

PANAGIOTIS TSIOTRAS  
School Aerospace Engineering  
Institute for Robotics and Intelligent Machines  
Georgia Institute of Technology  
Atlanta, GA 30332-0150  
<http://www.ae.gatech.edu/people/ptsiotra/>  
<http://www.ae.gatech.edu/labs/dcsI/>

## I. Earned Degrees

Ph.D. Aeronautics and Astronautics, Purdue University, 1993  
M.S. Mathematics, Purdue University, 1992  
M.S. Aerospace Engineering, Virginia Tech, 1987  
Eng.Dipl. Mechanical Engineering, National Technical Univ., Athens, Greece, 1986 (top 1%)

## II. Professional Experience

Georgia Institute of Technology, Atlanta, Georgia  
Institute for Robotics and Intelligent Machines  
*Associate Director for Research*, 2016–

Georgia Institute of Technology, Atlanta, Georgia  
School of Aerospace Engineering  
*College of Engineering Dean's Professor*, 2012–

In recognition for accomplishments and contributions to the School of Aerospace Engineering and the aerospace profession.

*Professor*, 2005–

Research in the areas of wavelet optimization, multiple-rendezvous servicing of satellite constellation, autonomous aerial and ground vehicle guidance, experimental vision-based automated rendezvous and docking in space. Main funding sources include NSF, ARO, AFOSR, NASA, NRO, AFRL, DARPA, ARL, Ford Motor Co. Principal investigator of MURI award "Neuro-Inspired Adaptive Perception for Agile Mobility of Autonomous Ground Vehicles," from ARO.

*Associate Professor*, 1998–2005

Research in the areas of active magnetic bearing control design, high-speed vehicles, spacecraft control, friction modeling. Main funding sources include NSF, NASA, ARO, AFOSR, AFRL and private industry. Granted tenure in March 2001.

*Director*, Dynamics and Control Systems Laboratory, 1998–

Supervised research and educational programs both at graduate and undergraduate level in the area of Dynamics and Controls. Research in the area of control of nonlinear systems emphasizing mechanical and aerospace applications.

Massachusetts Institute of Technology, Cambridge, Massachusetts  
Laboratory for Information and Decision Systems

Visiting Scholar, 2014–2015

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California  
Mobility and Robotic Systems Section, Autonomous Systems Division

Summer Visiting Faculty Fellow, June 2014 and June 2016

Ecole Nationale Supérieure des Mines de Paris, Paris, France  
Centre Automatique et Systèmes

Visiting Research Scholar, May 2003–July 2003

Conducted research in the use of wavelets for control applications; in collaboration with Dr. F. Chaplais.

INRIA, Rocquencourt, France

Control of Complex Systems Group (SOSSO Projet)

Visiting Research Scholar, September 2002–May 2003

Conducted research in modeling and short-term control of the cardiovascular system; in collaboration with Dr. M. Sorine.

Visiting Research Scholar, November–December 2000

Conducted research in the area of time-delayed linear, parameter-varying systems; in collaboration with Dr. P.-A. Bliman.

School of Engineering and Applied Science, University of Virginia, Charlottesville, Virginia  
Department of Mechanical and Aerospace Engineering

Assistant Professor, 1994–1998

Research in the areas of spacecraft control, nonholonomic motion planning, active magnetic bearing control, inverse optimality and passivity-based control for aerospace applications. Main funding sources included NSF, NASA and private industry. Received the NSF Faculty Early Career Development (CAREER) Award.

Director, Dynamics and Control Systems Laboratory, 1996–1998

Developed laboratory through NSF CAREER Award. Supervised research and educational programs both at graduate and undergraduate level in the area of Dynamics and Controls.

Purdue University, West Lafayette, Indiana  
School of Aeronautics and Astronautics

Post-Doctoral Fellow, 1993–1994

Worked on developing robust and optimal control for rotating bodies. Performance requirements were measured in the  $\mathcal{L}_2$  sense (with Dr. M. Corless and Dr. M. Rotea).

Research Assistant, 1989–1993

Developed analytic solutions for the equations of spinning rigid bodies for the case of constant and time-varying, body-fixed torques. Developed new kinematic formulations for the attitude kinematics and new control laws for underactuated rotating vehicles (with Dr. J. Longuski).

Teaching Assistant, 1989–1991

Assisted in teaching courses on *Analytical Dynamics* and *Vibrations*.

Virginia Polytechnic Institute and State University, Blacksburg, Virginia  
Interdisciplinary Center of Applied Mathematics

Research Associate, 1989

Worked on closed-loop feedback laws for on-board trajectory guidance for the Advanced Launch System (ALS) using singular perturbations (with Dr. Eugene Cliff).

Department of Aerospace and Ocean Engineering

Research Assistant, 1986–1987

Worked on optimal control laws for trajectory optimization for aerospace vehicles. New switching structures were found for the well-studied Goddard problem of a rocket in vertical flight. A new method for determining the optimal switching structure for trajectories with singular arcs was also proposed (with Dr. H. Kelley).

Teaching Assistant, 1986–1987

Assisted in courses on *Astromechanics* and *Stability and Control of Aerospace Vehicles*.

Hellenic Air Force, General Command, Athens, Greece

Computer Programmer, 1987–1988 (during military service)

SYDKRAFT AB (Southern Swedish Power Board), Malmö, Sweden  
Malmö Power Plant, Maintenance and Design Office

Mechanical Engineer, summer 1985

Wrote computer program for component data retrieval from plant database. Designed coal-sampling device.

### III. Teaching

#### A. Individual Student Guidance

##### Current and Past Post-Doctoral Students

Georgios Kotsalis, August 2015–June 2016

Research in the area multi-agent differential games with incomplete and asymmetric information

Michael Kontitsis, August 2013–February 2016

Research in the area of perception-based guidance

Efstathios Bakolas, January 2012–August 2012

Research in the area of path-planning of autonomous vehicles subject to kinodynamic constraints  
Currently, Assistant Professor, Department of Aerospace Engineering,  
University of Texas, Austin, TX.

Raghvendra Cowlagi, May 2011–November 2011 (jointly with MIT Aero-Astro department)

Research in the area of control and perception for wheeled vehicles under abnormal driving conditions. Currently Assistant Professor, Department of Mechanical Engineering  
Worcester Polytechnic Institute, Worcester, MA

Annalisa Scacchioli, March 2008–February 2010

Research in the area of ground vehicle control under abnormal driving conditions  
Currently, visiting Assistant Professor, Mech. Engineering, New York Polytechnic, New York

Dongwon Jung, December 2007–April 2009

Research in the area of emergency trajectory generation for aircraft  
Currently, Assistant Professor at the Korea Aerospace University  
Goyang, South Korea

Efstathios Velenis, May 2006–December 2007

Research in the area of analysis and control of high-speed land vehicles  
Currently Lecturer, Department of Automotive Engineering, Cranfield University, Cranfield, UK

Alexander Lanzon, January 2001–September 2001

Research in the area of robust control of Linear, Parameter Varying (LPV) systems  
Currently Professor, School of Electrical and Electronic Engineering, Univ. of Manchester, UK

Seddik Djouadi, January 1999–January 2000

Research in the area of robust control of Linear, Parameter Varying (LPV) systems  
Currently Associate Professor, Dept. of Electrical Eng. and Comp. Science, Univ. of Tennessee

### Current Graduate Students

Sun Wei

Doctor of Philosophy, advised since August 2011  
Expected graduation date December 2016

Florian Hauer

Doctor of Philosophy, advised since May 2011  
Expected graduation date December 2016

Ioannis Exarchos

Doctor of Philosophy, advised since August 2011  
Expected graduation date December 2016

Changxi You

Doctor of Philosophy, advised since August 2014  
Expected graduation date August 2019

Alfredo Valverde

Doctor of Philosophy, advised since August 2014  
Expected graduation date May 2018

Kazuhide Okamoto

Doctor of Philosophy, advised since January 2015  
Expected graduation date May 2019

Maxim Goldshtein

Doctor of Philosophy, advised since August 2015  
Expected graduation date May 2019

Matthew Brewer

Doctor of Philosophy, advised since August 2016  
Expected graduation date August 2019

Daniel Larsson

Doctor of Philosophy, advised since August 2016  
Expected graduation date August 2021

Mehregan Dor

Doctor of Philosophy, advised since August 2016  
Expected graduation date August 2020

Ramana Venkata

Doctor of Philosophy, advised since August 2016  
Expected graduation date August 2020

Alexandre Damião

Doctor of Philosophy, advised since August 2015  
Expected graduation date August 2019

Jack Ridderhof

Master of Science, advised since May 2016  
Expected graduation date August 2018

#### Previous Graduate Students - Doctoral

1. Jihao Luo (1999), Thesis Title: "Control on Underactuated and Nonholonomic Systems," Currently with Garmin Electronics, Kansas City, MO
2. Jianrong Zhang (co-advisor with C. Knospe) (2000), Thesis Title: "Analysis of Systems with State Delay: A Comparison System Framework," First position after graduation: Lucent Technologies, Boston, MA. Current position unknown.
3. Haijun Shen (2003), Thesis Title: "Optimal Scheduling for Satellite Refueling in Circular Orbits," Currently with Analytical Mechanics and Associates, Inc., Hampton, VA
4. Xiping Zhang (2003), Thesis Title: "Parameter-Dependent Lyapunov Functions and Stability Analysis of Linear Parameter-Dependent Dynamical Systems," First position after graduation: Research Engineer, ASDL, Georgia Institute of Technology. Current position unknown.
5. Hyungjoo Yoon (2004) Thesis Title: "Spacecraft Attitude and Power Control Using Variable Speed CMGs," Currently at the Korea Aerospace Research Institute (KARI), Daejeon, South Korea
6. Brian Wilson (co-advisor with B. Heck) (2004), Thesis Title: "Control Design for Low-Loss Active Magnetic Bearings: Theory and Implementation," Currently with Draper Laboratory, Cambridge, MA.
7. Efstathios Velenis (2006), Thesis Title: "Analysis and Control of High-Speed Autonomous Vehicles," Currently Lecturer, Department of Automotive Engineering, Cranfield University, Cranfield, UK.
8. Dongwon Jung (2007), Thesis Title: "Hierarchical Path Control of a Small Fixed-wing UAV: Theory and Experimental Validation," First position after graduation: Korea Aerospace Research Institute (KARI), Daejeon Korea. Currently Assistant Professor, Aerospace Engineering, Korea Aerospace University.
9. Sachin Jain (2008), Thesis Title: "Multiresolution Strategies for the Numerical Solution of Optimal Control Problems," Currently with Aurora Flight Sciences, Cambridge, MA.
10. Atri Dutta (2009), Thesis Title: "Optimal Cooperative and Non-Cooperative Peer-to-Peer Maneuvers for Refueling Satellites in Circular Constellations," First position after graduation: Research Engineer, Air Transportation Center, Georgia Institute of Technology. Currently, Assistant Professor, Department of Aerospace Engineering, Wichita State University.
11. Raghvendra Cowlagi (2011), Thesis Title: "Hierarchical Motion Planning for Autonomous Aerial and Terrestrial Vehicles," Currently, Assistant Professor, Department of Mechanical and Aerospace Engineering, Worcester Polytechnic Institute.

12. Efsthios Bakolas (2011), Thesis Title: "Optimal Steering for Kinematic Vehicles with Applications to Spatially Distributed Agents," First position after graduation: Assistant Professor, Department of Aerospace Engineering, University of Texas at Austin.
13. Yiming Zhao (2011), Thesis Title: "Efficient And Robust Aircraft Landing Trajectory Optimization," First position after graduation: Mitsubishi Electric Research Laboratories, Cambridge, MA.
14. Nuno Felipe (2014), Thesis Title: "Nonlinear Position and Attitude Control For Satellite Proximity Operations: An Approach Based on Dual Quaternions," First position after graduation: JPL
15. Oktay Arslan (2015), Thesis Title: "Machine Learning and Dynamic Programming Algorithms for Motion Planning and Control," First position after graduation: JPL

#### Previous Graduate Students - Masters

1. Stephen Mason (1997), Thesis Title: "Linear Parameter-Varying Controllers for Magnetic Bearings"
2. Haijun Shen (1998), Thesis Title: "Time-Optimal Control of Axisymmetric Spacecraft with Two Controls"
3. Byungmoon Kim (1999), Project Title: "Experimental Comparison of Controllers for Wheeled Mobile Robots"
4. Alexander Schleicher (1999), Project Title: "Partial Stabilization of a Rigid Body Spacecraft using Two Control Torques"
5. Viktoria Doumchenko (2000), Project Title: "Control of Underactuated Spacecraft"
6. Efsthios Velenis (2000), Project Title: "Low-Bias Control of Active Magnetic Bearings"
7. David Richie (2001), Thesis Title: "Combined Attitude Control and Energy Storage Using VSCMG's"
8. Chandek Park (2002), Project Title: "Numerical Solution of Optimal Control Problems using Wavelets"
9. Ancil Marshal (2002), Project Title: "Control of Underactuated Spacecraft"
10. Caroline Muller (2002), Project Title: "Haar Wavelets Applied to Linear Systems"
11. Arnaud de Nailly (2004), Project Title: "Coordinated Satellite Rendezvous"
12. Debao Zhou (2004), Project Title: "Development of Communication Algorithms Between a Ground Station and the UAV Platform"
13. Kenneth Dienmunsch (2004), Project Title: "Analysis of Low-Bias AMB Control via Describing Function Methods"
14. Atri Dutta (2005), Project Title: "Optimal Peer-to-Peer Refueling Strategies for Satellites in Circular Constellations"
15. Emmanuel Levy (2005), Project Title: "Autopilot Design for a UAV"
16. Mark Hunkele (2005), Project Title: "Relative Vision-Based Range and Attitude Determination"
17. Alexandros Salazar-Kardozo (2006), Thesis Title: "A High-Level Framework for the Autonomous Refueling of Satellite Constellations"
18. Efsthios Bakolas (2007), Thesis Title: "A Hierarchical On-Line Path Planning Scheme using Wavelets"
19. Imon Chakraborty (2011), Project Title: "Time-Optimal Control for Collision Mitigation at Intersections"
20. Daniel Kuheme (2011), Project Title: "Aggressive Maneuvers of Vehicles using Multi-Stage Control"

21. Spyros Zafeiropoulos (2013), Project Title: "Design of a Lane-Tracking Driver Steering Assist System and Its Interaction with a Two-Point Visual Driver Model"
22. Ioannis Exarchos (2013), Project Title: "Two-Player Pursuit-Evasion: An Asymmetric Two Car Game"
23. Su Yeon Choi (2016), Thesis Title: "Automatic Mass Balancing System For The 5-Dof Spacecraft Simulator"
24. Matthew Brewer (2016), Thesis Title: "Partial Synchronization Of Underactuated Satellite Systems"

#### Current Undergraduate Students

- As part of a Vertically Integrated Project (VIP) course on "Active Safety Systems for Autonomous and Semi-Autonomous Vehicles", more than 15 undergraduate students, divided in several teams, participate in research while earning credit. The VIP program is an undergraduate education program by which undergraduate students joining VIP teams earn academic credit for their participation in design/discovery efforts that assist faculty and graduate students with research issues in their areas of expertise (for more details, see [www.vip.gatech.edu](http://www.vip.gatech.edu)). The teams are: multidisciplinary (drawing students from all disciplines on campus); vertically-integrated (maintaining a mix of sophomores through PhD students each semester); and long-term (each undergraduate student may participate in a project for up to three years and each graduate student may participate for the duration of their graduate career).

#### Previous Undergraduate Students

1. Michael McCracken, "Extended Kalman Filter for a Quadrotor," January 2016–May 2016.
2. Dongha, Kang, "Quadrotor Path Optimization with Artificial Potential Field," January 2016–May 2016.
3. Gabriel Nakajima, "Development of Graphical Interfacing with AR Parrot Quadrotor," January 2016–May 2016.
4. Cecilia Liu, "Graphical User Interface for Scaled Autonomous Ground Vehicle Using ROS," January 2016–May 2016.
5. Jaemin Lim, "Trajectory Optimization of Quadcopter by Receding Horizon Differential Dynamic Programming in Discrete Time," January 2016–December 2016.
6. Jack Ridderhof, "Testing ROS with NVIDIA's Jetson Board" January 2016–August 2016.
7. Meet Patel, "Slope Measurement Calibration for Spacecraft Simulator Test Area," May 2014–August 2014.
8. Zach Braun, "Automatic Mass Balancing System for a 5DOF Spacecraft Simulator Platform," January 2014–May 2014.
9. Mateus de Freitas Virgilio Pereira, "Approximate Optimal Trajectory Generation using Gaussian Stochastic Processes," August 2013–May 2014 (exchange student from Federal University Of Minas Gerais, Brasil)
10. Bhanu Kumar, "Consensus Algorithms for Multi-Agent Systems," May 2012–December 2012.
11. Yuan Yuo, "Hardware-in-the-Loop UAV Autopilot," August 2012–December 2012.
12. Chris Richardson, "A Virtual Environment for Autonomous Rendezvous and Docking in Space," May 2012–December 2012, (PURA Undergraduate Research Fellowship)
13. Ricardo Sanz Diaz, "Optimal Aggressive Vehicle Maneuvering," August 2012–December 2012 (exchange student from University of Valencia, Spain).

14. David Miculescu, "An Optimal Control Interface", August 2011-December 2011
15. Johnny Worthy, "Small scale UAV Autopilot," January 2011–August 2011
16. Luis Ignacio Reyes Castro, "Generalized Consensus Algorithms in 2D and 3D Problems," August 2009–May 2011 (REU Undergraduate Research Fellowship).
17. David Chanin, "NorthStar Localization System for a 5dof Spacecraft Simulation Platform," June 2009–August 2009.
18. Daniel Kuheme, "Numerical Optimal Control for Aerospace Applications," May 2008–September 2008 (Dash Undergraduate Research Fellowship).
19. Katie Milway, "An Optical System for High-Resolution Angular Measurement for a 3-Axis Air-Bearing Platform" May 2008–Aug. 2008
20. William Gloss, "Development and Construction for a Small UAV," Sept. 2005–Jan. 2005
21. Sean Tamblyn, "Development and Construction for a Small UAV," May 2005–Aug. 2005.
22. Daniel Jegeman, "Development of PID Controllers for a Small UAV," Sept. 2006–Dec. 2006.
23. Eiji Ozawa, "A Virtual Environment for UAV Autopilot Design," Sept. 2005–May 2006.
24. Jeffrey Staub, "Development of a GUI for a UAV Ground Station," June 2006–Dec. 2006.
25. Phillip Hom, "Development for a Simulink GUI Interface for Simulating a Half-Car Model," May 2006–August 2006.
26. Andrew Earl, "Development and Construction for a Small UAV," March 2005–Dec. 2005.
27. Jason Yu, "Adaptive Wavelet Denoising", August 2005–December 2005.
28. Brandon Lunders, "Application of an Extended Kalman Filter in UAV Autopilot Design," June 2004–May 2005 (PURA Undergraduate Research Fellowship).
29. Aurelien Drevon, "Spacecraft Autonomous Rendezvous and Docking," Aug. 2004–May 2005
30. Maria Galvis, "Autopilot Software Development for a Small UAV," Oct. 2004–May 2005
31. Terry Williams, "Design of an Autopilot for a Radio-Controlled Airplane," Oct. 2003–Dec. 2004.
32. Rebecca Fink, "Design of an Autopilot for a Radio-Controlled Airplane," Oct. 2003–May 2005.
33. Jonathan Moshe, "Design of an Autopilot for a Radio-Controlled Airplane," Oct. 2003–Dec. 2004.
34. David Lambeth, "A MATLAB Interface for Solving Two Point Boundary Value Problems using BNDSCO," NSF - REU research grant, May 2002–Dec. 2002.
35. Kriengsiri Malasri, "Experimental Stiffness Determination of the REVOLVE Active Magnetic Bearing," NSF - REU research grant, March 2002–Aug. 2002.
36. Anne Bergeron, "Computer Interface for Control of Active Magnetic Bearings," NSF - REU research grant, Feb. 2001–April 2002.
37. Aromal Prasannan, "Design of a Crane Experiment for AE4525," NSF - REU research grant, Summer 2001; exchange student from IIT, Madras.
38. Pat Kriengsiri, "Design of a Spacecraft Simulator Facility," NSF - REU research grant, Oct. 2000–Dec. 2001.
39. Emmanuel Witrant, "Applications of Linear Matrix Inequalities in Control," June 2000 – May 2001.
40. Christopher Hanlon, "Aircraft Simulator for AE 3521," NSF - REU research grant, March 1999–Aug. 2000.
41. Ancil Marshal, "Attitude Control of Small Sats using Magneto-torquers," NSF - REU research grant, March 1999–Aug. 2000.



42. Jason Stauch, "Modelling of Geomagnetic Field for an Attitude Control System," Mar. 1999–June 1999.
43. Alejandro Morin, "A Preliminary Design for a Tethered Orbiting Interferometer to Observe High Radio Frequencies," senior thesis, May 1995, Univ. of Virginia.
44. Luke Simpson, "The Design and Modelling of an Attitude Control System for a Forest Fire Detection and Tracking Satellite," senior thesis, March 1995, Univ. of Virginia.
45. Felix Gablis-Reig, "A User-Friendly Environment for Numerical Solution of Optimal Control Problems," NSF - REU research grant, May 1997–Dec. 1997, Univ. of Virginia.
46. Andrew Turner, "Design of Autonomous and Semi-autonomous Aerospace Vehicles," Feb. 1998–Aug. 1998, Univ. of Virginia.
47. Melissa Snee, "Attitude Control of Small Sats using Magneto-torquers," NSF - REU research grant, March 1998–Aug. 1998, Univ. of Virginia.

## B. Other Teaching Activities

### Courses Taught

Georgia Institute of Technology, Atlanta, Georgia  
School of Aerospace Engineering

AE 3500, *Aircraft Flight Mechanics*, W99

AE 8123, *Nonlinear Control Systems*, S99

AE 6580, *Aerospace Nonlinear Control*, F04, S09, S12, S16

AE 6511, *Optimal Guidance and Control*, F99, F01, F05, F07, F10, F11, S14

AE 3521, *Aircraft and Spacecraft Flight Dynamics*, S00, S01, S02, F03, F06, S08, F13, F15

AE 3515, *System Dynamics and Control*, S04, S05, S06, S11

AE 3801, *Classical Control*, S04

AE 6531, *Robust Control I*, S07, S10

AE 3510 *Flight Mechanics and Controls Laboratory*, F98, W99, S99

AE 4525 *Control System Design Laboratory*, S05, F05, F06, F09, F10, S14

AE 4380, *Astronautics*, S01

AE 6530, *Multivariable Linear Control Systems*, F12

AE 8803TSI, *Advanced Nonlinear Control*, S08, F09, F12

School of Engineering and Applied Science, University of Virginia, Charlottesville, Virginia  
Department of Mechanical and Aerospace Engineering

MAE 651, *Linear Automatic Control Systems*, F97

MAE 756/EE 726, *Nonlinear Control Systems*, S95, S97

MAE 692, *Linear State-Space Systems and Control*, F95, F96

MAE 853/EE 823, *Optimal Control Systems*, S96, S98

ENGR 205, *Introduction to Solid Mechanics*, F94

Purdue University, West Lafayette, Indiana  
School of Aeronautics and Astronautics

AAE 507, *Basic Mechanics III*, F89, F90, (Teaching Assistant)

AAE 340, *Dynamics and Vibrations*, S90, (Teaching Assistant)

Virginia Polytechnic Institute and State University, Blacksburg, Virginia  
Department of Aerospace and Ocean Engineering

AOE 4134, *Astromechanics*, S87, (Teaching Assistant)

AOE 3134, *Stability & Control of Aerospace Vehicles*, F86, (Teaching Assistant)

### Courses Developed

School of Aerospace Engineering, Georgia Institute of Technology

#### **AE 3521** *Aircraft and Spacecraft Flight Dynamics*

Four-credit course intended to introduce students in the flight dynamics of spacecraft and aircraft. Topics covered include: review of Keplerian orbits; longitudinal statics and stability; rigid-body rotational kinematics; orientation parameters; rigid-body rotational dynamics; Euler's equations; torque-free motion; effects of energy dissipation; attitude determination and control; spin-stabilization, gravity-gradient stabilization, momentum-bias satellites; attitude sensors and actuators; gyroscopic instruments; static and dynamic stability of aircraft; small disturbance theory; stability derivatives; longitudinal static stability and control; directional stability and control; roll stability and control; stability of uncontrolled motion; stick-fixed longitudinal motion; longitudinal approximations; lateral/yaw modes of motion and approximations; longitudinal and lateral flying qualities.

#### **AE 8123/AE 6580** *Nonlinear Control Systems*

Graduate-level course whose objective is to introduce fundamental concepts and tools for analyzing and controlling nonlinear systems. Topics covered include: nonlinear differential equations and equilibrium points; review of linear stability theory; Lyapunov stability theory;  $\mathcal{L}_p$  spaces and input-output stability; small-gain theorem; relationships between I/O and Lyapunov stability; passivity concepts; absolute stability criteria; singular perturbations; variable structure control; geometric methods; input-to-state and input-output feedback linearization; control design for nonlinear systems.

#### **AE 8803TSI** *Advanced Nonlinear Control*

Advanced research-oriented graduate-level course for students specializing in nonlinear control. Topics covered include: review real analytical and topological concepts; review of Lyapunov stability theory using  $\mathcal{K}$  and  $\mathcal{L}$  functions; nonlinear controllability, accessibility, observability; control Lyapunov functions; input-to-state stability; dissipativity; stabilization of cascade systems; backstepping and forwarding; Jurdjevic-Quinn approach to stabilization; necessary conditions for smooth stabilization, Brockett's condition; control of nonholonomic and underactuated systems; dilations and homogeneous norms; control of homogeneous systems; geometric methods; Lie brackets, Frobenius theorem; zero dynamics and feedback linearization; input-output linearization; center manifold theory; control of singularly perturbed systems; Hamilton-Jacobi theory; inverse optimal control.

### VIP Course on Active Safety for Autonomous Automotive Vehicles

A *Vertically Integrated Project Team (VIP)* was developed to involve undergraduate students in research. The VIP program is an undergraduate education program by which undergraduate students joining VIP teams earn academic credit for their participation in design/discovery efforts that assist faculty and graduate students with research issues in their areas of expertise (for more details, see [www.vip-program.gatech.edu](http://www.vip-program.gatech.edu)). The VIP teams are multidisciplinary (drawing students from all disciplines on campus); vertically-integrated (maintaining a mix of sophomores through PhD students each semester); and long-term (each undergraduate student may participate in a project for up to three years and each graduate student may participate for the duration of their graduate career). The VIP program is supported by a track of three courses, one each at the sophomore, junior and senior levels.

Department of Mechanical and Aerospace Engineering, University of Virginia

#### MAE 692 *Introduction to State-Space Systems and Control*

A dual-level graduate and advanced undergraduate course in the modeling and control of linear systems. The main objective of the course is to introduce the current techniques and tools for the analysis, description and feedback control of multivariable linear systems. Emphasis is given to linear algebra concepts and the use of computer packages (e.g. MATLAB) for the solution of these problems. Topics covered include: models of physical systems; equilibrium points, solutions and linearization; state-space vs. transfer function matrix models; vectors and vector spaces; linear mappings and adjoint operators; eigenvalues, eigenvectors, Jordan normal forms; null space and range of a matrix; linear matrix equations and least squares theory; realizations, Kalman canonical forms; stability, Lyapunov equation; controllability and observability grammians; state feedback; output feedback and observer design; model reduction.

### Laboratory Developed

**DYNAMICS AND CONTROL SYSTEMS LABORATORY.** Through an NSF CAREER award, DCSL was established in 1996 to train both graduate and undergraduate students in the analysis and control of dynamical systems. A variety of software is available (MATLAB, SIMULINK, DSTOOLS, STK, FLIGHT GEAR, etc) running on high-end workstations. Electronic instrumentation includes standard equipment (power supplies, oscilloscopes, function generators, multimeters) and specialized dSPACE 1103 controller boards with the associated software. Experiments include a 15,000 rpm flexible shaft supported on active magnetic bearings, a flywheel supported on active/passive magnetic bearings, a wheeled mobile robot and an unmanned aerial vehicle (UAV) platform. The lab also has a Flight Simulator for evaluating flight control system responses.

**SPACECRAFT ROBOTICS LABORATORY.** Through two AFOSR DURIP awards totalling approximately \$500K, a 5-dof experimental rendezvous and docking facility was established in 2008 in the basement of the Montgomery Knight Building (MK-111). The spacecraft platform floats on a set of three linear and a hemispherical air-bearing, allowing unrestricted translation along the  $x$  and  $y$  axes, and  $\pm 30$  deg rotations about the  $x$  and  $y$  axes, and  $\pm 360$  deg rotation about the  $z$  axis. The test arena, made of hardened epoxy, has dimensions 14 ft  $\times$  14 ft. A plethora of sensors (rate gyros, magnetometer, 3-axes accelerometers, IMU, CCD cameras, lidars) and actuators (12 thrusters, 4 variable speed CMGs) onboard the spacecraft platform allow for the realistic validation of a wide variety of space proximity operations scenarios.

### Instructional Material Developed

AE 4520/AE4525: Feedback Control Systems Lab: An updated, significantly improved, laboratory manual was developed for the laboratory part of the course. A new 3-axis spacecraft simulator was designed and included in the lab series experiments.

AE 3521: Spacecraft and Aircraft Flight Dynamics: An aircraft simulator has been incorporated in the class via funds provided by the School of Aerospace Engineering and the Teaching Fellows Program at GIT.

### Graduate Student Advisory Committees

#### Georgia Institute of Technology

Guangcong Zhang, Doctor of Philosophy/ECE (December 2015)  
 Daniel Magree, Doctor of Philosophy (May 2015)  
 Timothy Wang, Doctor of Philosophy (May 2015)  
 Claus Christmann, Doctor of Philosophy (May 2015)  
 Sang Gyun Park Doctor of Philosophy (August 2014)  
 Duy-Nguyen Ta, Doctor of Philosophy/CS (May 2014)  
 Gaurav Agrawal, Doctor of Philosophy/ChBE (December 2014)  
 Richard Roberts, Doctor of Philosophy/CS (May 2014)  
 Jason Bentley, Doctor of Philosophy/ChBE (May 2013)  
 Brad Steinfeldt, Doctor of Philosophy (December 2013)  
 Clayton Tino, Doctor of Philosophy (May 2013)  
 Yibiao Lu, Doctor of Philosophy/ISyE (December 2012)  
 McClain Evan, Doctor of Philosophy (December 2012)  
 Peter Kingston, Doctor of Philosophy/ECE (May 2012)  
 Michael Grant, Doctor of Philosophy (May 2012)  
 Tansel Yucelen, Doctor of Philosophy (May 2012)  
 Girish Chowdhary, Doctor of Philosophy (December 2010)  
 Konstantyn Volyansky, Doctor of Philosophy (May 2010)  
 Kristina Alemany, Doctor of Philosophy (December 2009)  
 Gidado-Yisa Immanuel, Doctor of Philosophy (May 2009)  
 Qing Hui, Doctor of Philosophy (December 2008)  
 Keumjin Li, Doctor of Philosophy (December 2007)  
 Yoko Watanabe, Doctor of Philosophy (December 2007)  
 Shannon Twigg, Doctor of Philosophy (May 2007)  
 John Huey, Doctor of Philosophy/ME (August 2006)  
 Ali Kutay, Doctor of Philosophy (December 2005)  
 Sergei Nesterov, Doctor of Philosophy (August 2005)  
 Julide Topsakal, Master of Science (May 2005)  
 Gregory Dukeman, Doctor of Philosophy (December 2004)  
 David May, Doctor of Philosophy (May 2002)  
 David W. Way, Doctor of Philosophy (December 2001)  
 Manu Sharma, Doctor of Philosophy (May 2001)  
 Erika Ooten, Master of Science (December 2000)

Irene Budianto, Doctor of Philosophy (August 2000)  
 Joseph Corrado, Doctor of Philosophy (August 2000)  
 Eric Johnson, Doctor of Philosophy (December 2000)  
 Flavio Nardi, Doctor of Philosophy (December 2000)

#### University of Virginia

James Masters, Doctor of Philosophy (August 1998)  
 Edward Weller, Doctor of Philosophy (May 1998)  
 Stephen Fedigan, Doctor of Philosophy (May 1998)  
 Yi Ling, Doctor of Philosophy (Aug. 1998)  
 Xiao Yang, Master of Science (July 1997)  
 Zhenghong Wu, Doctor of Philosophy (May 1997)  
 Ming Tian, Doctor of Philosophy (May 1997)  
 Ravichandran Vancheeswaran, Doctor of Philosophy (May 1996)  
 Shannon Young, Master of Science (May 1996)

#### External Reader

Barbara Savini, Doctor of Philosophy, Polytecnico di Milano (May 2007)

## IV. Scholarly Accomplishments

### A. Books and Book Chapters

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## B. Journal Publications

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#### Journal Publications Under Review

94. Jung, D., and Tsiotras, P., "Path Following Control of a Small UAV via Bank-to-Turn using Backstepping and Parameter Adaptation," *Control Engineering Practice*, (submitted July 2015).
95. Sun, W., and Tsiotras, P., "Sequential Pursuit of Multiple Targets Under External Disturbances via Zermelo-Voronoi Diagrams," *Automatica*, (revision submitted May 2016).
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97. You, C., Lu, J., and Tsiotras, P., "Nonlinear Driver Parameter Estimation and Driver Steering Behavior Analysis for ADAS using Field Test Data," *IEEE Transactions on Human-Machine Systems*, (submitted June 2016).

#### **C. Conference Proceedings**

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166. Filipe, N., and Tsiotras, P., "Adaptive Model-Independent Tracking of Rigid Body Position and Attitude Motion with Mass and Inertia Matrix Identification using Dual Quaternions," *AIAA Guidance, Navigation, and Control Conference*, Boston, MA, August 19–22, 2013 (**best student paper award**), AIAA Paper 2013-5173, doi:10.2514/6.2013-5173
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169. Filipe, N., and Tsiotras, P., "Adaptive Position and Attitude Tracking Controller for Satellite Proximity Operations using Dual Quaternions," *Astrodynamics Specialist Conference*, Hilton Head, SC, August 11–15, 2013, AAS Paper 13-858; also in *Advances in the Astronautical Sciences*, Vol. 150, pp. 2313–2332.
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173. Zhang, G., Vela, P., Tsiotras, P., and Cho, D.-M., "Efficient Closed-Loop Detection and Pose Estimation for Vision-Only Relative Localization in Space with a Cooperative Target," *AIAA Space and Astronautics Forum and Exposition*, San Diego, CA, August 4–7, 2014, AIAA Paper 2014-4262, doi:10.2514/6.2014-4262

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178. Arslan, O., Theodorou, E., and Tsiotras, P., "Information-Theoretic Stochastic Optimal Control via Incremental Sampling-based Algorithms," *IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning*, Orlando, FL, Dec. 9–12, 2014, pp. 71–78, doi:10.1109/ADPRL.2014.7010617
179. Sun, W., Theodorou, E., and Tsiotras, P., "Continuous-Time Differential Dynamic Programming with Terminal Constraints," *IEEE Symposium on Adaptive Dynamic Programming and Reinforcement Learning*, Orlando, FL, Dec. 9–12, 2014, pp. 289–294, doi:10.1109/ADPRL.2014.7010647
180. Valverde, A., Filipe, N., Kontitsis, M. and Tsiotras, P., "Experimental Validation of an Inertia-Free Controller and a Multiplicative EKF for Pose Tracking and Estimation Based on Dual Quaternions," *38th AAS Guidance and Control Conference*, Breckenridge, CO, Jan. 30–Feb. 4, 2015, AAS Paper 2015-017.
181. Hauer, F., Kundu, A., Rehg, J., and Tsiotras, P., "Multi-scale Perception and Path Planning on Probabilistic Obstacle Maps," *IEEE International Conference on Robotics and Automation*, Seattle, WA, May 26–30, 2015, pp. 4210–4215, doi:10.1109/ICRA.2015.7139779
182. Arslan O., and Tsiotras, P., "Dynamic Programming Guided Exploration for Sampling-based Motion Planning Algorithms," *IEEE International Conference on Robotics and Automation*, Seattle, WA, May 26–30, 2015, pp. 4819–4826, doi:10.1109/ICRA.2015.7139869
183. Filipe, N., Kontitsis, M. and Tsiotras, P., "An Extended Kalman Filter for Spacecraft Pose Estimation Using Dual Quaternions," *American Control Conference*, Chicago, IL, July 1–3, 2015, pp. 3187–3192, doi: 10.1109/ACC.2015.7171823
184. Sun, W., and Tsiotras, P., "Pursuit Evasion Game of Two Players under an External Flow Field," *American Control Conference*, Chicago, IL, July 1–3, 2015, pp. 5617–5622, doi:10.1109/ACC.2015.7172219
185. Sun, W., Theodorou, E. and Tsiotras, P., "Game Theoretic Continuous Time Differential Dynamic Programming," *American Control Conference*, Chicago, IL, July 1–3, 2015, pp. 5593–5598, doi:10.1109/ACC.2015.7172215
186. Arslan, O., and Tsiotras, P., "Machine Learning Guided Exploration for Sampling-based Motion Planning Algorithms," *IEEE/RJS International Conference on Intelligent Robots and Systems*, Hamburg, Germany, September 28–October 3, 2015, pp. 2646–2652, doi: 10.1109/IROS.2015.7353738
187. Exarchos, I., Tsiotras, P., and Pachter, M., "UAV Collision Avoidance based on the Solution of the Suicidal Pedestrian Differential Game," *AIAA Guidance, Navigation, and Control Conference*, San Diego, CA, January 4–8, 2016.
188. Kontitsis, M., Tsiotras, P. and Theodorou, E., "An Information-Theoretic Active Localization Approach during Relative Circumnavigation in Orbit," *AIAA Guidance, Navigation, and Control Conference*, San Diego, CA, January 4–8, 2016.

189. Hauer, F., Tsiotras, P., "Reduced Complexity Multi-Scale Path-Planning on Probabilistic Maps," *IEEE International Conference on Robotics and Automation*, Stockholm, Sweden, May 16-21, 2016, pp. 83–88, doi: 10.1109/ICRA.2016.7487119
190. You, C., and Tsiotras, P., "Optimal Two-Point Visual Driver Model and Controller Development for Driver-Assist Systems for Semi-Autonomous Vehicles," *American Control Conference*, Boston, MA, July 6–8, 2016, pp. 5976–5981, doi: 10.1109/ACC.2016.7526607
191. Antonello, A., Carron, A., Carli, R., and Tsiotras, P., and Carron, A., "Performance Analysis of Three Cost Policies for the Control of a Camera in Relative Circumnavigation Scenarios," *International Astronautical Congress*, Guadalajara, Mexico, Sept. 26–30, 2016.
192. Antonello, A., and Tsiotras, P., "Vision Based Attitude Determination Using a Simultaneous Localization and Mapping Algorithm During Relative Circumnavigation of Non-Cooperative Objects," *International Astronautical Congress*, Guadalajara, Mexico, Sept. 26–30, 2016.
193. You, C., Lu, J., and Tsiotras, P., "Driver Parameter Estimation Using Joint E-/UKF and Dual E-/UKF Under Nonlinear State Inequality Constraints," *IEEE Conference on Systems, Man and Cybernetics*, Budapest, Hungary, Oct. 9-12, 2016.
194. Okamoto, K., and Tsiotras, P., "A New Hybrid Sensorimotor Driver Model with Model Predictive Control," *IEEE Conference on Systems, Man and Cybernetics*, Budapest, Hungary, Oct. 9-12, 2016, **((best student paper finalist))**.
195. Brewer, M. J., and Tsiotras, P., "Partial Attitude Consensus for Underactuated Satellites Clusters," *55th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 12–14, 2016.
196. Exarchos, I., Theodorou, E., and Tsiotras, P., "Game-Theoretic and Risk-Sensitive Stochastic Optimal Control via Forward and Backward Stochastic Differential Equations," *55th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 12–14, 2016.
197. Arslan, O., and Tsiotras, P., "Incremental Sampling-based Motion Planners using Policy Iteration Methods," *55th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 12–14, 2016.
198. Sun, W., Theodorou, E., and Tsiotras, P., "Stochastic Game Theoretic Trajectory Optimization In Continuous Time," *55th IEEE Conference on Decision and Control*, Las Vegas, NV, Dec. 12–14, 2016.

## D. Other Publications

### Book Reviews

1. *Dynamics and Control* by G. Leitmann, F. E. Udwardia, and A. V. Kryazhimskii (eds.), Gordon Breach, in *AIAA Journal of Guidance, Control, and Dynamics*, Vol. 25, No. 2, p. 415–416, 2002.
2. *Optimal Control with Engineering Applications* by H. P. Geering, Springer, in *IEEE Control Systems Magazine*, Vol. 31, No. 5, p. 115–117, 2011, doi: 10.1109/MCS.2011.942047.

### Position Papers

1. "Trains, Planes, and Automobiles," (with E. Feron and M. Wolf) *2011 Workshop for Developing Dependable and Secure Automotive Cyber-Physical Systems from Components*, Tory, MI, March 17–18, 2011.
2. "The Case for Passenger Customized Automotive Active Safety Systems: Motivation, Challenges, Opportunities," *2014 National NSF Workshop on Transportation Cyber-Physical Systems*, Arlington, VA, January 22–23, 2014.



## E. Presentations

### Invited Seminars

- Dept. of Eng. Mech. and Astronautics, Univ. of Wisconsin, Madison, WI, April 6, 1993
- Dept. of Aeronautics and Astronautics, Stanford University, Stanford, CA, June 1, 1993
- Dept. of Mechanical and Aerospace Eng., Univ. of California, Irvine, CA, June 7, 1993
- Guidance and Control Branch, Jet Propulsion Laboratory, Pasadena, CA, June 8, 1993
- Dept. of Aerospace Engineering, Univ. of Michigan, Ann Arbor, MI, July 7, 1993
- Dynamics and Controls Branch, NASA LaRC, Hampton, VA, April 7, 1995
- Dept. of Aerospace Eng., Univ. of Illinois, Urbana-Champaign, IL, Sept. 25, 1995
- Dept. of Electrical Engineering, Univ. of Virginia, Charlottesville, VA, Oct. 27, 1995
- Guidance and Control Branch, NASA GSFC, Greenbelt, MD, Nov. 9, 1995
- Electromechanical Systems Branch, NASA GSFC, Greenbelt, MD, Feb. 14, 1996
- Dept. of Mechanical Engineering, Univ. of Maryland, College Park, MD, Sept. 24, 1996
- Guidance and Control Branch, Jet Propulsion Laboratory, Pasadena, CA, Dec. 15, 1997
- Guidance and Control Group, Hughes Space Systems, El Segundo, CA, Dec. 12, 1997
- Dept. of Aerospace and Ocean Eng., Virginia Tech, Blacksburg, VA, Feb. 16, 1998
- Dept. of Aerospace Engineering, Univ. of Michigan, Ann Arbor, MI, May 11, 1998
- Spacecraft Engineering Dept., NRL, Washington, DC, Oct. 14, 1998
- Dept. of Mechanical Engineering, University of Houston, Houston, TX, March 22, 2000
- Controls Group (Projet SOSSO), INRIA Rocquencourt, France, November 27, 2000
- Controls Group (Projet SOSSO), INRIA Rocquencourt, France, November 29, 2000
- Magnetic Bearings Center, ETH Zürich, Switzerland, June 21, 2001
- Centre Autom. et Systemes, Ecole de Mines, Fontainebleau, France, March 15, 2003
- Surrey Space Center, University of Surrey, Guildford, United Kingdom, April 17, 2003
- Centre de Mathématiques Appliquées, Ecole des Mines de Paris, Sophia Antipolis, France, May 12, 2003
- Space Vehicles Directorate, AFRL, Kirtland AFB, Albuquerque, NM, October 14, 2003
- Space Vehicles Directorate, AFRL, Kirtland AFB, Albuquerque, NM, October 15, 2003
- Guid., Nav. and Control Systems Eng., NASA GSFC, Greenbelt, MD, Nov. 18, 2003
- Guid., Nav. and Optimization Branch, NASA MSFC, Huntsville, AL, April 20, 2005
- Dept. of Mechanical and Process Engineering, ETH Zürich, Switzerland, Dec. 20, 2006
- Space Vehicles Directorate, AFRL, Kirtland AFB, Albuquerque, NM, February 16, 2006
- Dept. of Mechanical Engineering, The University of New Mexico, *Mechanical Engineering Excellence Seminar Speaker series*, February 17, 2006
- Dept. of Mechanical and Aerospace Engineering, UCLA, June 9, 2006
- Guidance and Control Branch, Jet Propulsion Laboratory, Pasadena, CA, May 9, 2007
- Dept. of Electrical, Computer and Systems Engineering, Rensselaer Polytechnic Institute, Troy, NY, October 22, 2007.
- Active Safety Group, Ford Motor Company, Dearborn, MI, September 3, 2008.
- Control Systems Laboratory, Department of Mechanical Engineering, National Technical University of Athens (NTUA), Greece, November 27, 2008.

- Dept. of Aerospace Engineering, UIUC, Champaign, IL, October 19, 2009.
- Dept. of Aeronautics and Astronautics, Purdue Univ., West Lafayette, IN, Oct. 20, 2009.
- Dept. of Electrical Engineering and Computer Sciences, University of California at Berkeley, Berkeley, CA, November 3, 2009.
- Decision and Control Seminar Series, Georgia Inst. of Tech., Atlanta, GA, Jan. 22, 2010.
- Air Transportation Center, School of Industrial and Systems Engineering, Georgia Inst. of Tech., GA, April 27, 2010.
- Dept. of Mechanical and Aerospace Engineering, Rutgers University, Oct. 6, 2010.
- Dept. of Mechanical and Aerospace Engineering, Cornell University, Feb. 10, 2012.
- Dept. of Aerospace Engineering, University of Michigan, March 19, 2012.
- Army Research Lab, Vehicle Technology Directory, Aberdeen, Maryland, May 24, 2012
- Centre Automatique et Systèmes, Mines-ParisTech, France, June 13, 2013
- PSA Peugeot-Citroën Research Center, Velizy, France, June 17, 2013.
- Laboratoire d'Analyse et d'Architecture des Systèmes (LAAS), Humanoid Motion Group, Toulouse, France, July 10, 2013.
- Robotics and Mobility Branch, Jet Propulsion Laboratory, Pasadena, CA, June 13 & 18, 2014
- Laboratory of Information and Decision Systems, Inference and Control seminar series, MIT, Cambridge, MA, October 2, 2014.
- Oak Ridge National Laboratory, Knoxville, TN, October 5, 2014.
- ATK Spacecraft Systems and Services, Washington, DC, November 20, 2014.
- Boston University, Center for Information and Systems Engineering, Boston, MA, December 5, 2014.
- The Charles Stark Draper Laboratory, Guidance and Control and Division, December 19, 2014.
- Mitsubishi Electric Research Laboratories, Cambridge, MA, February 3, 2015.
- Department of Mechanical and Aerospace Engineering, Worcester Polytechnic Institute, Worcester, MA, February 4, 2015.
- The Charles Stark Draper Laboratory, Guidance and Control and Division, February 23, 2015.
- Laboratory for Information and Decision Systems, LIDS seminar series, MIT, Cambridge, MA, April 14, 2015.
- United Technologies Research Center, Embedded Systems & Networks Group, Hartford, CT, May 14, 2015.
- Mechanical Engineering, MIT, Cambridge, MA, May 22, 2015.
- Naval Research Laboratory, Washington, DC, August 13, 2015.
- Space Vehicles Directorate, AFRL, Kirtland AFB, Albuquerque, NM, August 19, 2015.
- Institute for Human and Machine Cognition, Pensacola, FL, October 20, 2015.

#### Conference, Workshop and Keynote Presentations

- Tsiotras, P., "The Effect of Coordinates on SO(3) for Attitude Analysis, Stabilization, and Control Problems," *2nd World Congress of Nonlinear Analysis*, Athens, Greece, July 10-17, 1996. (invited).

- Tsiotras, P., "Spacecraft/Aircraft Control under Actuator and Sensor Failures," *Virginia Consortium of Engineering and Sciences Universities Conference*, Old Dominion University, June 11-12, 1997.
- Tsiotras, P., "Control of Energy/Momentum Storage Flywheels," *Virginia Consortium of Engineering and Sciences Universities Conference*, Old Dominion Univ., June 11-12, 1997.
- Tsiotras, P., Djouadi, S., Allaire, P., Bartlett, R., "Robust Control Design for an Active Magnetic Bearing/Flywheel System," *Aerospace Flywheel Workshop*, Glenn Research Center, Cleveland, OH, Oct. 18-20, 1999.
- Tsiotras, P. and Luo, J. "Robust Control of High-Speed Flywheels on Active Magnetic Bearings for Spacecraft Applications," *Space Power Workshop*, Torrance, CA, April 10-13, 2000.
- Luo, J., Tsiotras, P., Djouadi, S., Bartlett, R., Allaire, P., Hilton, E., Schönhoff, U., "Flywheel Battery Magnetic Bearing Controller Design and Verification," *Space Power Workshop*, Torrance, CA, April 10-13, 2000 (invited).
- Tsiotras, P., and Wilson, B. "Zero and Low-Bias AMB Flywheel Control: Theory and Experimental Setup," *Aerospace Flywheel Workshop*, Glenn Research Center, Cleveland, OH, March 14-15, 2002.
- Wilson, B., Tsiotras, P., and Fausz, J., "An Experimental Test-Bed for Low-Loss Control Design of AMBs," *Aerospace Flywheel Workshop*, Fort MacArthur, Los Angeles AFB, CA, Aug. 6-8, 2003.
- Tsiotras, P., "Aggressive Maneuvering of Ground Vehicles over Rough Terrain and Uncertain Environments: Key Issues and Possible Approaches," *ARO/MIT Workshop on Mobility and Control in Challenging Environments*, Olin College, MA, Oct. 5-6, 2006.
- "Advanced Methods for Intelligent Flight Guidance and Planning in Support of Pilot Decision Making," *NASA Aviation Safety Technical Conference*, Denver, CO, Oct. 21-23, 2008.
- Tsiotras, P. and Cowlagi, R., "Achieving Increased Mobility And Autonomy For Ground Vehicles Over Rough Terrain," *26th Army Science Conference*, Orlando, FL, Dec. 1-4, 2008.
- "Robust Aircraft Optimal Trajectory Generation," *Tutorial Workshop on Methods for Optimal Trajectory Design*, *5th International Conference on Research in Air Transportation*, Berkeley, CA, May 22-25, 2012.
- "Robust Aircraft Optimal Trajectory Generation," *5th Aerospace Decision and Control Workshop*, Atlanta, GA, June 11-12, 2012.
- "Fast and Furious: The Next Generation of (Semi-)Autonomously Driving Vehicles," *France-Atlanta Symposium on Optoelectronics and Robotics in Automotive*, Atlanta, GA, October 26, 2012.
- "Linking High-Level Planning Specifications with Low-Level Motion Primitives Using Transition Histories in Cell Decomposition Graphs," R. Cowlagi and P. Tsiotras, *2nd NSF Workshop on Formal Composition of Motion Primitives*, part of the Cyber-Physical Systems Week (CPSWeek) 2013, Philadelphia, PA, April 8, 2013.
- "Robust and Numerically Efficient Aircraft Optimal Trajectory Generation for Emergency Landing," keynote speaker, *2nd International Conference on Interdisciplinary Science for Air Traffic Management*, Toulouse, France, July 8-10, 2013.
- "Real-Time Near-Optimal Feedback Control of Aggressive Vehicle Maneuvers," *Workshop on Optimization and Optimal Control in Automotive Systems*, Linz, Austria, July 15-16, 2013.
- "Intelligent Systems" invited panelist, *Army Science Planning and Strategy Meeting on Intelligent Systems*, Potomac, Maryland, November 12-13, 2013.

- “Advances in Autonomous Vehicle Control,” Workshop on *Intelligent Vehicles*, PSA Peugeot Citroën Technical Center, Vélizy, France, November 14, 2013.
- “Connected Vehicles and Automation,” keynote speaker, *NSF 2014 Transportation CPS Workshop*, Arlington, VA, January 23–24, 2014.
- Arslan, O. and Tsiotras, P., “Machine Learning and Dynamic Programming Algorithms for Motion Planning and Control,” *New England Machine Learning Day*, Microsoft Corporation, Cambridge, MA, May 18, 2015.
- “Towards an Algorithmic Control Theory for Control,” *NSF Workshop on Control, Perception and Learning*, Arlington, VA, August 25–26, 2015.
- Arslan, O. and Tsiotras, P., “Dynamic Programming Principles for Sampling-Based Motion Planners,” *Optimal Robot Motion Planning Workshop in the IEEE International Conference on Robotics and Automation*, Seattle, WA, May 30, 2015.
- “Satisficing Mechanisms for Enabling Real-Time Perception and Action in Vehicle Autonomy,” *ONR Unmanned Maritime Systems Technology Forum*, Miramar Beach, FL, February 1–4, 2016.
- “Computing Optimal Trajectories: From Continuous to Discrete and from Deterministic to Stochastic and Back,” Allerton Conference pre-symposium tutorial, Allerton, IL, September 27, 2016.

## F. Other Scholarly Accomplishments

### Patents

- (a) “Control of Magnetic Bearing-Supported Rotors,” R. Bartlett, P. Tsiotras and P. Alaire, U.S. Patent No. 6,267,876 B1, (issued July 31, 2001).
- (b) “System For Vehicle Control To Mitigate Intersection Collisions And Method Of Using The Same,” J. Lu, P. Prasad, P. Tsiotras, E. Velenis, and D. Filev, US Patent No. 8577550 (issued November 8, 2013).

## V. Service

### A. Professional Contributions

#### Associate Editorships

*Frontiers in Robotics and AI*, Specialty Chief Editor in the area of Space Robotics, 2015–

*AIAA Journal of Guidance, Control, and Dynamics*, special issue on “Computational Guidance and Control,” Guest-Editor, 2015–2016

*International Journal of Vehicle Autonomous Systems*, special issue on “Autonomous and Semi-Autonomous Control for Safe Driving of Ground Vehicles,” Guest-Editor, 2008–2009

*IEEE Transactions on Automatic Control*, 2009–2011, Associate Editor

Published monthly by the Institute of Electrical and Electronics Engineers

*IEEE Control Systems Magazine*, 2003–2009, Associate Editor

Published monthly by the Institute of Electrical and Electronics Engineers

*AIAA Journal of Guidance, Control, and Dynamics*, 1999–2007, Associate Editor

Published bi-monthly by the American Institute of Aeronautics and Astronautics

*Dynamics and Control: An International Journal* (merged with the *Journal of Dynamical and Control Systems*), 2000–2002, Associate Editor

Published quarterly by Kluwer Academic Publishers

Membership to Professional Societies

American Institute of Aeronautics and Astronautics (AIAA) – Fellow  
 Institute of Electrical and Electronics Engineers (IEEE) – Senior Member  
 Society of Professional Engineers of Greece (TEE) – Member

Session and Workshop Organizer

- 55th IEEE Conference on Decision and Control (with E. Feron and E. Theodorou), workshop on “Perception, Control and Planning for Agile Autonomous Agents,” December 11, 2016, Las Vegas, NV.
- IEEE International Conference on Robotics and Automation (with A. Censi and S. Soatto), invited workshop on “Task-driven Perceptual Representations: Sensing, Planning and Control under Resource Constraints,” May 16–21, 2016, Stockholm, Sweden.
- 51th IEEE Conference on Decision and Control (with J. Lu and S. Di Cairano), Session on “Integrated Vehicle Dynamics and Control”, Dec. 10–13, 2012, Maui, HI.
- 5th International Conference on Research in Air Transportation (with E. Feron, D. Delahaye and S. Puechmorel), Workshop on “Methods for Optimal Trajectory Design”, May 22, 2012, Berkeley, CA.
- 50th IEEE Conference on Decision and Control (with J. Lu), Session on “Integrated Vehicle Dynamics and Control - I and II”, Dec. 12–15, 2011, Orlando, FL.
- 49th IEEE Conference on Decision and Control (with J. Lu and F. Borelli, Session on “Integrated Vehicle Dynamics and Control”, Dec. 15–17, 2010, Atlanta, GA.
- 48th IEEE Conference on Decision and Control (with J. Lu, Z. Lin, X.-Y. Lu), Session on “Integrated Vehicle Dynamics and Control - I and II”, Dec. 16–18, 2009, Shanghai, China.
- American Control Conference, (with C. Canudas de Wit), Session on “Control Techniques for Improved Vehicle Handling and Stability”, June 28–30, 2000, Chicago, IL.
- Workshop on the Integration of Engineering Research and Education, NSF, Session on “Partnership with Industry: Benefits and Pitfalls” (session facilitator), Nov. 9–10, 1998, Arlington, VA.

Proposal Review Panels

National Science Foundation (NSF)  
 Army Research Office (ARO)  
 Air Force Office for Scientific Research (AFOSR)  
 Office of Naval Research (ONR)  
 Israel Science Foundation (ISF)

Professional Committees and Service

AIAA Space Automation and Robotics (SAR) Technical Committee  
 Member, 2015 –

Best Student Paper Selection Committee, American Control Conference  
 Member, 2014

External Evaluation Committee, Dept. of Mechanical Engineering and Aeronautics  
 University of Patras, Chairman, 2013

AIAA Fellow Selection Committee  
 Member, 2010

- AIAA Guidance, Navigation and Control (GNC) Technical Committee  
Member, 2008 – 2011
- MAG'97 Magnetic Bearings and Dry Gas Seals Conference and Exhibition  
Organizing committee member, 1996–1997
- 6th International Symposium on Magnetic Bearings  
International steering committee member, 1997–1998
- ASME Dynamic Systems and Control Committee, Automotive Transportation Panel  
Member, 1999 – 2011
- 13th IEEE Mediterranean Conference on Control and Automation  
International program committee member, 2004–2005
- 1st International Conference on Robot Communication and Coordination (ROBOCOMM)  
International program committee member, 2007
- 9th Annual Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)  
National Research Conference, Judge, October 22–26, 2008
- 2nd International Conference on Robot Communication and Coordination (ROBOCOMM)  
International program committee member, 2009
- IEEE Senior Member Selection Committee  
Member, 2009
- 19th IEEE Mediterranean Conference of Control and Automation  
Organizing committee member (invited workshops chairman), 2010–2011

### Media Coverage

- “Ford Steps on the Driverless-Car Gas’ *Tech News World*, [www.technewsworld.com/story/79638.html](http://www.technewsworld.com/story/79638.html)
- “Talking Cars Coming Down the Pike” *Tech News World*, [www.technewsworld.com/story/79914.html](http://www.technewsworld.com/story/79914.html)
- “Google Puts Cute Little Rides on the Road” *Tech News World*, [www.technewsworld.com/story/80525.html](http://www.technewsworld.com/story/80525.html)
- “The Future of Talking Cars,” [www.myfoxtlanta.com/story/24774734/the-future-of-talking-cars](http://www.myfoxtlanta.com/story/24774734/the-future-of-talking-cars)
- “New Technique Controls Autonomous Vehicles in Extreme Conditions,” [www.news.gatech.edu/2016/05/23/new-technique-controls-autonomous-vehicles-extreme-conditions](http://www.news.gatech.edu/2016/05/23/new-technique-controls-autonomous-vehicles-extreme-conditions)
- “New Technique Controls Autonomous Vehicles on a Dirt Track,” [www.sciencedaily.com/releases/2016/05/160523141240.htm](http://www.sciencedaily.com/releases/2016/05/160523141240.htm)
- “Autonomous Mini Rally Car Teaches Itself to Powerslide,” [spectrum.ieee.org/cars-that-think/transportation/self-driving/autonomous-mini-rally-car-teaches-itself-to-powerslide](http://spectrum.ieee.org/cars-that-think/transportation/self-driving/autonomous-mini-rally-car-teaches-itself-to-powerslide)
- “These driverless car drones have been taught to drift,” [www.businessinsider.com/this-driverless-car-drone-has-taught-itself-how-to-drift-and-it-looks-awesome-2016-5?r=US&IR=T&IR=T](http://www.businessinsider.com/this-driverless-car-drone-has-taught-itself-how-to-drift-and-it-looks-awesome-2016-5?r=US&IR=T&IR=T)
- “Georgia Tech Builds An Aggro Autonomous Rally Car,” [www.popsci.com/georgia-tech-builds-an-aggro-autonomous-rally-car](http://www.popsci.com/georgia-tech-builds-an-aggro-autonomous-rally-car)
- “Extreme self-driving: Watch the radio controlled car that taught itself to DRIFT,” [www.dailymail.co.uk/sciencetech/article-3609578/Extreme-self-driving-Watch-radio-controlled-car-taught-DRIFT.html](http://www.dailymail.co.uk/sciencetech/article-3609578/Extreme-self-driving-Watch-radio-controlled-car-taught-DRIFT.html)

- “RC Trucks Learning to Drift at High Speeds Will Make Self-Driving Cars Safer,” [gizmodo.com/rc-trucks-learning-to-drift-at-high-speeds-will-make-se-1777577460](http://gizmodo.com/rc-trucks-learning-to-drift-at-high-speeds-will-make-se-1777577460)
- “Safety, Pah! Digital Dukes of Hazzard Have Robot Cars Powersliding,” [www.theregister.co.uk/2016/05/23/selfdriving\\_cars\\_powersliding/](http://www.theregister.co.uk/2016/05/23/selfdriving_cars_powersliding/)
- “Autonomous rally car gets sideways to improve performance in hazardous conditions,” [www.gizmag.com/driftng-autonomous-rally-cars/43497/](http://www.gizmag.com/driftng-autonomous-rally-cars/43497/)
- [www.livescience.com/55184-robot-cars-test-hazard-response.html](http://www.livescience.com/55184-robot-cars-test-hazard-response.html)
- “New technique controls autonomous vehicles on a dirt track,” [phys.org/news/2016-05-technique-autonomous-vehicles-dirt-track.html](http://phys.org/news/2016-05-technique-autonomous-vehicles-dirt-track.html)
- “Watch this autonomous rally car destroy a dirt track,” [/www.autoblog.com/2016/05/27/autonomous-car-dirt-track-georgia-tech-video/](http://www.autoblog.com/2016/05/27/autonomous-car-dirt-track-georgia-tech-video/)
- “Self-driving car taught to drift round corners by American researchers,” [www.independent.co.uk/life-style/gadgets-and-tech/news/self-driving-car-drifting-corner-autonomous-georgia-tech-a7043696.html](http://www.independent.co.uk/life-style/gadgets-and-tech/news/self-driving-car-drifting-corner-autonomous-georgia-tech-a7043696.html)
- “New technique controls autonomous vehicles on a dirt track,” [www.spacedaily.com/reports/New\\_technique\\_controls\\_autonomous\\_vehicles\\_on\\_a\\_dirt\\_track\\_999.html](http://www.spacedaily.com/reports/New_technique_controls_autonomous_vehicles_on_a_dirt_track_999.html)
- “New-technique-controls-autonomous-vehicles-extreme-conditions,” [www.pddnet.com/news/2016/05/new-technique-controls-autonomous-vehicles-extreme-conditions](http://www.pddnet.com/news/2016/05/new-technique-controls-autonomous-vehicles-extreme-conditions)

## B. Campus Contributions

### Georgia Institute of Technology

- Associate Director for Research, Institute for Robotics and Intelligent Machines, 2016–
- AE School, Space Systems Area Faculty Search Committee, Member, 2016
- AE School, Strategic Plan Committee, Member, 2013–2014
- AE School, Autonomy Area Faculty Search Committee, Chairman, 2013–2014
- ChBE School, Reappointment, Tenure and Promotion Internal Review Committee, Member, 2013
- AE School, Flight Mechanics and Control Area Faculty Search Committee, Member, 2012–2013
- Sigma Xi Undergraduate Research Award Institute Committee, Member, 2012
- AE School, Space Systems Area Faculty Search Committee, Member, 2011–2012
- AE School, Reappointment, Tenure and Promotion Committee, Member, 2011–2014
- College of Engineering, Research Faculty Promotion Committee, Member, 2010–2012
- AE School, Graduate Quality Enhancement Committee, Member, 2010–2012
- AE School, Reappointment, Tenure and Promotion Internal Review Committee, Member, 2010–2011
- College of Engineering, Reappointment, Tenure and Promotion Committee, Member, 2008–2010
- AE School, Space Systems Area Faculty Search Committee, Member, 2006–2009
- AE School, Reappointment, Tenure and Promotion Internal Review Committee, Chairman, 2007–2009
- AE School, Periodic Peer Review Committee, Chairman, 2005–2006
- AE School, Dutton/Ducoffe Endowed Chair Faculty Search Committee, Chairman, 2004–2005

- AE School, Five-Year Strategic Plan Committee, Member, 2005–2007
- AE School, Propulsion Area Faculty Search Committee, Member, 2004
- AE School, FMC Honors Curriculum Committee, Member, 1998–
- AE School, FMC Ph.D. Qualifying Examination Committee, Member, 1998–
- AE School, FMC Curriculum Committee, Member, 1998–
- AE School, Undergraduate Education Enhancement Committee, Member, 2000–2005
- AE School, Student Honors Program Committee, Member, 2001–
- AE School, Graduate Committee, Member, 2000–
- AE School, Laboratory Facilities Committee, Member, 2000–2010
- AE School, Andrew and David Lewis Endowed Chair Faculty Search Committee, Member, 1999–2002

#### University of Virginia

- MANE Department, Dynamics and Control Committee, Member, 1994–1998
- MANE Department, Dynamics and Control Comprehensive Examination Committee, Member, 1994–1998
- MANE Department, Computer Committee, Member, 1996–1998
- SEAS, ENGR 207 Undergraduate Curriculum Committee, Member, 1997–1998

## VI. Grants and Contracts

### A. As Principal Investigator

1. “A User-Friendly Environment for Numerical Solution of Optimal Control Problems,” amount \$5,000, NSF (REU Program), May 1997–Sept. 1997.
2. Carlos E. Farrar Fellowship (for Haijun Shen), amount \$6,000, SEAS, Univ. of Virginia, Sept 1997–May 1998.
3. “CAREER: Robust and Optimal Control of Nonlinear Mechanical Systems with Rotating Components,” amount \$220,000, NSF, June 1996 – May 2000.
4. “Robust and Optimal Control of Nonlinear Mechanical Systems with Rotating Components,” amount \$107,000, NSF, June 1996 – May 1999, (supplement to CAREER award).
5. “Nonlinear Control Laws for Low Loss Magnetic Bearings,” amount \$25,000, AFS, Inc., June 1998–May 1999.
6. “Advanced Control Techniques for Energy Storage Flywheel Magnetic Bearings,” amount \$128,592, AFS, Inc., Jan. 1999–Dec. 2000.
7. “Non-smooth Feedback Control of Nonholonomic Systems with Applications to Mobile Robots,” amount \$16,000, NSF, (France-NSF Cooperation Program), Mar. 1998 – Feb. 2001.
8. “Attitude Control of Small Sats using Magneto-Torquers,” amount \$5,000, NSF (Research Experience for Undergraduates Program), Mar. 1998–May 1999.
9. “Analysis and Control of High-Speed Wheeled Mobile Robots,” amount \$235,000, Army Research Office, June 2000–May 2003.
10. “Robust Gain-Scheduling Control for High-Speed Gyroscopic Rotors Supported on Magnetic Bearings” amount \$250,000, American Flywheel Systems, Inc., June 2000–December 2001.



11. "Nonlinear Spacecraft Control with Applications to Combined Attitude Tracking and Energy Storage," amount \$300,000, AFOSR, August 2000–July 2003.
12. "Numerical Nonlinear and Optimal Control Using Wavelets," amount \$175,000, NSF/CMS, September 2000–August 2003.
13. "Upgrade of AE4520 Undergraduate Controls Laboratory," amount \$25,100, Technology Fee Program, Georgia Tech, October 2000.
14. "A Spacecraft Simulator for Undergraduate Education," amount \$10,000, Technology Fee Program, Georgia Tech, October 2001.
15. "DURIP: A Simulator Facility for Attitude Control and Energy Storage of Spacecraft," amount \$230,000, AFOSR, April 2001–March 2002.
16. "Experimental Validation of Zero- and Low-Bias Control Algorithms for Active Magnetic Bearings," amount \$45,000, AFRL/AFOSR, January 2002–December 2002.
17. "Coordinated Resource Allocation Among Multiple Agents with Application to Autonomous Refueling and Servicing of Satellite Constellations," amount \$303,027, AFOSR, Jan. 2004–Dec. 2007.
18. "On-Line Path Generation and Tracking for High-Speed Wheeled Autonomous Vehicles," amount \$325,366, Army Research Office, Feb. 2005–Feb. 2008.
19. "Control of Vehicles at High-Speed over Rough Terrain: The Effect of Vehicle Modalities," amount \$100,000, Army Research Office, Sept. 2007–Feb. 2009.
20. "Wavelets in Control and Optimization," amount \$160,000, NSF/CMS, Sept. 2005–Aug. 2007.
21. "Control and Recovery of Vehicles During High-Speed and Other Abnormal Conditions," amount \$120,000, Ford Motor Co., Jan. 2006–Dec. 2008.
22. "DURIP: A 5-DOF Test-Bed for Autonomous Spacecraft Rendezvous and Docking," amount \$237,500, AFOSR, April 2006–March 2007.
23. "GOALI: Next Generation Active Safety Control Systems for Crash-Avoidance of Passenger Vehicles Using Expert Driver Knowledge," (Co-PIs: J. Lu and E. Velenis), amount \$274,000, NSF/CMI, Sept. 2007–Aug. 2010.
24. "Advanced Methods for Intelligent Flight Guidance and Planning in Support of Pilot Decision Making," (Co-PI: E. Johnson) amount \$701,858 (\$350,000), NASA, Oct. 2007–Sept. 2010.
25. "High Performance Satellite Pointing Algorithm Development and Testing," amount \$90,000, SAIC, Feb. 2008–Dec. 2008.
26. "Synthetic Automotive Virtual Environments," amount \$290,000, US Army, ERDC-CRREL and Vehicle Control Training, LLC, Sept. 2008–Aug. 2010.
27. "Multiscale, Beamlet-Based Data Processing for the Solution of Shortest-Path Problems with Applications to Embedded Vehicle Autonomy," (Co-PI: X. Huo), amount \$185,000, NSF, Oct. 2009–Aug. 2011.
28. "Advanced Algorithm Development and Testing for Autonomous Operation of Small Satellites in Space," amount \$500,000, Star Technologies, May 2010–March 2011.
29. "MURI: Neuro-Inspired Adaptive Perception and Control for Agile Mobility of Autonomous Vehicles in Uncertain and Hostile Environments," (Co-PIs: J. Rehg, F. Dellaert, E. Feron, L. Itti, USC, E. Frazzoli, MIT, K. Iagnemma, MIT) amount \$6,250,000 (\$750,000), ARO, Oct. 2010–Sept. 2015.

30. "DURIP: A Scaled Automotive Platform for Validation and Testing of Perception and Control Algorithms for Unmanned Ground Vehicles Operating Under Extreme Driving Conditions," amount \$98,000, ARO, July 2012-June 2013.
31. "GOALI: Advanced Driver Assistance and Active Safety Systems through Drivers Controllability Augmentation and Adaptation," (Co-PIs: L. Itti, USC, J. Lu, Ford Motor Co.), amount \$375,550 (\$225,550), NSF/CMMI, Sept. 2012-Aug. 2015.
32. "Environment-Agent Interaction in Autonomous Networked Teams with Applications to Minimum-Time Coordinated Control of Multi-Agent Systems," amount \$240,000, NSF/CMMI, Sept. 2012-Aug. 2015.
33. "Autonomous, Vision Based Satellite Proximity Operations for Inspection, Health Monitoring and Surveillance in Orbit," (Co-PIs: P. Vela, R. Russell, UTA), amount \$820,000 (\$375,000), AFRL, Nov. 2012-Oct. 2015.
34. "A Framework for Bounded Rationality Autonomy Using Neuromorphic Decision and Action Models," ONR, \$1,755,000, (\$480,000) (Co-PIs: L. Itti (USC), S. Schaal (USC), S. Soatto (UCLA), June 2013-May 2017.
35. "Autonomous Energy-Projecting Systems for Robotic Exploration of Extreme Environments," C-STAR/JPL, \$27,000, May-June 2014.
36. "NRI: Information-Theoretic Trajectory Optimization for Motion Planning and Control with Applications to Space Proximity Operations," NSF, \$700,000 (\$400,000) (Co-PI: E. Theodorou), September 2014-August 2017.
37. "CPS: Synergy: Collaborative Research: Adaptive Intelligence for Cyber-Physical Automotive Active Safety - System Design and Evaluation," NSF, \$800,000 (\$300,000) (Co-PIs: K. Feigh, L. Itti (USC)), September 2015-August 2018.
38. "Driver Behavior Characterization using Ford's BDD Data and its Usage for Discovery Project 20029," Ford, \$25,000, November 2015-April 2016.
39. "HSAP/URAP: Development and Implementation of Perception and Control Algorithms for Off-Road Autonomous Rally Driving Using a Scaled Automotive Platform," ARO, \$12,000, May 2016-Sept. 2016.
40. "Covariance Steering Theory for Precise GN&C Terrain Relative Navigation during Entry, Descent and Landing," C-STAR/JPL, \$25,000, May-June 2016.
41. "Statistical Mechanics for Learning Algorithmic-Based Controllers: The Role of Physics in New Computational Models for Real-Time Control," ARO, \$350,000, (Co-PIs: E. Theodorou, S. Karaman (MIT)), July 2016-June 2017.
42. "RI: Incremental Sampling-Based Algorithms and Stochastic Optimal Control on Random Graphs," NSF, \$335,757, May 2016-April 2019.
43. "Dynamic Modeling of Articulated Space Robotic Spacecraft Using Dual Quaternions," JPL/SURP, \$25,000, Nov. 2016-Oct. 2017.

#### **B. As Co-Principal Investigator or Investigator<sup>1</sup>**

44. "Energy Momentum Wheels (EMW's) for Satellites and Other Applications with Gain-Scheduled Controllers" (Co-PI), amount \$91,000 (\$45,000), AFS, Inc., (NASA SBIR - Phase I), Feb. 1997 - July 1997.
45. "Design of a Magnetic Bearing Test Rig," (PI: P. Allaire), amount \$24,000 (\$10,000), RDC, Inc., Oct. 1995-Apr. 1996.

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<sup>1</sup>The amount in parenthesis shows level of responsibility.

46. "Magnetic Bearings for Flywheel Systems," (PI: P. Allaire), amount \$38,000 (\$12,000), RDC, Inc., Jan. 1997–June 1997.
47. "Energy Momentum Flywheels for Satellites: Theoretical and Experimental Investigation of Gain-Scheduled Controllers," (PI: P. Allaire), amount \$600,000 (\$110,000), AFS, Inc., (NASA SBIR – Phase II), Feb. 1998–Jan. 2000.
48. "Integrated Lab Project," amount \$30,000 (\$10,000), (Co-PIs: J. Seitzman and J. Craig), GTF, July 1999–September 2000.
49. "Gain-Scheduled Control of Magnetic Bearing Milling Spindles," (PI: C. Knospe), amount \$250,000 (\$100,000), NSF, Nov. 1997–Oct. 2000.
50. "NIA: Experimental Validation of Advanced Nonlinear Concepts in Spacecraft Control," (PI: D. Schrage), amount \$500,000, (\$20,000), NIA/NASA LaRC, June 2004–May 2005.
51. "Prototype Controller for Elastic Spacecraft," (PI: W. Singhose) amount \$69,000 (\$10,000), Northrop-Grumman, Dec. 2003–May 2005.
52. "Flight Algorithms for Nocturnal Atmospheric Wind Energy Extraction," (PI: M. Costello), amount \$100,950 (\$50,000), DARPA (Subcontract from Simpson Weather Associates), Nov. 2008–Mar. 2009.
53. "Rapid Reconnaissance and Response (R<sup>3</sup>) Mission," (PI: D. Spencer), amount \$110,000, AFOSR (University NanoSat Program), Jan. 2009–Dec. 2010.
54. "Satellite Tracking Station and Mission Operations Center," (Co-PIs: R. Russell and D. Spencer), Technology Fee Funds, College of Engineering, Georgia Institute of Technology, amount \$100,000, Jan. 2009–June. 2009.
55. "Motion Coordination and Adaptation Using Deception and Human Interactions," (PI: M. Egerstedt), amount \$620,000 (\$320,000), AFOSR, Jan. 2013–Dec. 2015.

## VII. Honors, Awards and Recognition

### Awards and Recognition

- Best student paper award finalist (advisor of Kazuhide Okamoto)  
IEEE Conference on Systems, Man and Cybernetics, Budapest, Hungary, 2016
- Sigma Xi Best PhD Thesis Award (advisor of Nuno Filipe)  
Sigma Xi Society, Georgia Institute of Technology, 2015
- Purdue University 2014 School of Aeronautics and Astronautics' Outstanding Aerospace Engineer (OAE) award (highest honor bestowed on that school's alumni)
- Best student paper award 1st place (advisor of Nuno Filipe)  
AIAA Guidance, Navigation and Control Conference, Boston, 2013
- Appointed College of Engineering Dean's Professor  
College of Engineering, Georgia Institute of Technology, 2012
- Sigma Xi Best Undergraduate Research Award (advisor of Luis Reyes Castro)  
Sigma Xi Society, Georgia Institute of Technology, 2011
- Best conference paper award finalist  
10th Symposium on Distributed Autonomous Robotic Systems (DARS), Lausanne, Switzerland, 2010
- American Institute of Aeronautics and Astronautics, Fellow, 2009
- Best student paper award 1st place (advisor of Raghvendra Cowlagi)  
American Control Conference, St. Louis, Missouri, 2009

Luther Long Award, 2006  
for best doctoral thesis at Georgia Tech in the area of Engineering Mechanics (advisor of E. Velenis)

Top Ten Best Paper list, AIAA Paper 03-5654  
AIAA Guidance, Navigation and Control Conference, Austin, 2003

Tibetts Award for Outstanding Research (leading member of SBIR team)  
NASA Goddard Space Flight Center, Technology Commercialization Office, 1999

Faculty Early Career Development (CAREER) Award  
National Science Foundation, 1996

Sigma Xi President and Visitors' Award for Excellence in Research  
Sigma Xi Society, University of Virginia, 1996

Teaching Fellow, 1998-1999  
Georgia Institute of Technology

Best Student Paper, 2nd place (advisor of Ancil Marshall)  
AIAA Southeastern Region Student Conference, Savannah, Georgia, 1999

Best student paper award, finalist (advisor of Jihao Luo)  
American Control Conference, Philadelphia, Pennsylvania, 1998

Best student paper award, finalist (advisor of Jihao Luo)  
American Control Conference, Albuquerque, New Mexico, 1997

Top Ten Best paper list, AIAA Paper 96-3791  
AIAA Guidance, Navigation and Control Conference, San Diego, 1996

Outstanding International Community Student Award  
Purdue Student Government, 1992

#### Scholarships and Fellowships

Scholarship to attend Summer School in Control Theory  
Centre de Recherches Mathématiques, Université de Montréal, 1992

Fellowship for Doctoral Studies  
Bakala Institute, Athens, Greece, 1992

David Ross Research Fellowship  
Purdue University, 1989-1991

NATO Research Fellowship for Doctoral Studies  
Greek State, 1989-1992

Yearly Fellowship for Academic Excellence  
Greek National Fellowship Institute, 1981-1986

#### Honor Societies

Phi Kappa Phi, Honor Society  
Tau Beta Pi, Engineering Honor Society  
Sigma Gamma Tau, Aerospace Engineering Honor Society