CT13 Program

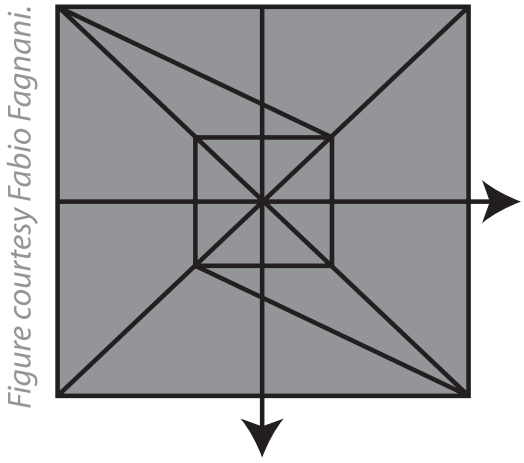

Figure courtesy Fabio Fagnani.

SIAM Conference on

CONTROL & Its APPLICATIONS

July 8-10, 2013

Town and Country Resort & Convention Center

San Diego, California USA

Sunday, July 7

Registration
7:00 AM-8:00 PM

Room:Atlas Foyer

SIAM Workshop on Network Science (July 7-8, 2013 -- separate fees apply)
8:00 AM-5:00 PM

Room:Sunrise

Sunday, July 7

Student Orientation
5:00 PM-6:00 PM

Room:Tiki Pavilion

Welcome Reception


6:00 PM-8:00 PM

Room:Grand Plaza Fountain Court

Monday, July 8

Registration
7:30 AM-4:30 PM

Room:Atlas Foyer

Opening Remarks
8:15 AM-8:30 AM

Room:San Diego

IC1
Simplicial Nonlinear Principal Component Analysis *
8:30 AM-9:15 AM

Room:San Diego

Chair: William M. McEneaney, University of California, San Diego, USA

We present a new manifold learning algorithm that takes a set of data points lying on or near a lower dimensional manifold as input, possibly with noise, and outputs a simplicial complex that is the data and the manifold. We have implemented the algorithm in the case where the input data is on a two dimensional manifold in R3 and can be triangulated. We provide triangulations of data sets that fall on the surface of a torus, sphere, swiss roll, and creased sheet. We also discuss the theoretical justication of our algorithm.

Arthur J. Krener
Naval Postgraduate School, USA

Co-author: Thomas Hunt
Naval Postgraduate School, USA

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* This presentation is included in the proceedings

Monday, July 8

IC2

Fast Distributed Optimization Methods over Networks

9:15 AM-10:00 AM

Room:San Diego

Chair: Qing Zhang, University of Georgia, USA

The standard approach for designing distributed algorithms for optimization problems over networks rely on (sub)-gradient methods, but suffers from slow rate of convergence. In this talk, we present new distributed optimization algorithms with much faster rate of convergence. We first provide a completely asynchronous, distributed, and fast algorithm based on Alternating Direction Method of Multipliers for solving coupled convex optimization problems over networks. We then focus on a structured version of this problem where the local objective functions take an additive form with a differentiable and a nondifferentiable component and develop a distributed proximal gradient method.

Asu Ozdaglar
Massachusetts Institute of Technology, USA

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Golden West/California

Coffee Break

10:00 AM-10:30 AM

Room:Golden West/California

Monday, July 8

MS1

Control of Partial Differential Equations

10:30 AM-12:30 PM

Room:Hampton

This minisymposium focuses on recent advances in control of systems with partial differential equation (PDE) models. The speakers will discuss controllability, stabilization, and asymptotic long-time behavior for models arising in a number of applications related to fluid flow, waves and structures. Of particular interest is the interplay between physical modeling and control properties, including the effect of nonlinearities.

Organizer: Kirsten Morris
University of Waterloo, Canada

Organizer: Ahmet Ozkan Ozer
University of Waterloo, Canada

10:30-10:55 Stabilizability of Piezoelectric Beams with Magnetic Effects
Ahmet Ozkan Ozer and Kirsten Morris, University of Waterloo, Canada

11:00-11:25 Stabilization of Wave PDE/nonlinear ODE Cascades
Nikolaos Bekiaris-Liberis and Miroslav Krstic, University of California, San Diego, USA

11:30-11:55 A Control Theoretic Approach to Low Reynolds Number Swimming
Marius Tucsnak, Université de Lorraine, France; Jorge San Martin, University of Chile, Chile; Takeo Takahshi, INRIA, France

12:00-12:25 Finite Dimensional Attractors in Flow-Structure Interactions
Irena M. Lasiecka and *Justin Webster*, University of Virginia, USA

Monday, July 8

MS2

Discrete Approximations and Optimality Conditions in Optimal Control

10:30 AM-1:00 PM

Room:Sheffield

The minisymposium includes five talks which will be given by well-known experts in the area. In the first talk B. S. Mordukhovich derives necessary optimality conditions for the new class of optimal control problems of the sweeping (Moreau) process. In the second talk M. Gerdts considers convergence properties of discretized optimal control problems with ordinary differential equations. In the third talk C. Marcelli discuses an a-priori monotonicity property of minimizers of one-dimensional variational problems. In the fourth talk M. R. de Pinho reports on necessary optimality conditions for some control systems. In the last talk G. N. Silva uses the Euler discretization method in his study of impulsive optimal control problems.

Organizer: Boris Mordukhovich
Wayne State University, USA

10:30-10:55 Optimal Control of the Sweeping Process Generated by Moving Convex Polyhedra
Boris Mordukhovich, Wayne State University, USA

11:00-11:25 Convergence Analysis for Discretized Control-State Constrained Optimal Control Problems with Controls of Bounded Variation
Matthias Gerdts, Universität der Bundeswehr München, Germany; Martin Kunkel, Elektrobit Automotive GmbH, Germany

11:30-11:55 A-priori Monotonicity Properties of Minimizers and Applications to existence Results for Non-coercive Variational Problems
Cristina Marcelli, Università Politecnica delle Marche, Italy

12:00-12:25 Properties of Control Systems with Mixed Constraints
Maria do Rosari de Pinho, Universidade do Porto, Portugal

12:30-12:55 Euler Discretization for Impulsive Optimal Control Problems
Geraldo N. Silva and Daniella Porto, Universidade Estadual Paulista, Brazil

Monday, July 8

MS3

Causal Algorithms for Optimal Control Problems - Part I of III

10:30 AM-12:30 PM

Room:Sunset

For Part 2 see MS20

Fast Marching and Ordered Upwind Methods are efficient (non-iterative) algorithms for solving discretizations of Hamilton-Jacobi PDEs arising in continuous optimal control problems. Their logic mirrors the classical Dijkstra's method for shortest path problems on graphs. In the discrete setting, Dijkstra's has been modified to restrict the computational domain (e.g., the A*-method) and to allow for dynamic replanning (e.g., the D*-type methods), while other related (label-correcting) algorithms were found more suitable for parallelization. This minisymposium focuses on challenges of extending these ideas to the continuous setting. We will also consider the computational cost implications of inhomogeniety, anisotropy, and time-dependence of the controlled dynamics.

Organizer: Ian M. Mitchell

University of British Columbia, Canada

Organizer: Alexander Vladimirsky

Cornell University, USA

10:30-10:55 Causality as a Source of Efficiency

Alexander Vladimirsky, Cornell University, USA

11:00-11:25 Approximating Non-Stationary Hamiltonians for Minimum-Time Problems in Dynamic Environments

Jason Durrie and Eric Frew, University of Colorado Boulder, USA

11:30-11:55 Efficient Methods for Finite-Horizon Optimal Control

Changxi Zheng, Columbia University, USA

12:00-12:25 Can Single-Pass Methods Solve Every Hamilton-Jacobi Equation?

Simone Cacace, Università di Roma "La Sapienza", Italy; Emiliano Cristiani, Istituto per le Applicazioni del Calcolo "Mauro Picone", Italy; *Maurizio Falcone*, Università di Roma "La Sapienza", Italy

Monday, July 8

MS4

Nonlinear Systems - Part I of II

10:30 AM-12:30 PM

Room:Brittany

For Part 2 see MS13

In this minisymposium, we review recent results on the analysis of nonlinear control systems

Organizer: Boumediene Hamzi

Imperial College London, United Kingdom

10:30-10:55 Control of Discrete-Time Nonlinear Systems with Long Non-Increasing Time-Varying Delays on the Input

Miroslav Krstic, University of California, San Diego, USA; *Joon-Young Choi*, Pusan National University, Busan (Pusan), Republic of Korea

11:00-11:25 Asymptotic Stabilization for Feedforward Systems with Delayed Feedbacks

Michael Malisoff, Louisiana State University, USA; Frederic Mazenc, INRIA, France

11:30-11:55 On Participation Factors for Nonlinear Systems

Eyad Abed, University of Maryland, College Park, USA; Boumediene Hamzi, Imperial College London, United Kingdom

12:00-12:25 Control of Fluid Flows in Channels

Lionel Rosier, Université de Lorraine, France; Vincent Perrollaz, University of Tours, France

Monday, July 8

MS5

Smooth and Discrete Geometrical Approaches to Control - Part I of II

10:30 AM-12:30 PM

Room:Eaton

For Part 2 see MS14

In this session we present various control settings that use geometrical techniques to approach problems in optimal control, discrete control and networked control systems. The session will contain a mixture of theoretical ideas and applications to specific systems. The techniques uses both smooth differential geometry as well as discrete geometry and discontinuous dynamics.

Organizer: Anthony M. Bloch

University of Michigan, USA

Organizer: Melvin Leok

University of California, San Diego, USA

Organizer: Dmitry Zenkov

North Carolina State University, USA

10:30-10:55 Optimal Control of Discrete Systems

Anthony M. Bloch, University of Michigan, USA; Peter Crouch and Nikolaj Nordkvist, University of Hawaii, USA

11:00-11:25 Distributed Line Search Algorithms for Multi-Agent Systems

Jorge Cortes and Sonia Martinez, University of California, San Diego, USA

11:30-11:55 The Standard Parts Problem and Quantization in Optimal Control Problems

John B. Baillieul and *Zhaodan Kong*, Boston University, USA

12:00-12:25 Controlled Lagrangians and Stabilization of Discrete Spacecraft with Rotor

Dmitry Zenkov, North Carolina State University, USA; Yuanyuan Peng, Claflin University, USA; Syrena Huynh, North Carolina State University, USA; Anthony M. Bloch, University of Michigan, USA

Monday, July 8

MS6

Challenges in Electricity Smart Grids of the Future

10:30 AM-12:30 PM

Room:Towne

The ever increasing diffusion of renewables in electricity systems asks for more and more responsive and resilient power delivery systems. The design of intelligent, self-healing networks allowing for intensive data flow among system components, system operators, generators, market traders, retailers and consumers is the main challenge for the information, communication and control communities. The minisymposium highlights the main challenges related to the integration of renewables in the network and the `active demand' paradigm recently developed, both for facilitating the integration of renewables and allowing energy savings through optimal scheduling of domestic as well as small commercial or industrial loads.

Organizer: Antonio Vicino

Università di Siena, Italy

10:30-10:55 Challenges in Electricity Smart Grids of the Future

Pravin Varaiya, University of California, Berkeley, USA

11:00-11:25 Efficiency and Risk Tradeoffs in the Smart Grid

Munther Dahleh, Massachusetts Institute of Technology, USA

11:30-11:55 Opportunities and Challenges in Smart Grid Controls

Pramod Khargonekar, University of Florida, USA

12:00-12:25 Integration of Active Demand in Electricity Distribution Grids

Antonio Vicino and Simone Paoletti, Università di Siena, Italy

Monday, July 8

MS7

Stochastic Systems and Applications - Part I of II

10:30 AM-12:30 PM

Room:Stratford

For Part 2 see MS24

The purpose of this minisymposium is to bring together experts and young researchers to present state-of-the-art results and to identify open problems and future research directions. Motivated by many applications, a unifying theme of this session is the stochastic systems theory. The first part of the minisymposium will cover some important issues including ergodic controls, singular and impulsive controls, zero-sum games, and numerical solutions to stochastic differential equations. The following is a list of confirmed speakers and talks to be presented.

Organizer: Son L. Nguyen

University of Puerto Rico, Puerto Rico

Organizer: George Yin

Wayne State University, USA

10:30-10:55 Optimal Ergodic Control with Minimum Variance

Onesimo Hernandez-Lerma and Hector Jasso-Fuentes, CINVESTAV-IPN, Mexico City, Mexico

11:00-11:25 Some New Perspectives About Certain Singular Control Problems

Qingshuo Song, City University of Hong Kong, Hong Kong; *Chao Zhu*, University of Wisconsin, Milwaukee, USA

11:30-11:55 Zero-Sum Game Between a Controller and a Discretionary Stopper

Daniel Hernandez-Hernandez, Centro de Investigacion en Matematicas, Mexico

12:00-12:25 Pathwise Convergence Rates for Numerical Solutions of Markovian Switching Stochastic Differential Equations

Son L. Nguyen, University of Puerto Rico, Puerto Rico; George Yin, Wayne State University, USA

Monday, July 8

MS8

Analysis of Biological Digester Systems (BIODIS)

10:30 AM-12:30 PM

Room:Dover

This minisymposium aims to study the dynamic properties of biological digesters models such as encountered in the field of nutrition (digestive system) and in environmental processes (wastewater treatment) via the use of new tools for analysis and model reduction. The type of proposed reduction should maintain a strong physical character, as well as various properties of importance in systems theory. The studied models are typically nonlinear, finite or infinite dimension (i.e. distributed parameter and/or delay ones). The studied microbial ecology systems raise various questions on the performance of ecosystems (the role of biodiversity spatial distribution being still poorly understood).

Organizer: Hugues Mounier

Laboratoire des Signaux et Systèmes , France

10:30-10:55 Introduction to Biological Reactor Models with a View on Differential Flatness Properties

Denis Dochain, CESAME, Universite Catholique de Louvain, Belgium; Béatrice Laroche, Université Paris-Sud, France; Hugues Mounier, Laboratoire des Signaux et Systèmes, France; Alain Rapaport, INRA, France

11:00-11:25 Stabilization of the Chemostat with Delayed Sampled Measurements

Jerome Harmand, INRA, France; Frederic Mazenc, INRIA, France

11:30-11:55 Chemostat Stabilisation Through Delayed Buffering

Alain Rapaport, INRA, France

12:00-12:25 Interval Observers with Delays for Biological Reactors

Frederic Mazenc, INRIA, France; *Silviu-Iulian Niculescu*, Laboratoire des Signaux et Systèmes, France

Monday, July 8

MS9

Marine Robotic Controls

10:30 AM-12:30 PM

Room:Ascot

The design and control of marine robots is a challenging problem with many important applications, such as the detection of pollutants from oil spills, determining the dynamics of waves, and monitoring the growth of algae or plankton. This minisymposium will present recent advances for surface and underwater marine robotic controls. The speakers are from four different research groups. The topics include modeling and control of gliding robotic fish, algorithms for estimating time-varying flow fields running on Lagrangian drifters, aquatic locomotion via biomimetic vortex shedding, and a robust forward invariance method for adaptive curve tracking and delay compensation.

Organizer: Michael Malisoff
Louisiana State University, USA

Organizer: Xiaobo Tan
Michigan State University, USA

10:30-10:55 Gliding Robotic Fish: A Highly Maneuverable and Energy-Efficient Platform for Aquatic Sensing
Feitian Zhang and Xiaobo Tan, Michigan State University, USA

11:00-11:25 Distributed Estimation of Ocean Internal Waves Via Relative Sensing
Michael Ouimet and Jorge Cortes, University of California, San Diego, USA

11:30-11:55 Robustness of Adaptive Control under Time Delays for Three-Dimensional Curve Tracking
Fumin Zhang, Georgia Institute of Technology, USA; Michael Malisoff, Louisiana State University, USA

12:00-12:25 Reduced-Order Modeling and Control of Aquatic Vehicles Exploiting Biomimetic Vortex Shedding
Scott D. Kelly, University of North Carolina, Charlotte, USA

Monday, July 8

CP1

Sparsity and Matrix Operations for Control Systems

10:30 AM-12:30 PM

Room:Clarendon

Chair: Tryphon Georgiou, University of Minnesota, USA

10:30-10:55 The Wasserstein Metric for Factor Analysis *
Lipeng Ning and *Tryphon Georgiou*, University of Minnesota, USA

11:00-11:25 Sparse Matrices and Decentralized Control: Theory and Algorithm
Mohamed Ali Belabbas, University of Illinois, USA

11:30-11:55 State of the Art Hifoo: H-Infinity Controller Optimization for Large and Sparse Systems
Tim Mitchell and Michael L. Overton, Courant Institute of Mathematical Sciences, New York University, USA

12:00-12:25 An All-at-Once Multigrid Method Applied to a Stokes Control Problem
Stefan Takacs, University of Oxford, United Kingdom

* This presentation is included in the proceedings

Monday, July 8

CP2

Math of Planet Earth: Energy, Irrigation, and Life Sciences

10:30 AM-12:00 PM

Room:Fairfield

Chair: Antonello Giannitrapani, Università di Siena, Italy

10:30-10:55 Optimal Bidding Strategies for Wind Power Producers with Meteorological Forecasts *
Antonio Vicino, *Antonio Giannitrapani*, Simone Paoletti, and Donato Zarrilli, Università di Siena, Italy

11:00-11:25 Optimal Control of Crop Irrigation Based on the Hamilton-Jacobi-Bellman Equation *
Paul-Henry Cournède, Yuting Chen, and Jacques Ramanathan, Ecole Centrale Paris, France

11:30-11:55 A Chaotic Model for Bird Flocking
Jorge Diaz-Castro, University of Puerto Rico, Puerto Rico

* This presentation is included in the proceedings

Monday, July 8

CP3

Control System Applications I

10:30 AM-12:30 PM

Room:Esquire

Chair: Mustafa A. Arat, Virginia Tech, USA

10:30-10:55 Adaptive Nonlinear Control for Electromagnetic Actuators *

Mouhacine Benosman, MERL, USA; Gokhan Atinc, University of Illinois at Urbana-Champaign, USA

11:00-11:25 Development and Improvement of Active Vehicle Safety Systems by Means of Smart Tire Technology

Mustafa A. Arat, Virginia Tech, USA

11:30-11:55 Reduced Order Observer Design for Structure and Motion Estimation *

Hui Xie, Romeo Fomena, and Alan Lynch, University of Alberta, Canada

12:00-12:25 A Passivity-Based Trajectory Tracking Controller for Robot Manipulators With Velocity Constraints

Ollin Peñaloza-Mejia, Luis Alejandro Marquez-Martinez, and Joaquin Alvarez-Gallegos, CICESE, Mexico

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

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* This presentation is included in the proceedings

Monday, July 8

JP1

Applied and Computational Mathematics for Energy Efficient Systems

2:00 PM-2:45 PM

Room:Town & Country

Chair: Fariba Fahroo, Air Force Office of Scientific Research, USA

Recent advances in the development of sustainable energy sources have led to an emphasis on energy-supply technologies and the corresponding mathematical sciences needed for these technologies. However, energy efficient end-use technologies may also be viewed as an energy resource. Since buildings are responsible for 32% of energy consumption and for 26% of end-use C02 emissions, optimizing the efficiency of a whole building system is a "grand challenge control" problem with huge payoffs in the global energy sector. We discuss mathematical challenges and opportunities that occur in designing practical controllers for energy efficient buildings. Examples are presented to illustrate the ideas.

John A. Burns
Virginia Tech, USA

Monday, July 8

AWM-SIAM Sonia Kovalevsky Lecture:

Introduction to Radar Imaging

2:45 PM-3:30 PM

Room:Town & Country

Chair: Jill Pipher, Brown University, USA

Radar imaging is a technology that has been developed, very successfully, within the engineering community during the last 50 years. Radar systems on satellites now make beautiful images of regions of our earth and of other planets such as Venus. One of the key components of this impressive technology is mathematics, and many of the open problems are mathematical ones. This lecture will explain, from first principles, some of the basics of radar and the mathematics involved in producing high-resolution radar images.

Margaret Cheney
Colorado State University and Naval Postgraduate School, USA

Coffee Break

3:30 PM-4:00 PM

Room:Golden West/California

Monday, July 8

MS10

Optimization and Control of Systems Governed by Partial Differential Equations

4:00 PM-6:00 PM

Room:Hampton

The talks in this minisymposium deal with issues related to the optimization and optimal control of systems whose states are described by PDEs. All of the talks are motivated by actual applications including the optimal design of the next generation of solar cells and the optimal design and control of smart, and in particular, energy efficient, buildings. Special attention is paid to numerical and computational methods. Two of the talks are concerned with methods appropriate for systems involving unbounded input and/or output operators of the type that are frequently encountered when control actuation occurs on the boundary of the domain.

Organizer: Chunming Wang

University of Southern California, USA

Organizer: I. Gary Rosen

University of Southern California, USA

4:00-4:25 An Optimal Design Problem Involving Helmholtz Equation in Multi-Layered Materials

Chunming Wang and Rongjie Lai, University of Southern California, USA

4:30-4:55 Balanced POD Model Reduction Algorithms for Parabolic PDE Systems with Unbounded Input and Output Operators

John Singler, Missouri University of Science and Technology, USA; Weiwei Hu, University of Southern California, USA

5:00-5:25 Control of Pde Systems with Delayed Actuators

John A. Burns, Terry L. Herdman, and Lizette Zietsman, Virginia Tech, USA

5:30-5:55 Synchronizing Controllers for Second Order Distributed Parameter Systems

Fariba Fahroo, Air Force Office of Scientific Research, USA; *Michael A. Demetriou*, Worcester Polytechnic Institute, USA

Monday, July 8

MS11

Geometric Methods for PDEs: Modeling and Control

4:00 PM-6:00 PM

Room:Sheffield

The aim of this session is to present several control problems in which models based on PDEs arise: quantum systems, crowds, fluid dynamics. Presentations aim to show in several examples that geometric control methods (originally stated for finite-dimensional systems) can be efficiently adapted to the context of PDEs.

Organizer: Francesco Rossi

Aix-Marseille Université, France

Organizer: Ugo Boscain

CMAP, Ecole Polytechnique, France

4:00-4:25 Regularity Issues for the Control of the Bilinear Schrödinger Equation

Thomas Chambrion, Université de Lorraine, France

4:30-4:55 Stabilization of Nonlinear Systems Modeled by Partial Differential Equations: Some Tools and Some Open Problems

Jean-Michel Coron, Université Pierre et Marie Curie, France

5:00-5:25 Sparse Control of Social Dynamics for Large Groups

Benedetto Piccoli, Rutgers University, USA

5:30-5:55 Control of Multi-scale Models for Crowd Interaction

Francesco Rossi, Aix-Marseille Université, France

Monday, July 8

MS12

Qualitative and Quantitative Aspects of Optimal Control

4:00 PM-6:00 PM

Room:Sunset

The minisymposium includes four talks which will be given by well-known experts in the area. In the first talk I. Zelenko gives estimates for the number of conjugate points along extremals of quite general optimal control problems. In the second talk A. Kryazhimskiy discusses an approach to convexifying non-convex optimal control problems with integral objective functionals based on a probabilistic relaxation of the system. In the third talk Y. Ledyaev uses methods of harmonic analysis and optimal control to obtain formulas for analytical representation of solutions of algebraic matrix Riccati equations. In the last talk D. F. M. Torres presents optimal control strategies for reducing the number of active infected individuals with tuberculosis.

Organizer: Igor Zelenko

Texas A&M University, USA

4:00-4:25 Rauch and Bonnet-Myers Type Comparison Theorems for Optimal Control Problems

Igor Zelenko, Texas A&M University, USA

4:30-4:55 Equivalent Convexification in Optimal Control

Arkady Kryazhimskiy, International Institute for Applied Systems Analysis, Austria

5:00-5:25 Harmonic Analysis and Optimal Control: Analytic Representation of Solutions of Riccati Matrix Equations

Yuri S. Ledyaev, Western Michigan University, USA

5:30-5:55 Optimal Control Strategies for Reducing the Number of Active Infected Individuals with Tuberculosis *

Cristiana J. Silva, University of Aveiro, Portugal; Paula Rodrigues, Universidade Nova de Lisboa, Portugal; *Delfim F. M. Torres*, University of Aveiro, Portugal

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* This presentation is included in the proceedings

Monday, July 8

MS13

Nonlinear Systems - Part II of II

4:00 PM-5:30 PM

Room:Brittany

For Part 1 see MS4

In this minisymposium, we review recent results on the analysis of nonlinear control systems

Organizer: Boumediene Hamzi

Imperial College London, United Kingdom

4:00-4:25 Controllability and Conditionally Stationary Measures

Fritz Colonius, University of Augsburg, Germany

4:30-4:55 On Control and Random Dynamical Systems in Reproducing Kernel Hilbert Spaces

Boumediene Hamzi, Imperial College London, United Kingdom; Jake Bouvrie, Massachusetts Institute of Technology, USA

5:00-5:25 Junction Conditions for Hamilton-Jacobi-Bellman System on Multi-Domains

Zhiping Rao, ENSTA ParisTech, France; Antonio Siconolfi, Università La Sapienza, Rome, Italy; Hasnaa Zidani, ENSTA ParisTech, France

Monday, July 8

MS14

Smooth and Discrete Geometrical Approaches to Control - Part II of II

4:00 PM-6:00 PM

Room:Eaton

For Part 1 see MS5

In this session we present various control settings that use geometrical techniques to approach problems in optimal control, discrete control and networked control systems. The session will contain a mixture of theoretical ideas and applications to specific systems. The techniques uses both smooth differential geometry as well as discrete geometry and discontinuous dynamics.

Organizer: Anthony M. Bloch

University of Michigan, USA

Organizer: Melvin Leok

University of California, San Diego, USA

Organizer: Dmitry Zenkov

North Carolina State University, USA

4:00-4:25 Dynamics and Control of a Chain Pendulum on a Cart

Taeyoung Lee, George Washington University, USA; *Melvin Leok*, University of California, San Diego, USA; N. Harris McClamroch, University of Michigan, USA

4:30-4:55 Polyhedral Subdivisions of Piecewise Affine Functions and Applications

Jinglai Shen and *Teresa Lebair*, University of Maryland, Baltimore County, USA

5:00-5:25 Contact Geometry of Optimal Control Problems

Tomoki Ohsawa, University of Michigan, USA

5:30-5:55 On the Coexistence of Synchronization and Chaos

Roger Brockett, Harvard University, USA

Monday, July 8

MS15

Direct Transcription Methods in Optimal Control

4:00 PM-6:30 PM

Room:Towne

The minisymposium focuses on numerical methods in optimal control based on a discretization of both the dynamics and the objective function. Several software packages will be discussed, one based on a differential algebraic formulation (DAE) which allows for delays in the state and the control, and another based on pseudospectral methods. Moving finite elements within DAE optimization will be presented, and computational issues that arise when solving low thrust orbit transfer problems will be discussed. The automatic computation of derivatives along with convergence theory for the discrete approximations will be examined.

Organizer: William Hager

University of Florida, USA

Organizer: Anil Rao

University of Florida, USA

4:00-4:25 Direct Transcription Solution of Optimal Control Problems with State and Control Delays

Stephen L. Campbell, North Carolina State University, USA; John T. Betts, Applied Mathematical Analysis, LLC, USA; Karmethia C. Thompson, North Carolina State University, USA

4:30-4:55 NLP Sensitivity with Direct Transcription: A Strategy to Incorporate Moving Finite Elements Within DAE Optimization

Weifeng Chen and Zhijiang Shao, Zhejiang University, China; *Larry Biegler*, Carnegie Mellon University, USA

5:00-5:25 Optimal Low Thrust Orbit Transfer with Eclipsing

John T. Betts, Applied Mathematical Analysis, LLC, USA

5:30-5:55 Convergence of Hp Pseudospectral Method for Unconstrained Optimal Control

Hongyan Hou, William Hager, and Anil Rao, University of Florida, USA

6:00-6:25 Numerical Solution of State-Inequality Constrained Optimal Control Problems Using Collocation at Legendre-Gauss and Legende-Gauss-Radau Points

Camila Francolin, Hongyan Hou, William Hager, and Anil Rao, University of Florida, USA

Monday, July 8

MS16

Dynamical System and Control Based Methods for Computer Vision Problems

4:00 PM-6:00 PM

Room:Stratford

Automated image/video content analysis for extracting actionable information is challenging due to high scene variability and complexity. We present several dynamical systems and control theoretic methods which provide a powerful means to robustly solve different computer vision problems which form the basis of such analysis tools. This includes nonlinear dynamical system analysis of crowded behavior, optimal mass transport in geometric observer setting for tracking, optimal control viewpoint of image registration, and convex relaxations of optimization problems related to system identification and machine learning. Applications will include video data segmentation, abnormal activity detection, tracking in crowded environments, and medical imaging.

Organizer: Amit Surana

United Technologies Research Center, USA

Organizer: Allen Tannenbaum

Boston University, USA

4:00-4:25 Dynamical Systems Framework for Anomaly Detection in Videos

Amit Surana, United Technologies Research Center, USA

4:30-4:55 Optimal Mass Transport as a Shape Metric for Visual Tracking

Allen Tannenbaum, Boston University, USA; Marc Niethammer, University of North Carolina at Chapel Hill, USA; Patricio Vela, Georgia Institute of Technology, USA

5:00-5:25 Optimal Control for Deformable Image Registration

Marc Niethammer, University of North Carolina at Chapel Hill, USA

5:30-5:55 Convex Relaxations of Semi-Algebraic Optimization Problems Arising in Systems Identification and Machine Learning

Mario Sznaier and Octavia Camps, Northeastern University, USA

Monday, July 8

MS17

Stochastic Optimal Control and Mathematical Finance - Part I of II

4:00 PM-6:00 PM

Room:Dover

For Part 2 see MS30

This minisymposium reports recent progress on stochastic optimal control and differential game. It includes new results on optimality conditions of optimal control, stochastic differential games, and viscosity solution to path-dependent Bellman equations.

Organizer: Shanjian Tang

Fudan University, China

4:00-4:25 Viscosity Solution to Path-Dependent Bellman Equations

Fu Zhang and Shanjian Tang, Fudan University, China

4:30-4:55 Stochastic Maximum Principle for Controlled Systems Driven by Fractional Brownian Motions

Yuecai Han, Jilin University, China; Yaozhong Hu, University of Kansas, USA; Jian Song, University of Hong Kong, Hong Kong

5:00-5:25 Stochastic Differential Games for Fully Coupled FBSDEs with Jumps

Juan Li and Qingmeng Wei, Shandong University, China

5:30-5:55 Iterative Dual Approach for Stochastic Control with Information Relaxation

Nan Chen and Wei Yu, The Chinese University of Hong Kong, Hong Kong

Monday, July 8

CP4

Control of Partial Differential Equations I

4:00 PM-5:30 PM

Room:Ascot

Chair: Qi He, University of California, Irvine, USA

4:00-4:25 Moderate Deviations Analysis for System Identification under Regular and Binary Observations *

Qi He, University of California, Irvine, USA; George Yin and Leyi Wang, Wayne State University, USA

4:30-4:55 Design of Recursively Updated Reduced Order Dynamic Observers for Distributed Parameter Systems

Davood Babaei Pourkargar and Antonios Armaou, Pennsylvania State University, USA

5:00-5:25 Optimal Control of Particle Accelerators

Oliver Thoma and Christian Meyer, Technische Universität Dortmund, Germany; Sascha Schnepp, ETH Zürich, Switzerland

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* This presentation is included in the proceedings

Monday, July 8

CP5

Finance, Economy, and Stochastic Systems

4:00 PM-5:30 PM

Room:Clarendon

Chair: Ran Tao, Shandong University, China and University of Georgia, USA

4:00-4:25 Optimal Replication of Random Claims by Ordinary Integrals with Applications in Finance *

Nikolai Dokuchaev, Curtin University, Australia

4:30-4:55 A Monte Carlo Method for Optimal Portfolio Execution

Nico Achtsis and Dirk Nuyens, Katholieke Universiteit Leuven, Belgium

5:00-5:25 Recursive Optimal Control Problems for Regime-Switching Model

Ran Tao, Shandong University, China and University of Georgia, USA; Zhen Wu, Shandong University, China

* This presentation is included in the proceedings

Monday, July 8

CP6

Math of Planet Earth: Water, Traffic, Crop Yield and Disease Control

4:00 PM-5:30 PM

Room:Fairfield

Chair: Vítor Nunes, Virginia Tech, USA

4:00-4:25 Parameter Estimation and Sensitivity Analysis in Ground Water Flow Equations

Vítor Nunes, Virginia Tech, USA

4:30-4:55 Iterative Convolution Particle Filtering for Nonlinear Parameter Estimation and Data Assimilation with Application to Crop Yield Prediction *

Yuting Chen, Samis Trevezas, and Paul-Henry Cournède, Ecole Centrale Paris, France

5:00-5:25 An Optimal Control Approach for An Hiv-Tb Co-Infection Model

Kailash C. Patidar, University of the Western Cape, South Africa

* This presentation is included in the proceedings

Monday, July 8

CP7

Control System Applications II

4:00 PM-6:00 PM

Room:Esquire

Chair: Qing Zheng, Gannon University, USA

4:00-4:25 Discrete Active Disturbance Rejection Control for Chemical Processes

Qing Zheng and Ahmad Ghaweta, Gannon University, USA; Yong Zheng, The Second Academy of China Aerospace Science & Industry Corp., China

4:30-4:55 Homology of Lie Algebras and Evapotranspiration in Control of a Greenhouse

José Ramón Guzmán, Universidad Nacional Autonoma de Mexico, Mexico

5:00-5:25 Stability Analysis of a Controller/Observer for Input-Constrained DC-DC Boost Power Converters *

Jorge Guzman-Guemez and Javier Moreno-Valenzuela, Instituto Politécnico Nacional, Mexico

5:30-5:55 Probabilistic Sensitivities for Fatigue Using Adjoint Methods

Mohamed Saadi, Universität Wuppertal, Germany

* This presentation is included in the proceedings

Monday, July 8

Intermission

6:00 PM-6:15 PM

PD1

Forward Looking Session: Academic, Government and Industrial Perspectives

6:15 PM-7:15 PM

Room:San Diego

Chair: William M. McEneaney, University of California, San Diego, USA

The panelists will open the session with short briefings on areas that they feel represent the future in Control and Systems Theory, as well as in related areas such as Applied Mathematics, Communications and Networks. That portion will be followed by responses and comments from the other session attendees. This should provide both an entertaining discussion and food for thought regarding possible future directions for our own research.

Panelists:

Andrzej Banaszuk
United Technologies Research Center, USA

Maurice Robin
Digiteo, France

Ralph Smith
North Carolina State University, USA

Andrew Teel
University of California, Santa Barbara, USA

Antonio Vicino
Università di Siena, Italy

Monday, July 8

Career Fair / Graduate Student Reception / Industry Reception

7:15 PM-9:15 PM

Room:Atlas Foyer

Tuesday, July 9

Registration

8:00 AM-4:30 PM

Room:Atlas Foyer

Remarks

8:25 AM-8:30 AM

Room:San Diego

IC3

Control of Some Partial Differential Equations and Nonlinearity

8:30 AM-9:15 AM

Room:San Diego

Chair: Kirsten Morris, University of Waterloo, Canada

In this talk, we survey some methods to study the controllability of some nonlinear partial differential equations when the nonlinearity plays an important role. This is for example the case when the linearized control system around the the equilibrium of interest is not controllable or if the nonlinearity is large at infinity and one looks for global results. Applications will be presented to various equations modeling fluid flows, as the Euler and the Navier-Stokes of incompressible fluids, the shallow water equations and the Korteweg-de Vries equations.

Jean-Michel Coron
Université Pierre et Marie Curie, France

Intermission

9:15 AM-9:20 AM

Tuesday, July 9

2011 SICON Paper Prize Lecture #1:

Feedback Stabilization of a Fluid-Structure Model

9:20 AM-9:40 AM

Room:Hampton

Chair: To Be Determined

We study a system coupling the incompressible Navier-Stokes equations in a 2D rectangular domain with a damped Euler-Bernoulli beam equation, occupying the upper boundary of the fluid domain. Due to the deformation of the beam, the fluid domain depends on time. We prove that this system is exponentially stabilizable, locally about the null solution, with any prescribed decay rate, by a feedback control corresponding to a force term in the beam equation.

Jean-Pierre Raymond
Universite Paul Sabatier, France

Tuesday, July 9

2013 SICON Paper Prize Lecture #1:

Gossip Coverage Control for Robotic Networks: Dynamical Systems on the Space of Partitions

9:20 AM-9:40 AM

Room:Sheffield

Chair: To Be Determined

Abstract not available at time of publication.

Ruggero Carli
University of California, Santa Barbara, USA

Co-authors: Francesco Bullo, University of California, Santa Barbara, USA; Paolo Frasca, Politecnico di Torino, Italy

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Golden West/California

Tuesday, July 9

2011 SICON Paper Prize Lecture #2:

Optimal Stopping Problem for Stochastic Differential Equations with Random Coefficients

9:45 AM-10:05 AM

Room:Hampton

Chair: To Be Determined

An optimal stopping problem for stochastic differential equations with random coefficients is considered. Dynamic programming principle leads to a Hamiltion-Jacobi-Bellman equation which, for the current case, is a backward stochastic partial differential variational inequality (BSPDVI, for short) for the value function. Well-posedness of such a BSPDVI is established and a verification theorem is proved.

Jiongmin Yong
University of Central Florida, USA

Co-authors: Mou-Hsiung Chang, U.S. Army Research Office, USA; Tao Pang, North Carolina State University, USA

Tuesday, July 9

2013 SICON Paper Prize Lecture #2:

The Total *s*-Energy of a Multiagent System

9:45 AM-10:05 AM

Room:Sheffield

Chair: To Be Determined

We introduce the s-energy of a sequence of undirected graphs embedded in d-space. This generating function provides a new analytical lens on bidirectional agreement dynamics, which we use to bound the convergence rates of dynamical systems for synchronization, flocking, opinion dynamics, and social epistemology.

Bernard Chazelle
Princeton University, USA

Coffee Break

10:05 AM-10:30 AM

Room:Golden West/California and Windsor

Tuesday, July 9

MS18

Inverse Problems in Complex Dynamical Systems

10:30 AM-12:30 PM

Room:Hampton

Inverse problems form the foundation for many modeling and control problems arising in modern control applications. These applications in turn require increasingly sophisticated complex dynamical models (nonlinear ordinary, partial and delay differential equations) to describe well the processes to be controlled. Design of data collection protocols, selection of parameters to be estimated and advanced methodology (Bayesian and Monte Carlo approaches) for parameter estimation are all important components of the development of new approaches to modern inverse problems in the context of complex dynamical systems. Speakers will address these fundamental topics.

Organizer: H. Thomas Banks
North Carolina State University, USA

10:30-10:55 Optimal Design Techniques for Distributed Parameter Systems *
H. Thomas Banks, North Carolina State University, USA

11:00-11:25 Parameter Subset Selction for Complex Models
Franz Kappel, University of Graz, Austria

11:30-11:55 Bayesian Techniques for Model Calibration and Quantification of Model Errors
Nathan Burch, *Ralph C. Smith*, and Zhengzheng Hu, North Carolina State University, USA

12:00-12:25 Randomize-then-Optimize: A Monte Carlo Method for Estimation and Uncertainty Quantification in Inverse Problems
Johnathan M. Bardsley, University of Montana, USA

* This presentation is included in the proceedings

Tuesday, July 9

MS19

Geometric Methods for PDEs: Sub-Riemannian Geometry

10:30 AM-12:30 PM

Room:Sheffield

The problem of finding the Carnot-Caratheodory distance on a sub-Riemannian manifold can be formulated as an optimal control problem linear in the control and with quadratic cost. The main purpose of this session is to study some problems of geometric analysis on sub-Riemannian manifolds. In particular: (i) the relation between diffusion and the Carnot Caratheodory distance, (ii) the problem of finding explicit expression of the heat kernels in some Lie-group cases, (iii) the stochastic completeness of certain degenerate Riemannian manifolds. Some applications coming from fluid dynamics will also be presented.

Organizer: Ugo Boscain
CMAP, Ecole Polytechnique, France

Organizer: Francesco Rossi
Aix-Marseille Université, France

10:30-10:55 Heat and Schroedinger Equations on Degenerate Riemannian Manifolds
Ugo Boscain, CMAP, Ecole Polytechnique, France

11:00-11:25 Perturbation Methods and Heat Kernel Asymptotics
Abdol-Reza Mansouri, Queen's University, Canada

11:30-11:55 Optimally Swimming Stokesian Robots
Benoît Merlet, Universite Paris-Nord, France

12:00-12:25 Common Features of Diffusions in the Sub-Riemannian and Riemannian Contexts
Robert Neel, Lehigh University, USA

Tuesday, July 9

MS20

Causal Algorithms for Optimal Control Problems - Part II of III

10:30 AM-12:30 PM

Room:Sunset

For Part 1 see MS3
For Part 3 see MS37

Fast Marching and Ordered Upwind Methods are efficient (non-iterative) algorithms for solving discretizations of Hamilton-Jacobi PDEs arising in continuous optimal control problems. Their logic mirrors the classical Dijkstra's method for shortest path problems on graphs. In the discrete setting, Dijkstra's has been modified to restrict the computational domain (e.g., the A*-method) and to allow for dynamic replanning (e.g., the D*-type methods), while other related (label-correcting) algorithms were found more suitable for parallelization. This minisymposium focuses on challenges of extending these ideas to the continuous setting. We will also consider the computational cost implications of inhomogeniety, anisotropy, and time-dependence of the controlled dynamics.

Organizer: Alexander Vladimirsky
Cornell University, USA

Organizer: Ian M. Mitchell
University of British Columbia, Canada

10:30-10:55 The Monotone Acceptance Ordered Upwind Method: A Causal Algorithm for Minimum Time / Cost Optimal Control.
Ken Alton and *Ian M. Mitchell*, University of British Columbia, Canada

11:00-11:25 Fast Replanning and Any-Angle Planning
Sven Koenig and Alex Nash, University of Southern California, USA

11:30-11:55 A Fast Marching Dynamic Replanning Method for Mobile Robots
Roland Philippsen, Halmstad University, Sweden

12:00-12:25 Serial and Parallel Hybrid Two-Scale Methods for Eikonal Equations
Adam Chacon, Cornell University, USA

Tuesday, July 9

MS21

Infinite Horizon Control Problems

10:30 AM-12:00 PM

Room:Brittany

The minisymposium includes four talks which will be given by well-known experts in the area. In the first talk J. Blot presents results on the necessary conditions and sufficient conditions of optimality for infinite-horizon and discrete-time optimal control problems when the admissible processes satisfy several kinds of constraints. In the second talk Naila Haeyk considers multiobjective infinite horizon optimal control problems in the discrete-time case for systems which are governed by difference equations or difference inequations. In the last talk S. Pickenhain applies apectral methods for solving infinite horizon optimal control problems in the Lagrange form.

Organizer: Joël Blot
Université Paris 1 Panthèon-Sorbonne, France

10:30-10:55 Pontryagin Principles for Infinite-Horizon Constrained Problems
Joël Blot, Université Paris 1 Panthèon-Sorbonne, France

11:00-11:25 Multiobjective Optimal Control over Infinite Horizon
Naila Hayek, Laboratoire ERMES, University Pantheon Assas Paris, France

11:30-11:55 Spectral Methods for the Solution of Infinite-Horizon Optimal Control Problems
Sabine Pickenhain, Brandenburg University of Technology, Germany

Tuesday, July 9

MS22

Targeted Model Reduction for Nonlinear Systems

10:30 AM-12:30 PM

Room:Eaton

In this minisymposium, we consider model reduction applications that preserve one or more structural properties of the system. The authors consider nonlinear systems with the additional constraints: a.) that the input-output characterization is accurate and functional gains are adequately represented, b.) that the resulting model maintains a bilinear structure, c.) that Hamiltonian structure is preserved, and d.) that additional modeling goals are satisfied. In addition to preservation of specified structure, the proposed methods in this minisymposium include efficient evaluation of the resulting nonlinear models either through maintaining polynomial structure, employing the discrete empirical interpolation method, or implementing multilevel methods.

Organizer: Lizette Zietsman
Virginia Tech, USA

Organizer: Jeff Borggaard
Virginia Tech, USA

10:30-10:55 Reduced Order Controllers for Boussinesq Equations with a Nonlinear Observer
Jeff Borggaard and *Lizette Zietsman*, Virginia Tech, USA

11:00-11:25 Volterra Series Interpolation Framework for Model Reduction of Bilinear Systems
Garret Flagg, Western Geco, USA; Serkan Gugercin, Virginia Tech, USA

11:30-11:55 Structure-Preserving Model Reduction for Nonlinear Port-Hamiltonian Systems
Christopher A. Beattie, Serkan Gugercin, and *Saifon Chaturantabut*, Virginia Tech, USA

12:00-12:25 Systematic Goal-Oriented Reduced-Order Models for Complex Systems
Zhu Wang, University of Minnesota, USA

Tuesday, July 9

MS23

Distributed Sensing and Control

10:30 AM-12:30 PM

Room:Towne

Issues considered: How might a distributed network of mobile robots be used to detect environmental anomalies in an optimal manner? To what extent can basic information theoretic concepts such as conditional entropy be used to further understand and characterize the behavior of a distributed network? How might one choose a state space realization of a large sparse transfer matrix which reflects the sparsity of the transfer matrix being realized? Is there an efficient way to move information throughout a distributed network of autonomous agents so that together all can collectively solve a system of equation whose defining parameters are distributed among them?

Organizer: A Stephen Morse

Yale University, USA

10:30-10:55 Strategies for Distributed Information Acquisition and Propagation in Networks

John B. Baillieul, Boston University, USA

11:00-11:25 Stochastic Surveillance Strategies for Spatial Quickest Detection

Francesco Bullo, University of California, Santa Barbara, USA; Vaibhav Srivastava, Princeton University, USA; Fabio Pasqualetti, University of California, Santa Barbara, USA

11:30-11:55 Smart Realizations of Sparse Transfer Matrices

Ali Jadbabaie, University of Pennsylvania, USA

12:00-12:25 Solving a Linear Equation Across a Network

A Stephen Morse, Yale University, USA

Tuesday, July 9

MS24

Stochastic Systems and Applications - Part II of II

10:30 AM-12:30 PM

Room:Stratford

For Part 1 see MS7

The purpose of this minisymposium is to bring together experts and young researchers to present state-of-the-art results and to identify open problems and future research directions. Motivated by many applications, a unifying theme of this session is the stochastic systems theory. The second part of the minisymposium will cover some important issues including control of discrete time linear systems, stock trading rules, risk models and reinsurance, and stability of numerical methods for jump diffusion systems. The following is a list of confirmed speakers and talks to be presented.

Organizer: Son L. Nguyen

University of Puerto Rico, Puerto Rico

Organizer: George Yin

Wayne State University, USA

10:30-10:55 Discrete Time Linear Quadratic Control with Arbitrary Correlated Noise

Tyrone E. Duncan and Bozenna J. Pasik-Duncan, University of Kansas, USA

11:00-11:25 Stock Trading Rules under a Switchable Market

Qing Zhang, Duy Nduyen, and Jingzhi Tie, University of Georgia, USA

11:30-11:55 Risk Models with Investment and Reinsurance

Rosario Romera, Universidad Carlos III de Madrid, Spain

12:00-12:25 Stability of Numerical Methods for Jump Diffusion Systems

Zhixin Yang, Wayne State University, USA

Tuesday, July 9

MS25

State Estimation and Control of Complex Biological and Biomedical Systems

10:30 AM-12:30 PM

Room:Dover

Many biological and biomedical processes can only be adequately described by complex, nonlinear models which do not always meet controlability and/or observability criteria and for which data is scarse. Standard methods which rely on linear approximations to accurately compute state estimation and calculate appropriate controls (e.g. therapies) are proving inadequate for such systems. This minisymposium will aim to address issues arising in the state estimation and application and design of control methods for complex biomedical systems.

Organizer: Judy Day

University of Tennessee, USA

10:30-10:55 Toward Adaptive Control of the Systemic Inflammatory Response

Judy Day, University of Tennessee, USA; Seddik Djouadi, University of Tennessee, Knoxville, USA; Wassim Bara and Greg Zitelli, University of Tennessee, USA

11:00-11:25 Characterization and Control of the Erk/MAPK Signaling Pathway in T Lymphocytes

Jeffrey Perley, Thembi Mdluli, Judith Mikolajczak, Marietta Harrison, Gregery Buzzard, and *Ann E. Rundell,* Purdue University, USA

11:30-11:55 Model-Based Estimation and Control for Personalized Real-Time Glucose Control in Intensive Care

Stanislaw Gawel, Gilles Clermont, and Thang Ho, University of Pittsburgh, USA; Brandi Newman, Iowa State University, USA; John Maalouf, Balaji Yegneswaran, and *Robert Parker*, University of Pittsburgh, USA

12:00-12:25 Multiple Model Predictive Control Approach to Personalized Anemia Management

Adam E. Gaweda, University of Louisville, USA

Tuesday, July 9

CP8

Quantum Systems

10:30 AM-12:30 PM

Room:Ascot

Chair: Shanon L. Vuglar, University of New South Wales, Australia

10:30-10:55 Quantum Noises Arising During the Quantum Implementation of an LTI System
Shanon L. Vuglar and Ian Petersen, University of New South Wales, Australia

11:00-11:25 Environment-Assisted One-Photon Coherent Phase Control
Leonardo A. Pachon and Paul Brumer, University of Toronto, Canada

11:30-11:55 Mechanism Analysis of Robust Quantum Control
Andy Koswara, Purdue University, USA; Raj Chakrabarti, Carnegie Mellon University, USA

12:00-12:25 Noether's Theorem for Control Problems on Time Scales
Agnieszka B. Malinowska, Bialystok University of Technology, Poland

Tuesday, July 9

CP9

Nonlinear Systems

10:30 AM-12:30 PM

Room:Clarendon

Chair: Anshu Narang-Siddarth, Texas A&M University, USA

10:30-10:55 On Almost Lyapunov Functions
Charles Ying, University of Illinois, USA; Daniel Liberzon and Vadim Zharnitsky, University of Illinois at Urbana-Champaign, USA

11:00-11:25 Necessary Conditions for Feedback Passivation of Nonaffine-in-Control Systems *
Anshu Narang-Siddarth and John Valasek, Texas A&M University, USA

11:30-11:55 Analyze of Synchronization Bifurcation Thank to Incremental Norm for a Class of Piecewise Smooth Systems
Jean-Pierre Barbot, ENSEA, France; Djamila Benmerzouk, University of Tlemcen, Algeria

12:00-12:25 Periodic Control System Stabilization on Time Scales *
Francisco Miranda, Instituto Politécnico de Viana do Castelo, Portugal

* This presentation is included in the proceedings

Tuesday, July 9

CP10

Control System Applications III

10:30 AM-12:00 PM

Room:Fairfield

Chair: William S. Levine, University of Maryland, College Park, USA

10:30-10:55 A Noise Canceling Feedback Controller for the National Synchrotron Light Source II
William S. Levine, University of Maryland, College Park, USA; Kevin Davis, Carnegie Mellon University, USA; Yuke Tian and Li-Hua Yu, Brookhaven National Laboratory, USA

11:00-11:25 Stochastic Model and Simulation Results of Interactions Between Human Subjects and Air Traffic Control Simulator
Keivan Sadeghzadeh and Rifat Sipahi, Northeastern University, USA

11:30-11:55 Application of The Fuzzy Gain Scheduling IMC-PID to The Power Plant
XiaoFeng Li, Electric Power Research Institute of Guangdong Power Group Co., China; Weidong Zhang, Shanghai Jiaotong University, China

Tuesday, July 9

CP11

Computational Methods for Control Systems I

10:30 AM-12:30 PM

Room:Esquire

Chair: Sebastian F. Walter, Heidelberg University, Germany

10:30-10:55 ADI Iteration Parameters for CARE Application
Eugene L. Wachspress, Columbia University, USA

11:00-11:25 Numerical Algorithms for Nonlinear Optimum Experimental Design Problems
Dennis Janka, Stefan Koerkel, and Hans Georg Bock, Heidelberg University, Germany

11:30-11:55 Cheap Optimization of Experimental Designs
Sebastian F. Walter, Heidelberg University, Germany

12:00-12:25 A Parallel Implementation of Multiagent Coordination Optimization Algorithm
Qing Hui and Haopeng Zhang, Texas Tech University, USA

Prizes and Awards Luncheon

12:30 PM-2:30 PM

Room:Golden Ballroom

Ticket Required

Tuesday, July 9

The John von Neumann Lecture:

What Sparsity and l1 Optimization Can Do For You

2:30 PM-3:30 PM

Room:Town & Country

Chair: Irene Fonseca, Carnegie Mellon University, USA

Sparsity and compressive sensing have had a tremendous impact in science, technology, medicine, imaging, machine learning and now, in solving multiscale problems in applied partial differential equations. l1 and related optimization solvers are a key tool in this area. The special nature of this functional allows for very fast solvers: l1 actually forgives and forgets errors in Bregman iterative methods. I will describe simple, fast algorithms and new applications ranging from sparse dynamics for PDE, new regularization paths for logistic regression and support vector machine to optimal data collection and hyperspectral image processing.

Stanley J. Osher
University of California, Los Angeles, USA

Coffee Break

3:30 PM-4:00 PM

Room:Golden West/California

Tuesday, July 9

MS26

Analysis and Control of Infinite-Dimensional Systems

4:00 PM-6:00 PM

Room:Hampton

The aim of this session is to present results on various aspects of infinite-dimensional systems both in the time and frequency domain. The theoretical questions considered in the submitted papers are relevant for the practical analysis of infinite-dimensional systems: location of unstable poles, root locus, implementation of Hinfty-controllers, explicit solutions of PDE's. The applicability of the methods to delay systems will be a focus of this session.

Organizer: Catherine Bonnet
INRIA, France

Organizer: Kirsten Morris
University of Waterloo, Canada

4:00-4:25 $H\infty$-Stability Analysis of Delay Systems of Neutral Type
Catherine Bonnet and Le Ha Vy Nguyen, INRIA, France

4:30-4:55 Root Locus of Infinite-Dimensional Systems
Kirsten Morris, University of Waterloo, Canada; Birgit Jacob, University of Wuppertal, Germany

5:00-5:25 Numerical Computation and Implementation of H-Infinity Controllers for Infinite-Dimensional Systems
Hitay Ozbay, Bilkent University, Turkey

5:30-5:55 Solution of An Infinite Dimensional Two-Point Boundary Value Problem Via the Principle of Least Action
William M. McEneaney, University of California, San Diego, USA; *Peter Dower*, University of Melbourne, Australia

For MS27, see Wednesday morning.

Tuesday, July 9

MS28

Variational Analysis in Dynamics and Control - Part I of II

4:00 PM-6:00 PM

Room:Eaton

For Part 2 see MS39

Variational analysis is now a mature and broad area of mathematics, which grew out of calculus of variations and subsumes convex, set-valued, and non-smooth analysis. It has seen important motivation from and applications in optimization and optimal control. This minisymposium highlights other uses of variational analysis in dynamical and control systems, especially beyond optimal control. Convex duality in stability analysis of constrained systems; set-valued mappings and selections for stochastic dynamics; controllability of reachable sets; nonsmooth analysis of Lyapunov functions; multivalued dynamics, constraints, and robustness in switching and hybrid systems; and similar topics will be presented.

Organizer: Rafal Goebel

Loyola University of Chicago, USA

4:00-4:25 Convex Lyapunov Functions and Duality for Convex Processes

Rafal Goebel, Loyola University of Chicago, USA

4:30-4:55 Numerical Computation of Nonsmooth Lyapunov Functions for Differential Inclusions

Robert Baier and *Lars Gruene*, University of Bayreuth, Germany; Sigurdur Hafstein, Reykjavik University, Iceland

5:00-5:25 Control Problems for a Class of Set Valued Evolutions

Dongmei Zhang and Alberto Bressan, Pennsylvania State University, USA

5:30-5:55 Robust Non-Zenoness of Piecewise Affine Systems with Applications to Complementarity Systems

Jinglai Shen, University of Maryland, Baltimore County, USA

Tuesday, July 9

MS29

Synchronization and Pattern Formation in Spatially Distributed Systems

4:00 PM-6:00 PM

Room:Brittany

This minisymposium aims to reveal structural properties that guarantee desirable spatiotemporal dynamics in natural and engineered networks. It starts with two talks that give verifiable conditions for various notions of synchrony in coupled oscillator networks and that illustrate them with application examples. The third talk presents a contraction theory perspective for synchrony that is applicable to continuum models. This perspective is also helpful for understanding when synchronous behavior is lost and spatial patterns emerge. The final talk employs graph-theoretic tools to study a class of networks that is implicated in the formation of fine-grained patterns in biology.

Organizer: Murat Arcak

University of California, Berkeley, USA

4:00-4:25 Coordination and Synchronization of Weakly Coupled Harmonic Oscillators

Tetsuya Iwasaki and Xinmin Liu, University of California, Los Angeles, USA

4:30-4:55 Synchronization in Complex Oscillator Networks

Florian Dorfler and Francesco Bullo, University of California, Santa Barbara, USA

5:00-5:25 Weighted L2 Norm Contractions in Diffusively-Coupled Systems

Sayed Y. Shafi, University of California, Berkeley, USA; Zahra Aminzare, Rutgers University, USA; Murat Arcak, University of California, Berkeley, USA; Eduardo Sontag, Rutgers University, USA

5:30-5:55 Determining Steady-State Patterns and Their Stability in Lateral Inhibition Networks

Ana Sofia Rufino Ferreira and Murat Arcak, University of California, Berkeley, USA

Tuesday, July 9

MS30

Stochastic Optimal Control and Mathematical Finance - Part II of II

4:00 PM-6:00 PM

Room:Dover

For Part 1 see MS17

This minisymposium reports recent progress on stochastic optimal control and its applications in mathematical finance. It includes an iterative method for optimal stochastic control, calibration of stochastic volatility models with an optimal control method, optimal consumption with learning, and nonlinear pricing.

Organizer: Baojun Bian

Tongji University, China

Organizer: Shanjian Tang

Fudan University, China

4:00-4:25 Weak Necessary and Sufficient Stochastic Maximum Principle

Harry Zheng, Imperial College London, United Kingdom

4:30-4:55 A Utility Model of Learning How to Consume Effectively

Hyeng Keun Koo, Ajou University, Korea; Philip Dybvig, Washington University, USA; Bong Gyu Jang, POSTECH, Korea

5:00-5:25 A Law of the Iterated Logarithm for Sublinear Expectations

Zengjing Chen, Shandong University, China; Feng Hu, Qufu Normal University, China

5:30-5:55 A Nonlocal Free Boundary Problem and Financial Pricing for Retirement Benefits

Baojun Bian, Tongji University, China

Tuesday, July 9

MS31

Optimal Motion Planning

4:00 PM-6:00 PM

Room:Towne

The scope of this minisymposium includes algorithms for planning optimal motion for holonomic and nonholonomic systems with applications to robotics. In addition to analytical methods, also known as indirect methods, the state-of-the-art direct algorithms are RRT*, primarily for problems with obstacles, and pseudospectral methods, primarily for problems without obstacles. This minisymposium will include four talks, on RRT* and analytical methods using the Pontryagin maximum principle.

Organizer: Hamidreza Chitsaz

Wayne State University, USA

4:00-4:25 On Time-optimal Trajectories for a Car-like Robot with One Trailer *

Hamidreza Chitsaz, Wayne State University, USA

4:30-4:55 Sampling-Based Algorithms for Optimal Motion Planning

Sertac Karaman, Massachusetts Institute of Technology, USA

5:00-5:25 Title Not Available

Steven LaValle, University of Illinois at Urbana-Champaign, USA

5:30-5:55 Kinodynamic Rrt*: Asymptotically Optimal Motion Planning for Robots with Linear Dynamics

Jur van den Berg and Dustin Webb, University of Utah, USA

* This presentation is included in the proceedings

Tuesday, July 9

MS32

Discrete Optimality Conditions in Control Problems

4:00 PM-6:00 PM

Room:Stratford

The minisymposium includes four talks which will be given by well-known experts in the area. In the first talk I. Shvartsman reports necessary optimality conditions for finite-difference approximations of continuous-time control systems with nonsmooth endpoint constraints and cost function. In the second talk C. Mariconda discusses the non occurrence of the Lavrentiev gap for scalar multidimensional variational problems. In the third talk L. Pfeiffer presents necessary and sufficient second-order optimality conditions for strong solutions of optimal control problems with pure and mixed constraints. In the last talk F. Rampazzo considers a (Sup + Bolza)-control problem which is rephrased in terms of a static differential game.

Organizer: Ilya Shvartsman

Pennsylvania State University, USA

4:00-4:25 Approximate Maximum Principle for Systems with Nonsmooth Endpoint Constraints

Boris Mordukhovich, Wayne State University, USA; *Ilya Shvartsman,* Pennsylvania State University, USA

4:30-4:55 The Non Occurrence of the Lavrentiev Gap for Scalar Multidimensional Variational Problems

Carlo Mariconda, Università degli Studi di Padova, Italy

5:00-5:25 Necessary and Sufficient Second-Order Optimality Conditions for Strong Solutions of Optimal Control Problems with Pure and Mixed Constraints

Laurent Pfeiffer, Frédéric Bonnans, and Xavier Dupuis, INRIA Saclay and CMAP Ecole Polytechnique, France

5:30-5:55 (Sup + Bolza)-Control Problems As Dynamic Differential Games

Franco Rampazzo, Universita di Padova, Italy

Tuesday, July 9

MS33

Time Delay Systems with Applications

4:00 PM-6:00 PM

Room:Sunset

Stabilization of nonlinear control systems under time delays is a central problem that has been studied using many methods. One approach involves first stabilizing the system with the input delays set equal to zero, and then analyzing the robustness of the closed loop stability to delays. Another involves prediction, where the control values are states of an auxiliary system. This session will present new results based on both approaches, including new designs for Lyapunov-Krasovskii functionals that can establish robustness to perturbations and sampling, applications to dynamic networks based on small gain theory, and numerical methods for implementing predictor feedbacks.

Organizer: Warren Dixon

University of Florida, USA

4:00-4:25 Time-Varying Input and State Delay Compensation for Uncertain Nonlinear Systems

Nic Fischer, Serhat Obuz, Rushi Kamalapurkar, and *Warren Dixon*, University of Florida, USA

4:30-4:55 Stability and Distributed Control for Dynamic Networks with Time-Delays: Some New Results

Zhong-Ping Jiang and *Tengfei Liu*, Polytechnic Institute of New York University, USA

5:00-5:25 Numerical Implementation of Predictor Feedback for Nonlinear Plants with Input Delays

Iasson Karafyllis, Technical University of Crete, Greece; *Miroslav Krstic*, University of California, San Diego, USA

5:30-5:55 Robustness of Nonlinear Systems with Respect to Delay and Sampling of the Controls

Frederic Mazenc, INRIA, France; Michael Malisoff, Louisiana State University, USA; Thach Dinh, INRIA, France

Tuesday, July 9

MS42

Computational Optimal Control and Applications

4:00 PM-6:00 PM

Room:Sheffield

Last decade witnesses significant progress in computational optimal control. Advancement in theoretical analysis and numerical algorithms makes it possible to tackle complicated control engineering problems. This minisymposium brings together experts to discuss recent advance in computational optimal control and its engineering applications. Topics include pseudospectral methods for the optimal control of multiscale systems, optima ensemble control, applications of optimal control on nonholonomic vehicles, and online optimal motion planning of ground robot. The minisymposium covers various aspects including emerging numerical methodologies and engineering applications that are attractive to a wide spectrum of audience.

Organizer: Qi Gong

University of California, Santa Cruz, USA

4:00-4:25 Pseudospectral Computational Optimal Control for Multiscale Systems

Qi Gong, University of California, Santa Cruz, USA; I. M. Ross, Naval Postgraduate School, USA; Veronica Pellegrini, University of California, Santa Cruz, USA

4:30-4:55 Iterative Svd Algorithm for Optimal Ensemble Control Synthesis

Jr-Shin Li, Washington University, St. Louis, USA; Anatoly Zlotnik, Washington University, St. Louis, USA

5:00-5:25 Stochastic Optimal Control of Nonholonomic Vehicles

Dejan Milutinovic, University of California, Santa Cruz, USA

5:30-5:55 Experimental Implementation of Pseudospectral Motion Planning

Mark Karpenko, Travis Bateman, and I. Michael Ross, Naval Postgraduate School, USA

Tuesday, July 9

MS43

Sparse Solutions in Optimal Control of Partial Differential Equations

4:00 PM-6:00 PM

Room:Windsor

In the control of distributed parameter systems, usually we cannot put control devices at every point of the domain. Actually, we are allowed to use only small regions to put the controllers in. Then the big issue is which region is the most convenient to localize them. Of course, we have to determine the power of the controllers as well. These controls are called sparse because they are supported in small domains. In the last few years, some researchers have focused their investigation in this direction. This minisymposium is concentrated on the theoretical and numerical analysis of these control problems.

Organizer: Eduardo Casas

Universidad de Cantabria, Spain

4:00-4:25 Sparse Controls in State-Constrained Elliptic Optimal Control Problems

Eduardo Casas, Universidad de Cantabria, Spain; Fredi Tröltzsch, Technical University of Berlin, Germany

4:30-4:55 Sparse Optimal Controls for the Linear Wave Equation

Karl Kunisch and *Philip Trautmann*, Universität Graz, Austria

5:00-5:25 Sparse Controls for the Optimization of Traveling Wave Fronts

Christopher Ryll, Technical University of Berlin, Germany; Fredi Tröltzsch, Technical University Berlin, Germany; Eduardo Casas, Universidad de Cantabria, Spain

5:30-5:55 A Priori Error Analysis for Discretization of Sparse Elliptic Optimal Control Problems in Measure Space

Boris Vexler and Konstantin Pieper, Technische Universität München, Germany

Tuesday, July 9

CP12

Networked Systems: Consensus and Performance Analysis

4:00 PM-6:00 PM

Room:Ascot

Chair: Solmaz S. Kia, University of California, San Diego, USA

4:00-4:25 Saturation-tolerant Average Consensus with Controllable Rates of Convergence *

Solmaz S. Kia, Jorge Cortes, and Sonia Martinez, University of California, San Diego, USA

4:30-4:55 Fixed Point Theory Approach to Exponential Convergence in LTV Continuous Time Consensus Dynamics with Delays *

Christoforos Somarakis and *John Baras*, University of Maryland, USA

5:00-5:25 Robustness and Performance Analysis of Cyclic Interconnected Dynamical Networks *

Milad Siami and Nader Motee, Lehigh University, USA

5:30-5:55 Pseudo-Rigid Formation Design for a Group of Unmanned Vehicles

Li-Sheng Wang and Fang-Chieh Chen, National Taiwan Normal University, Taiwan

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* This presentation is included in the proceedings

Tuesday, July 9

CP13

Optimal Control I

4:00 PM-6:00 PM

Room:Clarendon

Chair: Soledad Aronna, Universita di Padova, Italy

4:00-4:25 Necessary Conditions for Impulsive Optimal Control Problems
Soledad Aronna and Franco Rampazzo, Universita di Padova, Italy

4:30-4:55 On the Goh Second Order Conditions for Boundary Controls
Daniela Tonon and Helene Frankowska, Université Pierre et Marie Curie - Paris VI, France

5:00-5:25 On a Singular Subarcs in Optimal Control Problem for a Simple Trolley-Type Model with Nonlinear Friction and Bounded Fuel Expenditure
Ivan Samylovskiy, Lomonosov Moscow State University, Russia; Andrei V. Dmitruk, Russian Academy of Sciences, Russia

5:30-5:55 A Variational Method Via Optimal Control
Dan I. Tiba, Romanian Academy, Romania

Tuesday, July 9

CP14

Control of Biological Systems

4:00 PM-6:30 PM

Room:Fairfield

Chair: Joe Levine, California Institute of Technology, USA

4:00-4:25 Pulsed Feedback Defers Cellular Differentiation
Joe Levine and Michael Elowitz, California Institute of Technology, USA

4:30-4:55 A Small-Gain Result for Orthant-Monotone Systems under Mixed Feedback
German Enciso, University of California, Irvine, USA; David Angeli, Imperial College London, United Kingdom; Eduardo Sontag, Rutgers University, USA

5:00-5:25 Are High Dimensional Spinal Neural Circuits Configured to Facilitate Rapid Learning?
Yao Li, *Gerald E. Loeb*, John Sunwoo, and Tomaz Cerne, University of Southern California, USA

5:30-5:55 Real-Time Optimal Control of the Euglycemic Clamp in Mice
Faidra Stavropoulou, Helmholtz Zentrum München, Germany; Youssef M. Marzouk, Massachusetts Institute of Technology, USA

6:00-6:25 Controlling Systemic Inflammation Using Nonlinear Model Predictive Control with State Estimation
Gregory L. Zitelli, University of Tennessee, Knoxville, USA; Judy Day, University of Tennessee, USA

Tuesday, July 9

CP15

Computational Methods for Control Systems II

4:00 PM-6:00 PM

Room:Esquire

Chair: Jun Liu, Southern Illinois University, USA

4:00-4:25 High-Order Numerical Methods for Wave Equations with Van Der Pol Type Boundary Conditions *
Jun Liu, Southern Illinois University, USA; Yu Huang, Sun Yat-Sen University, China; Haiwei Sun, University of Macau, Macao SAR, China; Mingqing Xiao, Southern Illinois University, Carbondale, USA

4:30-4:55 Stabilization of Galerkin Reduced Order Models (roms) for Lti Systems Using Controllers
Irina Kalashnikova, Bart G. Van Bloemen Waanders, and Srinivasan Arunajatesan, Sandia National Laboratories, USA

5:00-5:25 Numerical Solution of Stochastic Regulator Problem with Nonlinear State Dynamics and Unbounded Terminal Condition
Coskun Cetin, California State University, Sacramento, USA; Jasmina Djordjevic, University of Nis, Serbia

5:30-5:55 Solving the P-Laplacian Equation by Using Finite Elements Methods Leading to a Optimization Problem
Abdullah Topcu, Noncommisioned Officer School, Turkey

Intermission

6:00 PM-6:15 PM

SIAM Business Meeting

6:15 PM-7:15 PM

Room:Town & Country

Complimentary beer and wine will be served.

Intermission

7:15 PM-7:30 PM

* This presentation is included in the proceedings

Tuesday, July 9

SIAG/CST Business Meeting

7:30 PM-8:00 PM

Room:San Diego

Complimentary beer and wine will be served.

PP1

Poster and Dessert Reception

8:00 PM-10:00 PM

Room:Exhibit Hall

Modeling and Analysis of Adaptive-Conversion-Ratio-Based Bidirectional Switched-Capacitor Converter *

Yuen-Haw Chang and Kun-Wei Wu, Chaoyang University of Technology, Taiwan

Pseudo-Real Time Monitoring and Control of Abnormal Occurrences of Fire Incidents with the Mining of the National Fire Data System (NFDS)

Kidon Joo, Dongil Shin, and Jeongpil Park, Myongji University, Korea

Nonlinear Model Reduction and Control

Christopher Jarvis, Boris Kramer, and John Burns, Virginia Tech, USA

Tip Position Estimation and Control of a Flexible Cantilever with Kalman Estimator Using An Accelerometer

Soon-Geul Lee, KyungHee University, South Korea

Phase Transition and Optimization of Granular Flow Down a Chute with Successive Turning Points

Qing-Song Wu, Mao-Bin Hu, Guo-Cheng Yang, Qi-Yi Liu, and Rui Jiang, University of Science and Technology of China, China

Markowitz's Mean-Variance Asset-Liability Management With Regime Switching: A Time-Consistent Approach

Siu Pang Yung, University of Hong Kong, Hong Kong, PRC

Cauchy Integral Formula to Compute the Exponential of a Matrix

Zhinan Zhang and Jianning Zhang, Xinjiang University, China

* This presentation is included in the proceedings

Wednesday, July 10

Registration

8:00 AM-4:30 PM

Room:Atlas Foyer

Closing Remarks

8:25 AM-8:30 PM

Room:San Diego

Wednesday, July 10

IC4

Role Of Scientific Computation In Next Generation Innovation – An Aerospace Perspective

8:30 AM-9:15 AM

Room:San Diego

Chair: Isaac Ross, Naval Postgraduate School, USA

For technologically mature industries or those with high barriers to change, innovation is a challenge. One low risk, low cost innovation path is to radically improve performance while minimizing change to existing infrastructure. In this presentation, a historical perspective on spacecraft optimal control is used to show how scientific computation can act as the enabler for next generation innovation. Real world examples will be presented where radical leaps in performance without altering spacecraft hardware or software has been achieved.

Nazareth Bedrossian
Halliburton, USA

Wednesday, July 10

SIAG/CST Prize Lecture:

Feedback Control of Hybrid Dynamical Systems: from Cells to Power Networks

9:15 AM-10:00 AM

Room:San Diego

Chair: William McEneaney, University of California, San Diego, USA

Hybrid systems have become prevalent when describing complex systems that mix continuous and impulsive dynamics. Continuous dynamics usually govern the evolution of the physical variables in a system, while impulsive (or discrete) behavior is typically due to discrete events and abrupt changes in the dynamics. Motivated by the lack of tools to rigorously study these systems, a mathematical framework and its associated tools for the analysis and synthesis of robust hybrid feedback control systems will be presented. The focus will be on asymptotic stability and invariance of sets. The tools will be exercised in applications, ranging from genetic networks to power systems.

Ricardo G. Sanfelice
University of Arizona, USA

Exhibit Hall Open

9:30 AM-4:30 PM

Room:Golden West/California

Coffee Break

10:00 AM-10:30 AM

Room:Golden West/California

Wednesday, July 10

MS27

Max-Plus/Tropical Analysis in Control and Systems Theory

10:30 AM-12:30 PM

Room:Dover

We consider max-plus/tropical methods applied to problems in control, linear programming and systems theory.

Organizer: William M. McEneaney
University of California, San Diego, USA

Organizer: Stephane Gaubert
INRIA and CMAP, Ecole Polytechnique, France

10:30-10:55 Tropicalizing the Simplex Algorithm
Xavier Allamigeon, CMAP, Ecole Polytechnique, France

11:00-11:25 A Max-plus Method for the Approximate Solution of Discrete-time Linear Regulator Problems with Non-quadratic Terminal Payoff *
Huan Zhang and *Peter Dower*, University of Melbourne, Australia

11:30-11:55 Contraction of Riccati Flows Applied to the Convergence Analysis of a Max-Plus Curse of Dimensionality Free Method
Zheng Qu, CMAP, Ecole Polytechnique, France

12:00-12:25 Random Tropical Curves
Ngoc Tran, University of California, Berkeley, USA

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* This presentation is included in the proceedings

Wednesday, July 10

MS34

Control and Stabilization of PDEs

10:30 AM-12:30 PM

Room:Windsor

The minisymposium includes four talks which will be given by well-known experts in the area. In the first talk I. Lasiecka discusses a third order in time equation which arises as a model of wave propagation in viscous thermally relaxing fluids. In the second talk I. Benedetti presents solution existence results and controllability results for semilinear differential inclusions with non-compact evolution operators. In the third talk H. J. Pesch analyzes a pointwisely state-constrained optimal control problem of an elliptic partial differential equation.In the last talk J.-P. Raymond considers fluid flows governed by the Navier-Stokes equations and the stabilization of a flow about an unstable stationary solution in the case of partial information.

Organizer: Irena M. Lasiecka
University of Virginia, USA

10:30-10:55 Optimizing Spectral Parameters in Nonlinear Wave Equation Arising in High Intensity Ultrasound
Irena M. Lasiecka, University of Virginia, USA; Barbara Kaltenbacher, University of Klagenfurt, Austria; Jason Knapp, University of Virginia, USA

11:00-11:25 Semilinear Differential Inclusions with Non-Compact Evolution Operators: Solution Existence Results and Controllability
Irene Benedetti, Università di Perugia, Italy

11:30-11:55 A New Numerical Method Based on Shape Calculus for State-Constrained Optimal Control Problems with PDEs
Michael Frey, Simon Bechmann, and *Hans Josef Pesch*, University of Bayreuth, Germany; Armin Rund, University of Graz, Austria

12:00-12:25 Stabilization of Fluid Flows with Partial Information
Jean-Pierre Raymond, Universite Paul Sabatier, France

Wednesday, July 10

MS35

Inverse Problems for Distributed Parameter Systems

10:30 AM-12:30 PM

Room:Hampton

This minisymposium is concerned with inverse or parameter estimation problems for systems with dynamics described by distributed parameter systems (e.g. PDEs, FDEs functional equations). The talks are motivated by applications. These include deconvoluion of biosensor data, optical tomography, and optical bar code decoding. Special attention is paid to numerical and computational issues. Challenges common to these problems include their inherent ill-posedness and the requirement that efficient and accurate computation of cost functional gradients with respect to the parameters be possible. The presentations in this minisymposium represent concrete examples of overcoming these challenges in the context of practical applications.

Organizer: I. Gary Rosen

University of Southern California, USA

10:30-10:55 Discrete-Time Blind Deconvolution for Distributed Parameter Systems with Dirichlet Boundary Input and Unbounded Output with Application to a Transdermal Alcohol Biosensor *

I. Gary Rosen, Susan Luczak, Weiwei Hu, and Michael Hankin, University of Southern California, USA

11:00-11:25 Solution of Ill-Posed Inverse Problems Through Local Variational Filtering

Patricia Lamm, Michigan State University, USA

11:30-11:55 Lp Parameter Differentiability in Diffuse Optical Tomography

Taufiquar R. Khan, Clemson University, USA

12:00-12:25 An Inverse Problem Involving Words

Fadil Santosa, University of Minnesota, USA

* This presentation is included in the proceedings

Wednesday, July 10

MS36

Turnpike Phenomenon and Averaging in Optimal Control

10:30 AM-1:00 PM

Room:Sheffield

The minisymposium includes five talks which will be given by well-known experts in the area. In the first talk A. J. Zaslavski presents necessary and sufficient conditions for turnpike properties of solutions for a large class of discrete-time optimal control systems. In the second talk A. Festa applies a decomposition technique for multi-agent pursuit evasion games. In the third talk V. Gaitsgory considers singularly perturbed optimal control problems by using averaging approaches and linear programming. In the fourth talk E. Ocana discusses a turnpike property for a one-dimensional infinite horizon variational problem, where the integrand is linear with respect to the velocity. In the last talk S. Rauski considers high dimensional nonlinear optimization on WORHP.

Organizer: Alexander J. Zaslavski

Technion Israel Institute of Technology, Israel

10:30-10:55 Necessary and Sufficient Conditions for Turnpike Properties of Solutions of Discrete-Time Optimal Control Systems

Alexander Zaslavski, Technion Israel Institute of Technology, Israel

11:00-11:25 A Decomposition Technique for Multi-agent Pursuit Evasion Games

Adriano Festa and Richard B. Vinter, Imperial College London, United Kingdom

11:30-11:55 Linear Programming and Averaging Approaches to Singularly Perturbed Optimal Control Problems

Vladimir Gaitsgory, University of South Australia, Australia

12:00-12:25 Explicit Solutions for Singular Infinite Horizon Calculus of Variations

Eladio Ocana, Instituto De Matematica y Ciencias Afines, Peru

12:30-12:55 Results and Experiments of LMBFGS in High Dimensional nonlinear optimization on WORHP

Sonja Rauski, University of Bremen and Astos Solutions GmbH, Germany

Wednesday, July 10

MS37

Causal Algorithms for Optimal Control Problems - Part III of III

10:30 AM-11:30 AM

Room:Sunset

For Part 2 see MS20

Fast Marching and Ordered Upwind Methods are efficient (non-iterative) algorithms for solving discretizations of Hamilton-Jacobi PDEs arising in continuous optimal control problems. Their logic mirrors the classical Dijkstra's method for shortest path problems on graphs. In the discrete setting, Dijkstra's has been modified to restrict the computational domain (e.g., the A*-method) and to allow for dynamic replanning (e.g., the D*-type methods), while other related (label-correcting) algorithms were found more suitable for parallelization. This minisymposium focuses on challenges of extending these ideas to the continuous setting. We will also consider the computational cost implications of inhomogeniety, anisotropy, and time-dependence of the controlled dynamics.

Organizer: Alexander Vladimirsky

Cornell University, USA

Organizer: Ian M. Mitchell

University of British Columbia, Canada

10:30-10:55 Simplicial A* Algorithm for Optimal Feedback Planning

Dmitry Yershov and Steven LaValle, University of Illinois at Urbana-Champaign, USA

11:00-11:25 Causal Domain Restriction Techniques

Zachary D. Clawson, Cornell University, USA

Wednesday, July 10

MS38

Computational Issues in Nonlinear Control

10:30 AM-12:30 PM

Room:Brittany

Computational mathematics has long been recognized as a powerful tool to penetrate the barrier of nonlinearity and complexity in dynamical systems. It plays increasingly important role in modern control systems. This minisymposium consists of experts on several issues of computational mathematics in control theory. Topics to be presented include an overview of challenges in computational nonlinear control in AFOSR programs, the computation of observability for numerical weather prediction, sum-of-square approach to the synthesis of hybrid systems, and approximate solutions for HJB equations with state-constraints. The topics are attractive to a wide spectrum of researchers from computational mathematics and control theory.

Organizer: Wei Kang

Naval Postgraduate School, USA

Organizer: Murat Arcak

University of California, Berkeley, USA

10:30-10:55 Challenges in Computational Nonlinear Control Theory: An Overview

Fariba Fahroo, Air Force Office of Scientific Research, USA

11:00-11:25 Partial Observability for the Shallow Water Equations *

Sarah King, Naval Research Laboratory, USA; Wei Kang, Naval Postgraduate School, USA; Liang Xu, Naval Research Laboratory, USA

11:30-11:55 Sum-of-Squares Approach to Synthesis of Switching Guards in Hybrid Systems

Murat Arcak and *Sam Coogan*, University of California, Berkeley, USA

12:00-12:25 The Hamilton-Jacobi Bellman Approach for Solving State-Constrained Optimal Control Problems

Olivier Bokanowski, LJLL (Lab. Jacques-Louis Lions, Univ. Paris 7) and COMMANDS (Inria Saclay), France

* This presentation is included in the proceedings

Wednesday, July 10

MS39

Variational Analysis in Dynamics and Control - Part II of II

10:30 AM-12:30 PM

Room:Eaton

For Part 1 see MS28

Variational analysis is now a mature and broad area of mathematics, which grew out of calculus of variations and subsumes convex, set-valued, and non-smooth analysis. It has seen important motivation from and applications in optimization and optimal control. This minisymposium highlights other uses of variational analysis in dynamical and control systems, especially beyond optimal control. Convex duality in stability analysis of constrained systems; set-valued mappings and selections for stochastic dynamics; controllability of reachable sets; nonsmooth analysis of Lyapunov functions; multivalued dynamics, constraints, and robustness in switching and hybrid systems; and similar topics will be presented.

Organizer: Rafal Goebel

Loyola University of Chicago, USA

10:30-10:55 Variational Analysis and Stochastic Hybrid Systems

Andrew Teel, University of California, Santa Barbara, USA

11:00-11:25 Distributed Continuous-Time Dynamics for Linear Programming

Dean Richert and Jorge Cortes, University of California, San Diego, USA

11:30-11:55 Hybrid Control Systems and Variational Analysis

Ricardo G. Sanfelice, University of Arizona, USA

12:00-12:25 Extensions of Chronological Calculus and Chow-Rashevskii Theorem in Infinite Dimensions

Robert J. Kipka and Yuri S. Ledyaev, Western Michigan University, USA

Wednesday, July 10

MS40

Stochastic Control and Financial Methods

10:30 AM-12:30 PM

Room:Towne

Techniques from stochastic control have been successfully applied in the solution of many fundamental problems in mathematical finance. In this minisymposium we shall intent to present some recent developments in mathematical finance, putting special emphasis in the role of stochastic control in their solutions. I have selected four speakers, where most of them have good experience in both fields. I also tried to have a balance between different models applied to solve problems related with optimal consumption, valuation of derivatives and optimal payment of dividends.

Organizer: Daniel Hernandez-Hernandez

Centro de Investigacion en Matematicas, Mexico

10:30-10:55 On HJB Equation for a Finite Time Optimal Consumption Problem

Shuenn-jyi Sheu, National Central University, Taiwan

11:00-11:25 The Valuation of Banxico Put Option

Erick Treviño-Aguilar, University of Guanajuato, Mexico

11:30-11:55 Shadow Prices and Well Posedness in the Problem of Optimal Investment and Consumption with Transaction Costs

Mihai Sirbu, University of Texas at Austin, USA; Jin Hyuk Choi, Carnegie Mellon University, USA; Gordan Zitkovic, University of Texas at Austin, USA

12:00-12:25 Existence of the Value Function for Controlled Two-Dimensional Lévy Processes

Harold Moreno-Franco, CIMAT, Mexico

Wednesday, July 10

MS41

Mathematical Issues in Model Predictive Control

10:30 AM-12:30 PM

Room:Stratford

Model Predictive Control (MPC) has proven its value in thousands of successful applications. Many more applications would be possible if techniques for insuring robustness, for dealing with the effects of stochastic noise and disturbances, and for rapid computation of demonstrably correct solutions to the underlying optimization problems could be developed. The talks in this session, all by leaders in the field and their collaborators, will present very recent results on each of these issues. More specifically, the first talk will deal with robustness, the second with computation, and the last two with stochastic effects.

Organizer: William S. Levine
University of Maryland, College Park, USA

Organizer: Sasa Rakovic
University of Oxford, United Kingdom

10:30-10:55 On the Inherent Robustness of Suboptimal Model Predictive Control
James Rawlings, University of Wisconsin, Madison, USA; Gabriele Pannocchia, University of Pisa, Italy; Stephen Wright, University of Wisconsin, USA

11:00-11:25 Online Computation of Backwards-Reachable Sets for Robust Linear Discrete-Time MPC
Mark Cannon, Johannes Buerger, and Basil Kouvaritakis, University of Oxford, United Kingdom

11:30-11:55 Separable Prediction Structures in Model Predictive Control Under Uncertainty
Sasa Rakovic, University of Oxford, United Kingdom

12:00-12:25 Stability Robustness in Stochastic Model Predictive Control That Generates Discontinuous Feedbacks
Sergio Grammatico, ETH Zürich, Switzerland; *Anantharaman Subbaraman* and Andrew Teel, University of California, Santa Barbara, USA

Wednesday, July 10

CP16

Observer Design and Its Applications

10:30 AM-12:00 PM

Room:Ascot

Chair: Jason Scott, North Carolina State University, USA

10:30-10:55 Observer Based Fault Detection in Differential Algebraic Equations *
Jason Scott and Stephen L. Campbell, North Carolina State University, USA

11:00-11:25 Observer-Based Feedback Control of a Mathematical Model of Intimal Hyperplasia *
Jiacheng Wu and Kevin W. Cassel, Illinois Institute of Technology, USA

11:30-11:55 Functional Observers for Nonlinear Systems
Costas Kravaris, University of Patras, Greece

* This presentation is included in the proceedings

Wednesday, July 10

CP17

Optimal Control II

10:30 AM-12:00 PM

Room:Clarendon

Chair: Nikolai Krivulin, St Petersburg State University, Russia

10:30-10:55 Tropical Optimization Problems: Solution Methods and Application Examples
Nikolai Krivulin, St Petersburg State University, Russia

11:00-11:25 On the Integer Max-Linear Programming Problem
Marie Maccaig, University of Birmingham, United Kingdom

11:30-11:55 Equivalence Between Control Problems for Jump-Diffusions and Their Linear Programming Formulation
Rafael Serrano, Universidad del Rosario, Colombia

Wednesday, July 10

CP18

Markov Decision Process and Control

10:30 AM-12:30 PM

Room:Fairfield

Chair: Chin Pang Ho, Imperial College London, United Kingdom

10:30-10:55 Multiresolution Stochastic Optimal Control
Chin Pang Ho, Imperial College London, United Kingdom

11:00-11:25 Conditions for the Existence of Constrained Optimal Policies for Discounted Markov Decision Processes
Tomas Prieto-Rumeau, Universidad Nacional de Educación a Distancia, Spain; *François Dufour*, INRIA Bordeaux Sud-Ouest, France

11:30-11:55 Optimal Control of Weakly Connected Markov Random Fields
Sei Howe, Imperial College London, United Kingdom

12:00-12:25 A Sufficient Condition for Stochastic Stability
Holly P. Borowski and Jason Marden, University of Colorado Boulder, USA; David Leslie, University of Bristol, United Kingdom; Eric Frew, University of Colorado Boulder, USA

Wednesday, July 10

CP19

Control and Decision-Making through Networks

10:30 AM-12:00 PM

Room:Esquire

Chair: Quanyan Zhu, University of Illinois at Urbana-Champaign, USA

10:30-10:55 Toward a Theory of Multi-Resolution Games
Quanyan Zhu and Tamer Basar, University of Illinois at Urbana-Champaign, USA

11:00-11:25 The Origin of Control of Complex Networks
Justin Ruths, Singapore University of Technology & Design, Singapore; Derek Ruths, McGill University, Canada

11:30-11:55 Risk-Averse Control with Time-Delay Compensation for Networked Stochastic Systems Subject to Communication Channel Constraints
Khanh D. Pham, Air Force Research Laboratory, USA

Lunch Break

12:30 PM-2:00 PM

Attendees on their own

Wednesday, July 10

Past President's Address:

Chebfun

2:00 PM-3:00 PM

Room:Town & Country

Chair: Irene Fonseca, Carnegie Mellon University, USA

Chebfun is a Matlab-based open-source software project for "numerical computing with functions" based on algorithms related to Chebyshev polynomials. In recent years developing Chebfun has been my main research activity, together with the closely linked project of writing the book *Approximation Theory and Approximation Practice* (SIAM 2013). This talk will present some highlights of the Chebfun endeavor and will be followed by a two-part Chebfun minisymposium.

Nick Trefethen
Oxford University, United Kingdom

Wednesday, July 10

W. T. and Idalia Reid Prize in Mathematics Lecture:

Solvability for Stochastic Control Problems

3:00 PM-3:30 PM

Room:Town & Country

Chair: Irene Fonseca, Carnegie Mellon University, USA

Some stochastic control problems for continuous time systems are described where optimal controls and optimal costs can be explicitly determined by a direct method. The applicability of this method is demonstrated by examples including the linear quadratic control problem with the system driven by an arbitrary noise process with continuous sample paths, a controlled Brownian motion in a symmetric space and the linear exponential quadratic Gaussian control problem. The problems for linear systems can be modified to allow for equations in an infinite dimensional Hilbert space that describe stochastic partial differential equations.

Tyrone E. Duncan
University of Kansas, USA

Coffee Break

3:30 PM-4:00 PM

Room:Golden West/California

Wednesday, July 10

MS44

The Traveling Salesman Problem and its Applications

4:00 PM-6:00 PM

Room:Sheffield

The traveling salesman problem (TSP) calls for the minimum-length Hamiltonian cycle through a prescribed set of cities/waypoints. The problem arises in diverse applications that include camera tracking, data collection, drilling, and path planning for autonomous vehicles, among many others. This session will concentrate on novel techniques for solving the TSP and efficient algorithms that utilize TSP solvers. In particular, we will construct novel heuristics for the TSP that are better than state-of-the art approaches. Additionally, we will demonstrate the utility of using the TSP in novel applications in planning and control for autonomous systems.

Organizer: Tuhin Sahai
United Technologies Research Center, USA

4:00-4:25 Procrustes Based Approximations to the Traveling Salesman Problem
Tuhin Sahai and Stefan Klus, United Technologies Research Center, USA; Michael Dellnitz, University of Paderborn, Germany

4:30-4:55 Stochastic and Dynamic Vehicle Routing Problems in Robotics and Transportation Systems
Emilio Frazzoli, Massachusetts Institute of Technology, USA

5:00-5:25 Autonomous Data Collection in Underwater Sensor Networks
Geoffrey A. Hollinger, Urbashi Mitra, and Gaurav Sukhatme, University of Southern California, USA

5:30-5:55 Efficient Tracking and Pursuit of Moving Targets by Heuristic Solution of the Traveling Salesman Problem
Brendan Englot, and Tuhin Sahai, United Technologies Research Center, USA

Wednesday, July 10

MS45

Numerical Analysis for Optimal Control of Parabolic PDEs

4:00 PM-6:00 PM

Room:Sunset

In the past years, many new results were contributed to the numerical analysis of optimal control problems for elliptic PDEs. In particular, the error analysis for the numerical approximation of such control problems was discussed extensively. Recently, the case of parabolic equations received more attraction again. This minisymposium reflects some related investigations. Parabolic problems of semi-infinite type, point controls, gradient state constraints, and the control of travelling wave fronts are discussed. Main emphasis is laid on numerical approximations and the associated error analysis. Moreover, results on the application of numerical methods and model reduction will be presented.

Organizer: Fredi Tröltzsch
Technical University of Berlin, Germany

4:00-4:25 Optimal Control Methods for the Schlögl Model
Fredi Tröltzsch and Christopher Ryll, Technical University of Berlin, Germany

4:30-4:55 A Priori Error Estimates for Parabolic Optimal Control Problems with Pointwise Controls
Dmitriy Leykekhman, University of Connecticut, USA; Boris Vexler, Technische Universität München, Germany

5:00-5:25 On a Class of Semi-Infinite Optimization Problems Arising in Pde-Constrained Optimal Control
Ira Neitzel, Technische Universität München, Germany

5:30-5:55 Adjoint Consistent Gradient Computation with the Damped Crank-Nicolson Method
Christian Goll and Rolf Rannacher, Heidelberg University, Germany; *Winnifried Wollner*, University of Hamburg, Germany

Wednesday, July 10

MS46

Recent Advances in L1 Adaptive Control: Theory and Application

4:00 PM-6:00 PM

Room:Brittany

L1 adaptive control has established itself as a promising tool in the area of robust adaptive control. It guarantees predictable transient performance for uncertain control systems through fast adaptation, without the loss of robustness. This section discusses the most recent results on L1 adaptive control with the applications in unmanned vehicles and anesthesia. The authors are from US and Denmark. The minisymposium is attractive to audience from various areas, including robust control, adaptive control, cooperative control, flight control systems, and medical systems etc.

Organizer: Xiaofeng Wang
University of South Carolina, USA

Organizer: Naira Hovakimyan
University of Illinois at Urbana-Champaign, USA

Organizer: Chengyu Cao
University of Connecticut, USA

4:00-4:25 L1Simplex for Co-Stability in Computer-Controlled Systems
Xiaofeng Wang, University of South Carolina, USA

4:30-4:55 Regulation of Anesthesia Delivery via ℓ1-Adaptive Control *
Evgeny Kharisov and Carolyn Beck, University of Illinois at Urbana-Champaign, USA; Marc Bloom, New York University, USA

5:00-5:25 $\ell 1$ Adaptive Control of High Speed Personal Watercraft
Roberto Galeazzi, Technical University of Denmark, Denmark; Niels Ole Holck, Image House, Denmark; Casper Svendsen, MAN Diesel & Turbo, Denmark; Lukas R. S. Theisen and Mogens Blanke, Technical University of Denmark, Denmark

5:30-5:55 Cooperative Control for Flocking of Mobile Agents Using L1 Adaptive Architecture
Jie Luo and *Chengyu Cao*, University of Connecticut, USA

* This presentation is included in the proceedings

Wednesday, July 10

MS47

Game Theory and Max-Plus/ Tropical Methods

4:00 PM-6:00 PM

Room:Eaton

We address several issue in game theory, both stochastic and deterministic, and in application of max-plus/tropical analysis to systems theory.

Organizer: William M. McEneaney
University of California, San Diego, USA

Organizer: Stephane Gaubert
INRIA and CMAP, Ecole Polytechnique, France

4:00-4:25 The Principle of Least Action and Solution of Two-Point Boundary Value Problems on a Limited Time Horizon *
William M. McEneaney, University of California, San Diego, USA; Peter Dower, University of Melbourne, Australia

4:30-4:55 Stochastic Games, Nonexpansive Operators and O-Minimal Structures
Guillaume Vigeral, Université Paris Dauphine, France; Jérôme Bolte, Université Toulouse I, France; Stéphane Gaubert, INRIA Saclay and CMAP Ecole Polytechnique, France

5:00-5:25 Informational Issues in Deterministic Dynamic Games
Meir Pachter, Air Force Institute of Technology, USA

5:30-5:55 Max-Plus Methods for Optimal Attitude Estimation on So(3)
Srinivas Sridharan, University of California, San Diego, USA

* This presentation is included in the proceedings

Wednesday, July 10

MS48

Stochastic Dynamic Games

4:00 PM-6:00 PM

Room:Towne

This minisymposium is mainly concerned with stochastic dynamic games. It includes talks on robust (or minimax) control of stochastic differential systems, and zero-sum discrete-time Markov games in which the payoff function depends on parameters unknown to one of the players. It also includes a talk on Markov decision processes. All of the topics involved are part of very active research areas.

Organizer: Onesimo Hernandez-Lerma
CINVESTAV-IPN, Mexico City, Mexico

Organizer: Vassili Kolokoltsov
University of Warwick, United Kingdom

Organizer: William McEneaney
University of California, San Diego, USA

4:00-4:25 Stochastic Differential Games Against Nature: An Application to Optimal Control with Unknown Parameters
Hector Jasso-Fuentes, CINVESTAV-IPN, Mexico City, Mexico

4:30-4:55 Stochastic Games Against Nature: Applications to Finance
Vassili Kolokoltsov, University of Warwick, United Kingdom

5:00-5:25 Average Optimal Strategies for Zero-Sum Markov Games with Poorly Known Payoff Function on One Side
J. Adolfo Minjarez-Sosa and Fernando Luque-Vásquez, Universidad de Sonora, Mexico

5:30-5:55 The Hamiltonian Cycle Problem and Markov Decision Processes
Jerzy Filar, Flinders University, Australia

Wednesday, July 10

MS49

New Developments in Stochastic Analysis, Control, and Their Applications

4:00 PM-6:00 PM

Room:Stratford

This minisymposium features new developments in stochastic analysis, control, modeling, quick detection, and their applications. The invited speakers will be presenting results in mean filed growth model, quickest detection with correlated noise, optimal investment and consumption in regime-switching model and a measure approach to impulse control problems in the minisymposium. It is anticipated that this minisymposium will help to exchange ideas and stimulate future collaborations between the participants.

Organizer: Chao Zhu

University of Wisconsin, Milwaukee, USA

4:00-4:25 A Mean Field Stochastic Growth Model and Its Out-of-Equilibrium Behavior

Minyi Huang, Carleton University, Canada

4:30-4:55 Quickest Detection and Sequential Classification in Systems with Correlated Noise

Olympia Hadjiliadis, City University of New York, Brooklyn, USA

5:00-5:25 Apply Stochastic Optimal Control to Investment and Consumption Problems with Regime-Switching

Ruihua Liu, University of Dayton, USA

5:30-5:55 A Measure Approach to Impulse Control Problems

Richard Stockbridge, University of Wisconsin, Milwaukee, USA; Kurt Helmes, Humboldt University Berlin, Germany; Chao Zhu, University of Wisconsin, Milwaukee, USA

Wednesday, July 10

CP20

Control System Applications IV

4:00 PM-5:30 PM

Room:Dover

Chair: Ilaria Xausa, Volkswagen, Germany

4:00-4:25 Multi-Agent Consensus Control with Communication Delay: Control Design and Application to a Three Nonholonomic Robot System

Wei Qiao and *Rifat Sipahi*, Northeastern University, USA

4:30-4:55 Delay-Independent Stable Control Design for Linear Time Invariant (LTI) Systems with Multiple Uncertain Delays; Theory and Experiments

Payam M. Nia and Rifat Sipahi, Northeastern University, USA

5:00-5:25 Applications of Reachable Sets to Driver Assistance Systems

Ilaria Xausa, Volkswagen, Germany; Robert Baier, University of Bayreuth, Germany; Olivier Bokanowski, Université Paris-Diderot, France; Matthias Gerdts, Universität der Bundeswehr München, Germany

Wednesday, July 10

CP21

Control of Partial Differential Equations II

4:00 PM-5:30 PM

Room:Ascot

Chair: Siu Pang Yung, University of Hong Kong, Hong Kong, PRC

4:00-4:25 Exponential Stability for a One-Dimensional Thermoviscoelastic System with Dirichlet Boundaries

Siu Pang Yung, University of Hong Kong, Hong Kong, PRC

4:30-4:55 Existence and Approximate Controllability of Stochastic Semilinear Reaction Diffusion Systems

Muthukumar Palanisamy and Rajivganthi C, Gandhigram Rural University, India

5:00-5:25 Fast Optimal Control of Asymmetric Flow Field Flow Fractionation Processes *

Tigran Nagapetyan, Fraunhofer Institut ITWM, Kaiserslautern, Germany; Rene Pinnau, Technische Universität Kaiserslautern, Germany; Nadir Bayramov, RICAM, Austrian Academy of Sciences, Austria

* This presentation is included in the proceedings

Wednesday, July 10

CP22

Optimal Control III

4:00 PM-6:00 PM

Room:Clarendon

Chair: C.H. Jeffrey Pang, National University of Singapore, Singapore

4:00-4:25 Second-Order Sufficient Conditions for Optimal Control of Elastoplasticity
Thomas Betz and Christian Meyer, TU Dortmund, Germany

4:30-4:55 Subdifferential Analysis of Differential Inclusions Via Discretization
C.H. Jeffrey Pang, National University of Singapore, Singapore

5:00-5:25 Lossless Convexification for a Class of Optimal Control Problems with Linear State Constraints
Matthew W. Harris and Behcet Acikmese, University of Texas at Austin, USA

5:30-5:55 Groebner Basis Computation of Feedback Control for Time Optimal State Transfer
Deepak Patil, Ameer Mulla, and *Debraj Chakraborty*, Indian Institute of Technology, India

Wednesday, July 10

CP23

Stability and Lyapunov Function

4:00 PM-6:00 PM

Room:Fairfield

Chair: Nobusumi Sagara, Hosei University, Japan

4:00-4:25 On Lie-Algebraic Reliable Stability Conditions for Multi-Channel Systems
Getachew K. Befekadu, Vijay Gupta, and Panos Antsaklis, University of Notre Dame, USA

4:30-4:55 Uniform Almost Sure Asymptotic Stabilization Problems by Adding Multi-Dimensional Wiener Processes
Yuki Nishimura, Kagoshima University, Japan

5:00-5:25 The Purification and Bang-Bang Principles in Infinite Dimensions: Additional Characterizations of the Saturation Property
Nobusumi Sagara, Hosei University, Japan; M. Ali Khan, Johns Hopkins University, USA

5:30-5:55 Stabilization of the Korteweg De Vries Equation
Steve Taylor, University of Auckland, New Zealand

Wednesday, July 10

CP24

Control on Networked Domain

4:00 PM-5:30 PM

Room:Esquire

Chair: Azwirman Gusrialdi, University of Central Florida, USA

4:00-4:25 Accessing the Role of Communication Link and Node Robustness in Interconnected Systems Via Eigenvalue Sensitivity *
Azwirman Gusrialdi and Zhihua Qu, University of Central Florida, USA

4:30-4:55 On Multi-Input Controllable Linear Systems Under Unknown Periodic DoS Jamming Attacks *
Hamed Shisheh Foroush and Sonia Martinez, University of California, San Diego, USA

5:00-5:25 The Method of Moments for Optimal Switching Topology Networks
Eduardo Mojica-Nava, Jimmy Salgado, and Duvan Tellez, Universidad Católica de Colombia, Colombia

Intermission

6:00 PM-6:15 PM

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* This presentation is included in the proceedings

Wednesday, July 10

I. E. Block Community Lecture:

From Razor Clams to Robots: The Mathematics Behind Biologically Inspired Design

6:15 PM-7:15 PM

Room:Town & Country

Chair: Irene Fonseca, Carnegie Mellon University, USA

Many natural systems have evolved to perform certain tasks -- climbing, sensing, swimming -- as perfectly as possible within the limits set by the laws of physics. This observation can be used both to guide engineering design, and to gain insights into the form and function of biological systems. In this talk we will consider both of these themes in the context of crawling snails, digging clams and swimming microorganisms. We will discover how an analysis of the physical principles exploited by snails and clams leads to the development of novel robotic diggers and crawlers, and explore the role of mathematics in the design, control, and assessment of unconventional robotic systems.

Anette Hosoi
Massachusetts Institute of Technology, USA

Community Reception

7:15 PM-8:15 PM

Room:Grand Plaza Fountain Court

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