ΠΡΟΣΚΛΗΣΗ

Το Ερευνητικό Κέντρο Τεχνολογίας Ευφυών Συστημάτων
και Δικτύων «Κοίος» του Πανεπιστημίου Κύπρου
σας προσκαλεί στο
Εργαστήρι "2nd KIOS Workshop",
που θα διεξαχθεί
την Δευτέρα, **9 Απριλίου 2012** και ώρα 9:00πμ
στην αίθουσα διαλέξεων 010,
του κτηρίου Κοινωνικών Δραστηριοτήτων,
στην Πανεπιστημιούπολη.

Ομιλητές

- Prof. Christos G. Cassandras
  Center for Information and Systems Engineering (CISE)
  Boston University

- Prof. Sergios Theodoridis
  Department of Informatics and Telecommunications
  National and Kapodistrian University of Athens

- Prof. Andreas Spanias
  SenSIP Center
  Arizona State University

**Οι εργασίες του Εργαστηρίου θα ολοκληρωθούν με παρουσίαση
Ερευνητικών Εργασιών (Poster Session).**

Το τελικό πρόγραμμα είναι αναρτημένο στην ιστοσελίδα:
http://www.kios.ucy.ac.cy/images/Documents/Events/Second_KIOS_Workshop.pdf

Π.Α. Μέχρι την Πέμπτη, 5 Απριλίου 2012
Τηλ. 22-893450/51
Email: dpetrou@ucy.ac.cy

Program "2nd KIOS Workshop"

Time	Session
09:00 – 09:20	**Marios Polycarpou, University of Cyprus** Welcome, Intro to KIOS Research Center
09:20 – 10:10	**Christos G. Cassandras , Boston University** "An Optimal Control Approach for Cooperative Persistent Search Problems"
10:10 – 10:30	**Christos G. Cassandras , Boston University** "Smart Parking": An Optimal Parking Assignment and Reservation System
10:30 – 11:00	Coffee Break
11:00 – 12:00	**Andreas Spanias, Arizona State University** "Opportunities for Joint KIOS-SenSIP Research in Sensor Networks and Signal Processing"
12:00 – 13:00	**Sergios Theodoridis, National and Kapodistrian University of Athens** "Adaptive Learning in a World of Projections"
13:00 – 14:30	Lunch
14:30 – 17:00	Poster Session

POSTER SESSION

Title/Author
"Enhancement of Hybrid State Estimation Using Pseudo Flow Measurements" *Markos Asprou, Elias Kyriakides*
"Dispatching isolated power systems with high share of wind power: an introspection through a real case study" *Irina Ciornei, Elias Kyriakides*
"Short Term Electricity Load Forecasting" *Yiannis Tofis, Elias Kyriakides*
"A New Hybrid PLL for Interconnecting Renewable Energy Systems to the Grid" *Lenos Hadjidemetriou, Frede Blaabjerg and Elias Kyriakides*
"Towards optimal CMOS lifetime via unified reliability modeling and multi-objective optimization" *A. Papadopoulos, T. Theocharides, M.K. Michael*
"Lateral resolution improvement in oversampled Optical Coherence Tomography images assuming weighted multi-scatterer contributions" *Evgenia Bousi and Costas Pitris*
"Investigation of a new nanostructure with distinct absorption and scattering for combined diagnostic and therapeutic applications" *Myria Angelidou and Costas Pitris*
"Complete urinary tract infection (UTI) diagnosis and antibiogram using surface enhanced Raman spectroscopy (SERS)" *Katerina Hadjigeorgiou, Evdokia Kastanos, Alexandros Kyriakides, Costas Pitris*
"Isolated Word Endpoint Detection Using Time-Frequency Variance Kernels" *Alexandros Kyriakides, Costas Pitris and Andreas Spanias*
"Converged Optical Wireless Access Network Architectures" *C.Christodoulou and G.Ellinas*
"Multicast Traffic Grooming in Transparent Optical Networks" *T. Panayiotou, G. Ellinas, and N. Antoniades*
"Converged Network and Device Management for Data Offloading" *Antonis M. Hadjiantonis, Georgios Ellinas*
"Distributed Sensor Fault Detection and Isolation of Nonlinear Dynamic Systems" *Vasso Reppa, Marios Polycarpou, Christos Panayiotou*
"Intelligent Water Systems Protection and Management" *Demetrios Eliades, Marios Polycarpou*
"Intelligent Irrigation Systems Using Wireless Sensor Technology" *Antonis Karayiannis, Michalis Michaelides and Christos Panayiotou*
"Semantic Mediation in Feedback Control Systems" *G. Milis, C. Panayiotou and M. Polycarpou*
"Multiscale Mathematical Modelling of Tumor Growth" *Achilleas Achilleos, Charalambos Loizides, Marios Hadjiandreou, Gizem Rizki, Katerina Strati, Triantafyllos Stylianopoulos, Georgios D. Mitsis*
"Model-based strategies for cancer chemotherapy with drug-resistance" *Marios M. Hadjiandreou and Georgios D. Mitsis*

Title/Author
"Investigation of brain dynamics from EEG measurements in patients with epilepsy using graph-theoretic approaches" *Manolis Christodoulakis, Maria Anastasiadou, Eleftherios Papathanasiou, Savvas Papacostas and Georgios D. Mitsis*
"Identification of the regional variability of the brain hemodynamic response to spontaneous and step-induced CO2 changes using functional expansions" *Prokopis C. Prokopiou, Kyle T.S. Pattinson, Richard G. Wise, Georgios D. Mitsis*
"Toward Selective Software-Based Self-Testing in Future Multi-Core Microprocessors" *Michael A. Skitsas, Chrysostomos A. Nicopoulos and Maria K. Michael*
"Monitoring awareness during anaesthesia" *Nicoletta Nicolaou, Julius Georgiou*
"Pattern Extraction On Human Gait Using Micro-Doppler Sonar" *Guillaume Garreau, Charalambos Andreou, Nicoletta Nicolaou, Guillermo Stuarts and Julius Georgiou*
"Robot Localization and Tracking for Simple Robots" *Demetris Stavrou and Christos Panayiotou*
"A Platform for the Evaluation of Fingerprint Positioning Algorithms on Android Smartphones" *C. Laoudias, G. Constantinou, M. Constantinides, S. Nicolaou, D. Zeinalipour-Yazti and C. G. Panayiotou*
"An HMM-based change detection method for intelligent embedded sensors" *Cesare Alippi, Stavros Ntalampiras and Manuel Roveri*
"Security constrained reserve scheduling for power systems with high wind penetration" *K.Margellos, M.Vrakopoulou, J.Lygeros, G.Andersson*
"Collaborative target search and coverage in mixed sensor networks" *Theofanis Lambrou and Christos Panayiotou*
"FireAlert: Obstacle detection system under power transmission lines" *Constantinos Heracleous and Christos Panayiotou*
"Contaminant Transport Simulation in Smart Buildings using CONTAM & Matlab" *M. Christodoulou, M. Michaelides and C.G. Panayiotou*
"The Evolution of Smart Homes: Towards the WEB" *Andreas Kamilaris and Andreas Pitsillides*
"Alternative-Path creation for Congestion Control in Wireless Sensor Networks" *Charalambos Sergiou and Vasos Vassiliou*
"Energy-hole Prevention in Wireless Sensor Networks" *Charalambos Sergiou and Vasos Vassiliou*
"Mobile-CC: Congestion Mitigation Using Mobile Nodes in WSNs" *Marios Koutroullos, Charalambos Sergiou and Vasos Vassiliou*
"Mobility Management in WSNs using Fuzzy Logic" *Zinon Zinonos, Chrysostomos Chrysostomou and Vasos Vassiliou*
"SenSIP Collaborative Research" *A. Spanias and SenSIP partners*
"Equalizing DC Capacitor Voltages in Multimodule HVDC Using SHE-PWM" *Nikolas Flourentzou*

ABSTRACTS AND BIOGRAPHIES

AN OPTIMAL CONTROL APPROACH FOR
COOPERATIVE PERSISTENT SEARCH PROBLEMS

Christos G. Cassandras

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ABSTRACT

In persistent search (also referred to as "persistent monitoring" and "persistent surveillance") problems, the objective is to control the movement of multiple cooperating agents that have limited sensing capabilities so as to minimize an uncertainty metric in a given mission space over some given mission time. In a one-dimensional mission space, we show that the optimal solution is a set of "oscillators" where each agent moves at maximal speed from one switching point to the next, possibly waiting some time at each point before reversing its direction. Thus, the solution is reduced to a simpler parametric optimization problem: determining a sequence of switching locations and associated waiting times at these switching points for each agent. This amounts to a hybrid dynamic system which we analyze using Infinitesimal Perturbation Analysis (IPA) to obtain on-line gradients of the uncertainty metric with respect to the decision variables, i.e., the switching point locations and associated waiting times. Using this information, we obtain a complete on-line solution through a gradient-based algorithm. An unusual feature of this algorithm is that the dimensionality of the parameter vector is a priori unknown and must be determined along with the actual values of the decision variables. Exploiting previously established robustness properties of IPA gradients, we also show that the solution we obtain is independent of the uncertainty model used. This implies that the same approach can be used in a setting where the uncertainty model is stochastic with unknown characterization. This work establishes the basis for extending the approach to a two-dimensional mission space by decomposing it into regions and using the one-dimensional optimal solution within each such region.

"SMART PARKING":
AN OPTIMAL PARKING ASSIGNMENT AND RESERVATION SYSTEM

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ABSTRACT

We present a new "smart parking" system for an urban environment. The system assigns and reserves an optimal resource (parking space) for a user (driver) based on an objective function that combines proximity to destination and parking cost, while also ensuring that the overall parking capacity is efficiently utilized. Our approach solves a Mixed Integer Linear Program (MILP) problem at each decision point in a time-driven sequence. The solution of each MILP is an optimal allocation based on current state information and subject to random events such as new user requests or parking spaces becoming available. The allocation is updated with a guarantee that there is no resource reservation conflict and that no user's cost is ever higher than under his current assignment. We will describe an implementation of this system at a Boston University parking facility based on a driver request entered through a smartphone app. Standard GPS technology guides the driver to the optimal reserved space. A wireless sensor network is used to detect parking space availability, proximity of a vehicle to a space this vehicle has reserved, and reservation implementation using a simple four-state light system at each space. Besides the obvious convenience to drivers, the system reduces traffic, as well as fuel consumption and pollution, while increasing overall parking space utilization and, therefore, municipal revenue.

BIOSKETCH of **Christos G. Cassandras**

Christos G. Cassandras is Head of the Division of Systems Engineering and Professor of Electrical and Computer Engineering at Boston University. He is also co-founder of Boston University's Center for Information and Systems Engineering (CISE). He received degrees from Yale University (B.S., 1977), Stanford University (M.S.E.E., 1978), and Harvard University (S.M., 1979; Ph.D., 1982). In 1982-84 he was with ITP Boston, Inc. where he worked on the design of automated manufacturing systems. In 1984-1996 he was a faculty member at the Department of Electrical and Computer Engineering, University of Massachusetts/Amherst. He specializes in the areas of discrete event and hybrid systems, stochastic optimization, and computer simulation, with applications to computer and sensor networks, manufacturing systems, and transportation systems. He has published over 300 refereed papers in these areas, and five books. He has guest-edited several technical journal issues and serves on several journal Editorial Boards. He has recently collaborated with The MathWorks, Inc. in the development of the discrete event and hybrid system simulator SimEvents.

Dr. Cassandras was Editor-in-Chief of the *IEEE Transactions on Automatic Control* from 1998 through 2009 and has also served as Editor for Technical Notes and Correspondence and Associate Editor. He is the 2012 President of the IEEE Control Systems Society (CSS) and has served as Vice President for Publications and on the Board of Governors of the CSS. He has chaired the CSS Technical Committee on Control Theory, and served as Chair of several conferences. He has been a plenary speaker at many international conferences, including the *American Control Conference* in 2001 and the *IEEE Conference on Decision and Control* in 2002, and an IEEE Distinguished Lecturer.

He is the recipient of several awards, including the 2011 IEEE Control Systems Technology Award, the Distinguished Member Award of the IEEE Control Systems Society (2006), the 1999 Harold Chestnut Prize (IFAC Best Control Engineering Textbook) for *Discrete Event Systems: Modeling and Performance Analysis*, a 2011 prize for the IBM/IEEE Smarter Planet Challenge competition, a 1991 Lilly Fellowship and a 2012 Kern Fellowship. He is a member of Phi Beta Kappa and Tau Beta Pi. He is also a Fellow of the IEEE and a Fellow of the IFAC.

OPPORTUNITIES FOR JOINT KIOS-SenSIP RESEARCH IN SENSOR NETWORKS AND SIGNAL PROCESSING

Andreas Spanias

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ABSTRACT

In the last KIOS workshop, we presented research results from the Sensor Signal and Information Processing (SenSIP) Center.
In this brief presentation, we will cover potential topics for research in Sensor Networks and Signal Processing and pose problems for joint SenSIP-KIOS proposals and publications. The seminar will provide information for faculty and student workshop participants about SenSIP capabilities and on select results in sensor systems. Our aim is to draw connections to KIOS capabilities and projects. We hope that the seminar will be followed by a discussion on Tuesday whose aim will be to identify joint areas of research that will lead to joint proposals, publications, and co-advised theses/dissertations. Specific areas covered will be: audio sensing and processing, DSP for chemical and nanopore sensors, sensors and signal processing for renewable energy applications

BIOSKETCH of **Andreas Spanias**

Andreas Spanias is Professor in the School of Electrical, Computer, and Energy Engineering at Arizona State University (ASU). He is also the founder and director of the NSF SenSIP Center and I/UCRC. His research interests are in the areas of adaptive signal processing, speech processing, and audio sensing. He and his student team developed the computer simulation software Java-DSP (J-DSP - ISBN 0-9724984-0-0). He is author of two text books: Audio Processing and Coding by Wiley and DSP; An Interactive Approach. He served as Associate Editor of the IEEE Transactions on Signal Processing and as General Co-chair of IEEE ICASSP-99. He also served as the IEEE Signal Processing Vice-President for Conferences. Andreas Spanias is co-recipient of the 2002 IEEE Donald G. Fink paper prize award and was elected Fellow of the IEEE in 2003. He served as Distinguished lecturer for the IEEE Signal Processing society in 2004.

ADAPTIVE LEARNING IN A WORLD OF PROJECTIONS

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ABSTRACT

The task of parameter/function estimation has been at the center of scientific attention for a long time and it comes under different names such as filtering, prediction, beamforming, curve fitting, classification, regression.

In this talk, the estimation task is treated in the context of set theoretic estimation arguments. Instead of a single optimal point, we are searching for a set of solutions that are in *agreement* with the available information, which is provided to us in the form of a set of training points and a set of constraints. Each point in the training data set, as well as each one of the constraints, is associated with a convex set, constructed according to a (convex) loss function (differentiable or not).

The goal of this talk is to present a *general* tool for parameter/function estimation, under a set of convex constraints, both for classification as well as regression tasks, in a time adaptive setting in (infinite dimensional) Reproducing Kernel Hilbert spaces (RKHS)..

The algorithmic scheme consists of a sequence of projections, of *linear complexity* with respect to the number of unknown parameters. Our theory proves that such a scheme converges to the intersection of all (with the possible exception of a finite number of) the convex sets, where the required solution lies. The performance of the methodology is demonstrated in the context of nonlinear classification and constrained sparsity-aware learning.

The work has been carried out in cooperation with Kostas Slavakis and Isao Yamada.

BIOSKETCH of **Sergios Theodoridis**

Sergios Theodoridis is currently Professor of Signal Processing and Communications in the Department of Informatics and Telecommunications at the National and Kapodistrian University of Athens. His research interests lie in the areas of Adaptive Algorithms and Communications, Machine Learning and Pattern Recognition, Signal Processing for Audio Processing and Retrieval. He is the co-editor of the book "Efficient Algorithms for Signal Processing and System Identification", Prentice Hall 1993, the co-author of the book "Pattern Recognition", Academic Press, 4th Ed. 2009, co-author of the book "Introduction to Pattern Recognition: A MATLAB approach", Academic Press, 2010, and the co-author of three books in Greek, two of them for the Greek Open University.

He is the co-author of six papers that have received best paper awards, including the IEEE Computational Intelligence Society Transactions on Neural Networks Outstanding Paper Award. He currently serves as Distinguished Lecturer of the IEEE Signal Processing Society.

He has served as President of the European Association for Signal Processing (EURASIP) and he is currently a member of the Board of Governors for the IEEE Circuits and Systems (CAS) Society. He was the general chairman of EUSIPCO-98, the Technical Programme co-chairman of ISCAS-2006 and the Co-chairman of CIP-2008. He has served as an Associate Editor in all major Signal Processing related journals, including IEEE Transactions on Signal Processing, IEEE Signal Processing Magazine, IEEE

Transactions on Neural networks, IEEE Transactions on Circuits and Systems, Signal Processing. He is currently the Editor-in-Chief of the EURASIP Signal Processing book series of Academic Press.

He was a member of the Greek National Council for Research and Technology and Chairman of the SP advisory committee for the Edinburgh Research Partnership (ERP). He has served as vice chairman of the Greek Pedagogical Institute and he was for four years member of the Board of Directors of COSMOTE (the Greek mobile phone operating company). He is Fellow of IET, a Corresponding Fellow of RSE and a Fellow of IEEE.