Zoran Kapelan (University of Exeter, United Kingdom)

EU project SECUREAU
Juhna Talis (Riga Technical University, Latvia)

12:45 PM – 2:00 PM

LUNCH

2:00 PM – 4:00 PM

Breakout sessions

Breakout session 3: Wide Area Measurement and Control in Power Systems
Room A
Chairs: Vladimir Terzija (University of Manchester, United Kingdom) and Elias Kyriakides (University of Cyprus, Cyprus)

Breakout session 4: Transverse Monitoring Strategies in Critical Infrastructure Systems
Room D
Chair: René Serral-Graciá (Technical University of Catalunya, Spain)

The Random Neural Network and Some of its Applications

Erol Gelenbe
Imperial College, London

Abstract:
The Random Neural Network is a biologically inspired spiked neuronal model based on a stochastic representation. In this lecture, we will describe its theoretical development and analytical properties and outline several applications in areas such as neurobiology, image segmentation, texture learning, video compression, combinatorial optimisation and packet network routing. We will also point to generalisations of this model to G-Networks which have been developed in the context of queueing theory.

Biography:
Erol is the Professor in the Dennis Gabor Chair at Imperial College. His current research addresses network security, Green IT, networked auctions, as well as modelling gene regulatory networks. He is a Fellow of ACM and of IEEE, a member of the French National Academy of Engineering (http://www.academie-technologies.fr), of the Turkish Academy of Sciences (http://www.tuba.gov.tr) and of Academia Europaea (http://www.acadeuro.org). He has received Honoris Causa Doctorates in Belgium, Italy and Turkey, scientific awards in the USA and France, and governmental honors from Italy and France. Erol's recent work has appeared in the Communications of the ACM, the ACM Transactions on Adaptive and Autonomous Systems, Sensor Networks, and Internet Technology, and other journals such as The Computer Journal, Neural Computation, Physical Review, and the Proceedings of the Royal Society. His research is currently funded by UK EPSRC, the UK Technology Strategy Board, the EU FP7 Program, BT and BAE Systems.

Computational Intelligence for Data-Intensive Security

Rodolfo Zunino
Universita di Genova

Abstract:
Modern approaches to the Protection of Critical Infrastructures rely more and more heavily on the availability and effectiveness of ICT-based supporting subsystems. Security plays a crucial role in the design, realization and deployment of the related technologies. At the same time, those applications often pose new challenges to existing methodologies, especially when considering the amount of data that have to be processed, the flexibility of the security technologies to contrast novel and evolving threats, and the reaction time that is imposed by the external environment.
The term "data-intensive security" tries to subsume those crucial aspects, and the talk aims to show that Computational Intelligence (CI) can bring a fruitful contribution within that area. Security is analyzed as a process and considered in a wide range of (apparently distant) domains related to Critical Infrastructure Protection [Network Security, Intelligence, Site Protection, Computer Forensics]. The analysis leads to a synthetic perspective, which identifies unifying technologies whose range of application is cross-domain and therefore favors interoperability. The role of CI is then considered in those applications, and the review presentation shows that most state-of-art methods in CI (classification, clustering, regression) apply effectively in data-intensive Security.
The talk concludes by addressing two case studies, namely, undersea Port Protection and Text Mining, and illustrates how the common learning technologies from CI do apply to such apparently heterogeneous domains.

Biography:
Rodolfo Zunino (born 1961) obtained the Laurea degree *cum laude* in Electronic Engineering from Genoa University in 1985. From 1986 to 1995 he was a research consultant with the Department of Biophysical and Electronic Engineering (DIBE) of Genoa University. He is currently Associate Professor at DIBE, where he teaches "Electronics for Embedded Systems" and "Electronics for Security".
His main scientific interests include efficient models for data representation and learning, electronic systems for neural networks, intelligent systems for security, and advanced methods for multimedia data processing.
Rodolfo Zunino coauthored more than 190 papers refereed in International Journals and Conferences. He holds one patent, co-authored four Books/Book Chapters and chaired the two editions of the Intern. Workshop on Computational Intelligence for Security in Information Systems (CISIS'08 and CISIS'09). He participated in the Scientific Committees of several International Conferences on neural networks, including ICANN and IJCNN. He served as Associate Editor to the IEEE Transactions on Neural Networks until from 2001 to 2009, and is a Senior Member of the IEEE (CIS, Computational Intelligence Society).

Morphogenetic Self-Organization of Collective Systems

Yaochu Jin
Honda Research Institute Europe

Abstract:
Biological morphogenesis can be seen as a self-organizing process where a large number of cells communicate and interact locally with each other and with the environment to form a complex shape as an emerging global behavior under the control of a gene regulatory network. This self-organization process is decentralized, robust to minor changes in the environment and capable of self-healing.
This talk presents a decentralized methodology for self-organizing collective systems based on genetic and cellular mechanisms. The central idea is of the methodology is to build up a metaphor between a cell and an agent, e.g., a mobile robot or a mobile sensor. Within each agent (cell), there is a virtual DNA, which results in a gene regulatory network (GRN). The concentration of proteins of the GRNs corresponds to a physical variable of the agent, such as the position and speed. Local interactions between the agents are simulated by protein diffusion that affects the states of each GRN.
The movement of the agents is guided by target information embedded in the GRN model, simulating the role of morphogen gradient that guild cell migration. Simulation results demonstrate that the collective system governed by the GRN models is able to construct rich complex shapes without a centralized control in the presence of uncertainties in the system and environment.

Biography:
Yaochu Jin received the B.Sc., M.Sc., and Ph.D. degrees, all in automatic control from Zhejiang University, Hangzhou, China, in 1988, 1991, and 1996, respectively, and the Dr.-Ing. Degree from Ruhr University Bochum, Germany, in 2001.
Dr. Jin will be a Professor in the Department of Computing, University of Surrey, UK from June 1, 2010. Presently, he is a Principal Scientist with the Honda Research Institute Europe and Scientific Coordinator, CoR-Lab Graduate School, Bielefeld University, Germany. His research interests include computational approaches to understanding evolution, learning and development in biology, and biological approaches to complex systems design. He has (co)edited three books and three conference proceedings, authored a monograph, and (co)authored over 100 peer-reviewed journal and conference papers.
Dr. Jin is an Associate Editor of BioSystems, the IEEE Transactions on Neural Networks, the IEEE Transactions on Control Systems Technology, the IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews, and the IEEE Computational Intelligence Magazine.
He is also an editorial member of Soft Computing, Memetic Computing and Swarm Intelligence Research. He was the Tutorial Chair of the 2007 Evolutionary Computation Congress in Singapore, Program Co-Chair of the 2007 IEEE Symposium Series on Computational Intelligence in Multi-Criteria Decision-Making in Honolulu, and Program Chair of the 2005 International Conference on Fuzzy Systems and Knowledge Discovery in Changsha. He also chairs Industry Liaison and Continuing Education sub-committees and the Task Force for “Evolutionary Computation in Dynamic and Uncertain Environments” of the IEEE Computational Intelligence Society. Dr. Jin is an invited Keynote Speaker on several international conferences and symposia. He is a Senior Member of IEEE.

Smart Grids Need Robust Distributed Control

Geert Deconinck
K.U. Leuven

Abstract:
Smart grids are power networks that rely on information and communication technology for more efficient operation. Smart grid applications allow increasing the efficiency of the grid, e.g., by avoiding peak loads. This presentation elaborates on a case study for coordinated charging of plugin hybrid electric vehicles and enumerates some associated relevant research questions.

Biography:
Geert Deconinck is full professor (hoogleraar) at the the Department of Electrical Engineering (ESAT) of the K.U.Leuven (Belgium). He performs research on the design of dependable system architectures for industrial control and smart grids. He teaches topics related to industrial automation and hardware, lighting, and measurement techniques. He received his M.Sc. in Electrical Engineering and his Ph.D. in Engineering from the K.U.Leuven, Belgium in 1991 and 1996 respectively. He is member of the IEEE SMC TC on Infrastructure Systems and Services and chairman of the TI society BIRA on industrial automation. He is a member of the Belgian Institute for Lighting, the Royal Flemish Engineering Society, the Institute of Engineering and Technology (IET), a senior member of the IEEE (Institute of Electrical and Electronics Engineers - Reliability, Computer and Power & Energy Societies) and can be reached at Geert.Deconinck@esat.kuleuven.be.

WSAN4CIP: Wireless Sensor and Actuator Networks for Critical Infrastructure Protection

Levente Buttyán
Budapest University of Technology and Economics

Abstract:
The protection of Critical Infrastructures (CI) provides an interesting application area for Wireless Sensor and Actuator Networks (WSAN). Threats such as natural catastrophes, criminal or terrorist attacks against CIs are increasingly reported. The large scale nature of CIs requires a scalable and low cost technology for improving CI monitoring and surveillance. WSANs are a promising candidate to fulfill these requirements, but if the WSAN becomes part of the CI in order to improve its reliability, then the dependability of the WSAN itself needs to be significantly improved first. In this talk, we discuss the challenges for achieving dependability of WSANs, and the potential solutions we are developing in the WSAN4CIP Project funded by the European Commission in the context of FP7.

Biography:
Levente Buttyán received the M.Sc. degree in Computer Science from the Budapest University of Technology and Economics (BME) in 1995, and earned the Ph.D. degree from the Swiss Federal Institute of Technology -- Lausanne (EPFL) in 2002. In 2003, he joined the Department of Telecommunications at BME, where he currently holds a position as an Associate Professor and works in the Laboratory of Cryptography and Systems Security (CrySyS). His research interests are in the design and analysis of security protocols and privacy enhancing mechanisms for wireless networked embedded systems (including wireless sensor networks, mesh networks, vehicular communications, and RFID systems), and the application of formal methods in security engineering. Levente Buttyán has carried out research in various international research projects (e.g., UbiSecSens, SeVeCom, EU-MESH, WSAN4CIP), in which he had task leader and work package leader roles. He published around 20 refereed journal papers and around 40 refereed conference/workshop papers. He also co-authored a book with Prof. Jean-Pierre Hubaux on Security and Cooperation in Wireless Networks published by the Cambridge University Press in 2008. Levente Buttyán is an Associate Editor of the IEEE Transactions on Mobile Computing, an Area Editor of Elsevier Computer Communications, a member of the Editorial Board of the Infocommunications Journal in Hungary, and he was a Guest Co-editor of the IEEE Journal on Selected Areas in communications, Special Issue on Non-cooperative Behavior in Networking. He is a Steering Committee member of the ACM Conference on Wireless Network Security, and he served on the Technical Program Committees of around 30 international conferences and workshops, most of which were related to wireless network security. He is the chair of the Scientific Committee of the Scientific Association for Infocommunications Hungary, a sister society of the IEEE Communications Society. He is a professional member of the ACM, and an affiliate of the IEEE Computer Society.

Measurements Get Together

Vladimir Terzija
The University of Manchester, United Kingdom

Abstract:
A broad spectrum of advanced technology solutions and novel protection and control techniques will deliver new modes of integrated power system protection and control. Supported by the Global Positioning System, the Synchronized Measurement Technology (SMT) is one of those key technologies. While the SMT is already commercially available, the development of its applications is still in its infancy. The focuses of this seminar are to discuss the challenges related to the development of such applications, the need for them in terms of the structure of future networks, the deployment of architectures for multi-purpose applications given different grid topologies, generation mixes and diverse operational challenges. Wide-Area Monitoring, Protection and Control (WAMPAC) is a concept that involves the use of system-wide information and the communication of selected local information to a remote location to counteract the propagation of large disturbances. SMT is an important element and enabler of WAMPAC. A successful novel protection and control application requires a carefully designed WAMPAC architecture. The communication requirements for future real-time applications can be high, so an optimal design of WAMPAC architecture is a prerequisite for the successful implementation of the SMT. However, the first control and protection applications based on SMT require a host of challenges to be addressed. They will be discussed in the seminar.

Biography:
Prof Vladimir Terzija is the EPSRC Chair Professor in Power Systems Engineering in the School of Electrical and Electronic Engineering at The University of Manchester. Before joining the School in July 2006, he spent six years with ABB, Germany, where he provided technical expertise on switchgear, power system protection and distribution automation. He is currently principal investigator (PI) on several UK government and industry-funded research projects related to future Wide Area Monitoring, Protection and Control Systems. His main research interests are in the application of intelligent methods for power system monitoring, control, and protection, as well as switchgear and DSP applications in power systems. Prof Terzija is Humboldt Research Fellow, Senior Member of the IEEE, and Member of the IET and Cigré. He is an active member of the North American SynchroPhasor Initiative (NASPI). He is currently convenor of the Cigré Working Group B5.14 “Wide Area Protection and Control Technologies” and a contributing member of several IEEE working groups. Prof Terzija has published over 170 peer-reviewed papers in international journals and in proceedings of international conferences. In his research team he has currently a number of MSc project students, 10 PhD students and 2 Postdoctoral Research Associates.

Reliable Management and Control of Power Grids Under Vulnerable Operating Conditions

Chen-Ching Liu
University College Dublin
National University of Ireland, Dublin

Abstract:
The purpose of a wide area defence system is to help a power grid avoid a cascading sequence of events. Traditional N-1 security criterion does not assure that the system can withstand cascading outages. A wide area protection and control system with the capabilities to perform vulnerability assessment and determine the defence actions is needed. Intelligent system techniques such as multi-agent systems are powerful tools for implementation of decision support systems for complex operating conditions. On line assessment should be based on vulnerable patterns of the power grid. Controlled islanding requires computational techniques to identify how the power grid will be partitioned. Cyber security issues can be studied using logic event modelling and simulation tools such as Petri Net. This presentation will provide an overview of the technical issues, state of the art, and example research results.

Biography:
Chen-Ching is a Professor and Deputy Principal of College of Engineering, Mathematical and Physical Sciences, University College Dublin, Ireland. During 1983-2005, he was on the faculty of University of Washington, where he also served as an Associate Dean of Engineering. He was Palmer Chair Professor at Iowa State University during 2006-08. Chen- Ching received his BS and MS from National Taiwan University and Ph.D. from University of California, Berkeley. USA. He received an IEEE Third Millennium Medal in 2000 and the PES Outstanding Power Engineering Educator Award in 2004. Professor Liu was elected a Fellow of the IEEE in 1994.

Frequency Measurement and Estimation

Mihaela Albu
Politehnica University of Bucharest

Abstract:
Power systems evolve by including new types of generation units (mostly based on renewable sources of energy), storage, power electronics based power flow control units and loads with flexible demand. The integrated operation of the geographically dispersed elements of the electrical networks and the associated increased use of power electronics layers in the electric grid give rise to considerable complexity translated from distribution to the transmission level.
As a direct consequence, one can observe that frequency is no longer a system variable and therefore most of the control strategies developed until now have to be re-designed accordingly. Another consequence derives from the fact that the use of power electronics interfaces for the generating nodes results in a significant decrease of the system inertia; in order to cope with the existing control schemes, one of the solutions proposed is to emulate the synchronous machine behaviour.
In all above mentioned cases, estimation of the local frequency plays a key role. For steady-state applications, including state estimation, existing algorithms with typical response times in the order of hundreds of milliseconds can be implemented. Another solution is to take advantage from the massive deployment of monitoring systems, with additional time-tag information (PMUs). In order to cope with these changes, assumptions on linearity, symmetry, and steady state behaviour have to be carefully reconsidered.
The presentation will be dedicated to a review of existing frequency-estimation algorithms, and results from extensive measurements campaigns providing frequency and rate of frequency information, with conclusions derived from statistical data analysis.

Biography:
Mihaela Albu graduated 1987 the Power Engineering Department of the “Politehnica” University of Bucharest (U.P.B.). In 1998 she obtained the PhD from the same university with a thesis on "Electromagnetic Transients on HV Aerial Lines with Application to Digital Distance Protection Design".
Since 2002 she is a Professor of Electrical Engineering. Her research interests include active distribution networks, DC grids, power quality, instrumentation, and remote experimentation embedded within on-line laboratories. She is IEEE senior member and volunteers for the IEEE Instrumentation and Measurement Society (2009-2012). Recent publications report work on synchronized measurement units, frequency estimation, algorithms for storage selection and virtual synchronous machines.

Reliability Assessment and Quality of Transmission Systems in the Competitive Environment

Evangelos Dialynas
National Technical University of Athens, Greece

Abstract:
An appropriate framework for the competitive electric energy market has been applied in many countries wordwide while appropriate directives have been issued in the countries of European Union concerning the common rules for the internal market of electric energy. In all the respective legislative documents, special attention is given for maintaining an adequate reliability level of electric power systems that includes both adequacy and security while it may take into account any actions causing such disturbances (human errors, extreme weather conditions, etc). A significant question has been raised that concerns if this reliability level will be decreased in the new environment. This presentation describes the main issues for the reliability assessment and quality of supply in electric power transmission systems that operate in the competitive electric energy market. The basic system fea tures and market characteristics are discussed while their impact on the system reliability performance is assessed. The following general conclusions can be obtained:

- The new legislation for the competitive electric energy market has changed considerably all aspects concerning the power system reliability performance.
- The role of Transmission System Operator is very important for assuring the power transmission in the network with objective and impartial criteria.
- It is necessary to develop new improved techniques and tools for the calculation of reliability indices. They must be based on a system probabilistic modelling while they must take into account the composite generation and transmission system.
- The assessment process of alternative system designs must be based on cost benefit analyses and must take into account the relative reliability costs.
- The relationships between the power suppliers and their customers become very important while it is necessary to determine reliability - quality levels and quality requirements for customers that will be related with their tariffs.
- The asset management can provide increased services with lower risk and cost within the limits of allowed revenues.

Biography:
Evangelos N. Dialynas received the Diploma in electrical engineering from National Technical University of Athens (NTUA), Athens, Greece, in 1975 and the M.Sc. and Ph.D. degrees from the University of Manchester Institute of Science and Technology, Manchester, U.K., in 1977 and 1979 respectively. He is presently a Professor in electric power systems at the School of Electrical and Computer Engineering at NTUA and the Director of Electric Energy Systems Laboratory. His research interests are reliability modeling and evaluation, power system probabilistic assessment, power system operation under the competitive electric energy market, impact of high penetration on the reliability and operational performance of interconnected and isolated power systems, power quality indices and computer applications of power systems. As a result of his research activities, he has written more than 70 papers published in international technical journals after review and more than 100 papers presented in various international conferences and published in their proceedings. Prof. E. Dialynas is a member of the Technical Chamber of Greece, a senior member of IEEE and a member of IET. He is also a distinguished member of CIGRE and a member of the Administrative Council of CIGRE.

New Frontiers in Revitalizing the Power Grid

Damir Novosel, President
Quanta Technology LLC

Abstract:
Society mindset has changed and new sense of urgency has been brought to all energy issues, including the power grid. Reliable grid operation is critical to society and oil dependency and environmental concerns drive the power industry. Power companies are in the position to benefit by making the transition from existing to new infrastructures to improve the performance of electric utility systems and address the energy needs of society, such as improved efficiency and utilization, renewable energy integration, demand response, power quality and reduced maintenance cost. This approach requires system infrastructure reinforcement, integrated system planning and automation. This complex infrastructure requires using the cutting edge technology or "Smart Grid". The global topic of development and deployment of a "smarter" electricity grid has been at the forefront of industry initiatives and investments around the world. Advanced monitoring, protection, and control technologies enable implementation of "smarter" electrical grids to realize the needs of the electricity users for sustainable energy delivery and enhanced power system performance. This lecture addresses the following topics:

- Emerging Trends in Energy Investments
- Holistic Smart Grid Approach
- Challenges Requiring Transmission Smart Grid
- Transmission Smart Grid: Wide Area Monitoring, Protection and Control (WAMPAC)

The focus will be on WAMPAC technology enablers such as system integrity protection systems (SIPS), integrated system-wide communication infrastructure allowing flexible and secure data collection, and synchronized measurements.

Biography:
Damir Novosel is President of Quanta Technology and Energized Services. Damir has over 28 years of experience working with electric utilities and vendors. He has developed and consulted on a number of products and methods to improve power system performance. Dr. Novosel has created and managed several reputable and successful organizations that developed innovative technology and industry best practices in various areas of power systems. Prior to joining Quanta Technology, he was President of T&D Consulting at KEMA in the US. He has also held various positions in ABB including Vice President of global product management for automation products.
His work in electrical power system monitoring, protection, control and automation earned him international recognition and was elected IEEE Fellow. He presently holds 16 US and international patents. Damir published over 100 articles in Refereed Journals and Conference Proceedings in various areas of power systems.
Damir is presently Vice President of the IEEE PES Technical Council and member of the IEEE PES Governing Board. Damir holds MSc and PhD degrees in electrical engineering from University of Zagreb, Croatia and Mississippi State University, respectively.

Overview of Fault Protection Methods in Mesh Optical Networks

George Ellinas
University of Cyprus, Cyprus

Abstract:
This talk will outline the motivation behind the need for fault protection methods in optical networks with arbitrary mesh topologies. Various protection techniques will be discussed and compared, including link-based, path-based, cycle-based, and segment-based approaches. Speed of recovery as well as redundant capacity required are amongst the main performance metrics that are taken into consideration for these techniques. New avenues of research such as protection techniques taking into account physical layer constraints, as well as proactive restoration will also be discussed.

Biography:
George Ellinas holds B.S., M.S., M.Phil, and Ph.D. degrees in electrical engineering from Columbia University. He is currently an Associate Professor of Electrical and Computer Engineering at the University of Cyprus. Prior to joining the University of Cyprus he was an Associate Professor of Electrical Engineering at City College of the City University of New York (2002-2005). Before joining the academia, he was a Senior Network Architect at Tellium (2000-2002), and a Senior Research Scientist in Telcordia Technologies' (formerly Bellcore) Optical Networking Research Group where he performed research for the DARPA-funded Optical Networks Technology Consortium (ONTC), Multiwavelength Optical Networking (MONET) and Next Generation Internet (NGI) projects from 1993 to 2000. He has co-authored two books on optical networking and than 120 journal and conference papers and book chapters, and is also the holder of 29 patents on optical networking. His research interests are in the areas of optical architectures, routing and wavelength assignment algorithms, fault protection/restoration techniques in arbitrary mesh optical networks, optical access networks, hybrid optical-wireless access networks, and complex networks.

Quality of Experience Enforcement in Wireless Networks

René Serral-Gracià
Unversitat Politècnica de Catalunya (UPC)

Abstract:
In this paper we present a Multimedia Wireless Management System, which can be used on-line to assess and guarantee the quality of multimedia traffic in a wireless network. The proposed platform uses both network and application layer metrics to build up a scalable quality assessment of multimedia traffic. Moreover, the system provides traffic provisioning capabilities by coordinating the network access and usage both from the wireless node and from the network access point. These two combined features permit our platform to guarantee a satisfactory multimedia user experience in wireless environments. We evaluate our proposal by issuing an experimental deployment in a testbed and performing a series of tests under different network situations to demonstrate the Quality of Experience guaranties of our system. The results show that the quality of video perceived by end-users is considerably improved compared to the typical wireless network.

Biography:
René Serral-Gracià, received his PhD in Computer Science from the Universitat Politècnica de Catalunya (UPC), where he holds the position of assistant professor. His main research topics focus on Network measurements and monitoring, with special interest in cross-layer Quality of Experience assessment of multimedia traffic; along with the design and performance evaluation of innovative interdomain routing protocols. He also has actively collaborated in European research projects such as European Quality of Service over heterogeneous networks (EuQoS) and Laboratories Over Next Generation Networks (LONG).

Wisense®, A Real-Time Remote Monitoring Platform for Wireless Sensor Networks

Tasos Kounoudes
SignalGeneriX Ltd, Cyprus

Abstract:
Wisense® is a web-based wireless sensor network platform that supports the deployment of low-powered distributed networks of wireless sensors for real time remote monitoring and control of industrial, commercial and environmental applications. The complete integrated end-to-end system includes wireless technology, data logging, web-based visualization, data management, customized automatic reporting and emergency alerts. SignalGeneriX utilised the scientific results obtained through its participation in three research projects funded by the Cypriot Research Promotion Foundation and combined them with the results of internal R&D to develop the platform. Wisense® offers a cost-effective and scalable solution that can be easily integrated to monitor existing systems and add value by significantly reducing operation costs and improving management, production and quality control processes. This presentation will provide an overview of the system and the technology and present some deployment examples for water quality monitoring, leak detection and precision agriculture.

Biography:
Tasos Kounoudes is the co-founder and CEO of SignalGeneriX LTD, a Cypriot R&D company focusing on DSP and Communications. He holds an MEng in Computer Engineering and Informatics from University of Patras, Greece and a PhD in Digital Signal Processing from Imperial College, UK. He worked as a Postdoctoral fellow at the DSP group of Imperial College and as a technical consultant for the Defense Research Evaluation Agency (DERA) of the British Ministry of Defense and QINETIQ. Dr. Kounoudes served the high-tech industry in the UK and Cyprus from various positions ranging from senior researcher and team leader to project manager and chief technical officer. His expertise includes wireless sensor networks and their applications, communications, biometrics, speech and signal processing. He is currently acting as a CapTech IAP4 expert for the European Defense Agency in aspects related to sensor networks and he is the National representative in the COST action “Biometrics for Identity Documents and Smart cards”. Dr. Kounoudes is the author of forty scientific papers, and is regularly acting as a reviewer for various scientific conferences and EU funding agencies.

Localization in Communication and Sensor Networks

Tolga Eren
Kirikkale University, Turkey

Abstract:
In this talk, we provide a theoretical foundation for the problem of network localization in which some nodes know their locations and other nodes determine their locations by measuring the distances to their neighbors. We construct grounded graphs to model network localization and apply graph rigidity theory to test the conditions for unique localizability and to construct uniquely localizable networks. We further study the computational complexity of network localization and investigate a subclass of grounded graphs where localization can be computed efficiently. We conclude with a discussion of localization in sensor and communication networks where the nodes are placed randomly.

Biography:
Tolga Eren received the B.S. degree in electrical engineering from Bilkent University, Ankara, Turkey, the M.S.E.E. degree in electrical engineering from the University of Massachusetts, USA, the M.S. and the Ph.D. degrees in engineering and applied science from Yale University, New Haven, Connecticut, USA, in 1994, 1998, 1999, and 2003, respectively. From October 2003 to July 2005, he was a postdoctoral research scientist at the Computer Science Department at Columbia University in the City of New York, USA. Since September 2005, he has been at the department of Electrical Engineering at Kirikkale University, Turkey. His research interests are cooperative control systems, networked control systems, intelligent control systems, multi-agent systems, localization and control in sensor networks.

Supervision and Control Reconfiguration of Networked Distributed Systems and Application to Hydrographical Systems

Philippe Charbonnaud
University of Toulouse

Abstract:
The principle of reactive control of large scale system will be presented. Usually, large scale systems have several operating modes. The concurrent supervision will be detailed and its importance to qualify the correct behaviour of the systems in presence of large perturbations will be explained. A discussion on how to react according to various situations will be proposed. It will be distinguished passive accommodation (by robustness methods) and active accommodation (reconfiguration and restructuration). Several applications to hydrographical systems will be summarized for explaining the performance achieved.

Biography:
Philippe Charbonnaud was born at Angoulême in 1962. He received a PhD (1991) from University Bordeaux 1 and an HdR (2002) from Polytechnic National Institute of Toulouse (INPT). Since 2003, he is full Professor at the National School of engineers at Tarbes (France). His topics of scientific interest concern the real-time decision support systems and more particularly the supervision and control accommodation (by reconfiguration or restructuration) allowing a safety exploitation of large scale complex systems. He leads the group D3 on Distributed Dynamical Decision (13 researchers). He proposes methods and tools to design new reactive control strategies. He is general coordinator of a french-spanish project PREGO (2009-2010) on predictive management of water resource. Since 2005, he is member of IFAC TC 5.4 Large Scale Complex System. He is also member of the International Water Association (Instrument Control & Automation group).

Control of Integrated Quality and Quantity in DWDS

Wojciech Kurek
Gdańsk Univeristy of Technology

Abstract:
The integrated control of quality and quantity in drinking water distribution systems is a problem of an increasing importance in the control of Critical Infrastructure Systems. The main concern is that quality and quantity cannot be considered separately, as flows of water influence the distribution and decay of disinfectants, therefore affect the quality of water in the network. The control problem gets even more complicated when we consider that the quality and quantity have different timescales in their internal dynamics. Moreover, whereas the hydraulic values like pressure and flows can be quite easily estimated based on the measurements in the network such as level of the tanks and pressure at the pumping stations, the estimation of quality across the network is still a big challenge. A viable control mechanism adequate for this complex and important problem is model predictive control, coupled with a newly developed quality interval estimator, that is crucial in order to estimate the unmeasurable quality state in the drinking water distribution system. This control problem is solved using a highly dedicated genetic algorithm tailored for this application in order to allow for an on-line efficient solving the predictive optimization task. Furthermore, a new approach based on a multiobjective model predictive control will be shown as a more appropriate way of tackling the control objectives.

Biography:
Wojciech Kurek received the M.Sc. degree in control engineering in 2005 from the Gdańsk University of Technology, Gdańsk, Poland, where he is currently working as an Assistant Professor in the Department of Control Systems Engineering. His research addressed issues of designing the allocation of secondary booster station within a drinking water distribution system and their control. Moreover, recent work is mainly focused on multiobjective model predictive control and its application to integrated water quality and quantity control and general multiobjective genetic optimization issues as well as decision support.

Real-Time Detection of Pipe Bursts in Water Distribution Systems

Zoran Kapelan
University of Exeter, United Kingdom

Abstract:
Detection of pipe bursts and associated leaks in water distribution systems is an important issue for several reasons. Not only is the loss of treated and frequently pumped water a waste of a valuable resource, money and energy, but it is also a potential health risk, due to possible contaminant intrusion from the nearby polluted groundwater/soil. The new Artificial Intelligence based system was recently developed with the aim to effectively and efficiently detect and locate pipe bursts as they occur by using the real-time pressure/flow sensor information. The detection system enables water companies to react more quickly to burst events thus saving water that would normally be lost, reducing the potential damage to the infrastructure and most importantly, improving the customer service by minimising the interruptions to water supply. The burst detection system has been tested and verified on historical real-life data from a number of DMAs in two UK water companies. The results obtained demonstrate the clear ability of the system to successfully detect a wide range of bursts in both timely and reliable manner. The above detection system has been recently patented and is currently being trialled on live data in a large UK water company.

Biography:
Prof. Zoran Kapelan is an Associate Professor in water infrastructure engineering in the Centre for Water Systems at the University of Exeter. He has over 20 years of research and consulting experience in various water engineering disciplines, both in the UK and abroad.
His research interests include the development of real-time management systems, risk and uncertainty based decision support systems, various modelling and optimisation techniques for the sustainable asset and other management of urban water infrastructure systems.
Prof. Kapelan is currently an RCUK Academic Fellow and an investigator on a number of EPSRC, EU and KTP projects. He is a member of the EWRI Innovative Technologies Task Committee, IWA Water Loss Task Force and the IWA Strategic Asset Management Specialist Group. He currently serves as an Associate Editor for the Journal of Water Resources Planning and Management (ASCE) and has (co)authored over 100 publications. Further information is available at www.people.ex.ac.uk/zkapelan.

Security and Decontamination of Drinking Water Distribution Systems following a Deliberate Contamination, FP7 Project SECUREAU

Talis Juhna
Riga Technical University

Abstract:
Vulnerability of drinking water distribution systems to deliberate attacks, which would have major health, economic and psychosocial consequences is one of the main issues of concern to regulatory agencies, and water utilities. Such a network appears very vulnerable and easy to contaminate though reservoirs, back-flow etc. The main objective of the SECUREAU project is to limit the impact on the population of safe water privation because of contaminated networks, and to launch an appropriate response for rapid restoring the use of the network after a deliberate contamination. Questions that is addressed for successful coordinated response of water utilities and regulatory agencies to contamination include: detection of unexpected changes in water quality which could be in relation to with deliberate contamination event, adaptation of known analytical methods to rapidly detect specific chemical, biological, radiological or nuclear contaminants in water and in biofilm, localization of the point sources of contamination and subsequently the contaminated area allowing delimitation of the corrective actions, decontamination procedures (efficient and realistic) on the distribution system, and controlling the efficacy of the corrective actions by analyzing the water bulk and especially the pipe walls and the deposits. Case studies will give a chance for the practitioners to apply on site in real conditions the selected sensors, methods, and remediation technologies. The emergency procedures will be tested on a complicated, inaccessible, and relatively fragile system with the challenge to apply the corrective treatments to the huge water bulk generated by the neutralization/extraction of the contaminants. The project has started in 2009 and its duration is four years. The consortium includes 14 partners from six countries.

Biography:
Talis Juhna is the Professor at the Department of Water Engineering and Technology, Riga Technical University (Latvia). His background is in drinking water engineering and treatment. Now his research group is specializing on application of molecular methods and mathematical modeling for elucidation the fate of bacteria, including pathogens, in water distribution networks. In Secureau he is leading the workpackage which is dealing with development of techniques for decontamination of the networks.