

**PANAGIOTIS TSIOTRAS**  
**School Aerospace Engineering**  
**Georgia Institute of Technology**  
**Atlanta, GA 30332-0150**  
<http://www.ae.gatech.edu/people/ptsiotra/>  
<http://www.ae.gatech.edu/labs/dcs/>

## I. Earned Degrees

- Ph.D.       Aeronautics and Astronautics, Purdue University, 1993  
*Dissertation: "Analytic Theory and Control of Spinning Rigid Bodies"*  
Advisor: J.M. Longuski
- M.S.        Mathematics, Purdue University, 1992  
Advisor: L.D. Berkovitz
- M.S.        Aerospace Engineering, Virginia Polytechnic Institute and State University, 1987  
*Thesis: "Goddard Problem Variants"*  
Advisor: H.J. Kelley
- Eng.Dipl.   Mechanical Engineering, National Technical Univ., Athens, Greece, 1986 (top 2%)  
*Thesis: "Extended Kalman Filtering in Flight Parameter Estimation"*  
Advisor: J. Krikelis

## II. Employment

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

Professor, 2005–

Research in the areas of wavelet optimization, multiple-rendezvous servicing of satellite constellation, autonomous wheeled vehicles, experimental vision-based automated rendezvous and docking in space. Taught courses on *Aircraft and Spacecraft Flight Mechanics, System Dynamics and Control, Nonlinear Control* and *Optimal Guidance and Control, Automatic Controls Lab, Aerospace Robust Control, Advanced Nonlinear Control*. Supervised graduate and undergraduate students. Proposal preparation for sponsored research. 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. Taught courses on *Aircraft and Spacecraft Flight Mechanics, System Dynamics and Control, Nonlinear Control* and *Optimal Guidance and Control*. Supervised graduate and undergraduate students. Proposal preparation for sponsored research. 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.

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. Taught courses on *Optimal Control*, *Nonlinear Control*, *Modern Control Theory*, *Classical Control Theory*, and *Introductory Statics*. Supervised graduate and undergraduate students. Proposal preparation for sponsored research. 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 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

Post-Doctoral Students

Raghvendra Cowlagi, May 2011–November 2011

Research in the area of control and perception for wheeled vehicles under abnormal driving conditions  
Currently post-doctoral student with MIT Aero-Astro department

Annalisa Scacchioli, March 2008–February 2010

Research in the area of ground vehicle control under abnormal driving conditions  
Visiting Assistant Professor, Mechanical Engineering

New York Polytechnic, New York

Dongwon Jung, December 2007–April 2009

Research in the area of emergency trajectory generation for aircraft  
First job as Research Engineer, Korea Aerospace Research Institute (KARI), Daejeon, 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 Mechanical Engineering, Brunel University, London, UK

Toshihiko Ouchi, October 2005–September 2006

Research in the area of robust control of space systems

On leave from the Japan Patent Office, Ministry of Economy, Trade and Industry, Tokyo, Japan  
Alexander Lanzon, January 2001–September 2001  
Research in the area of robust control of Linear, Parameter Varying (LPV) systems  
Currently Senior Lecturer, 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

Dae-Min Cho

Doctor of Philosophy, advised since August 2006  
Passed Ph.D. Qualifying Exam in Spring 2009  
Expected graduation date May 2012

Oktay Arslan

Doctor of Philosophy, advised since August 2009  
Expected graduation date May 2014

Nuno Felipe

Doctor of Philosophy, advised since August 2010  
Expected graduation date May 2014

Daniel Kuheme

Doctor of Philosophy, advised since August 2011  
Expected graduation date August 2014

Sun Wei

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

Florian Hauer (Robotics Program)

Doctor of Philosophy, advised since May 2011  
Expected graduation date August 2014

Spyridon Zafeiropoulos

Master of Science, advised since August 2011  
Expected graduation date August 2012

Yannis Exarchos

Master of Science, advised since August 2011  
Expected graduation date August 2012

Keith Clements

Master of Science, advised since August 2011  
Expected graduation date August 2013

#### Previous Graduate Students - Doctoral

1. Jihao Luo (1999), Thesis Title: "Control on Underactuated and Nonholonomic Systems," First position after graduation: American Flywheel Systems, Inc., Medina, WA
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
3. Haijun Shen (2003), Thesis Title: "Optimal Scheduling for Satellite Refueling in Circular Orbits," First position after graduation: AMA, 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
  5. Hyungjoo Yoon (2004) Thesis Title: "Spacecraft Attitude and Power Control Using Variable Speed CMGs," First position after graduation: Samsung Electronics, Seoul, South Korea
  6. Brian Wilson (co-advisor with B. Heck) (2004), Thesis Title: "Control Design for Low-Loss Active Magnetic Bearings: Theory and Implementation," First position after graduation: AFRL/VS, Albuquerque, NM
  7. Efstathios Velenis (2006), Thesis Title: "Analysis and Control of High-Speed Autonomous Vehicles," First position after graduation: Postdoctoral Fellow, Georgia Institute of Technology
  8. Dongwon Jung (2007), Thesis Title: "Hierarchical Path Control of a Small Fixed-wing UAV: Theory and Experimental Validation," First position after graduation: Postdoctoral Fellow, Georgia Institute of Technology
  9. Sachin Jain (2008), Thesis Title: "Multiresolution Strategies for the Numerical Solution of Optimal Control Problems," First position after graduation: Air Liquide, Newark, DE
  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
  11. Raghvendra Cowlagi (2011), Thesis Title: "Hierarchical Motion Planning for Autonomous Aerial and Terrestrial Vehicles," First position after graduation: Postdoctoral Fellow, MIT
  12. Efstathios Bakolas (2011), Thesis Title: "Optimal Steering for Kinematic Vehicles with Applications to Spatially Distributed Agents," First position after graduation: TBA
  13. Yiming Zhao (2011), Thesis Title: "Efficient And Robust Aircraft Landing Trajectory Optimization," First position after graduation: Mitsubishi Electric Research Laboratories, Cambridge, MA.

#### 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 Doumtchenko (2000), Project Title: "Control of Underactuated Spacecraft"
6. Efstathios 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. Efstathios 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"

#### Current Undergraduate Students

- David Miculescu, TBA, August 2011-

#### Previous Undergraduate Students

- Johnny Worthy, "Small scale UAV Autopilot," January 2011-August 2011
- Luis Ignacio Reyes Castro, "Generalized Consensus Algorithms in 2D and 3D Problems," August 2009-May 2011 (REU Undergraduate Research Fellowship).
- David Chanin, "NorthStar Localization System for a 5dof Spacecraft Simulation Platform," June 2009-August 2009.
- Daniel Kuheme, "Numerical Optimal Control for Aerospace Applications," May 2008-September 2008 (Dash Undergraduate Research Fellowship).
- Katie Milway, "An Optical System for High-Resolution Angular Measurement for a 3-Axis Air-Bearing Platform" May 2008-Aug. 2008
- William Gloss, "Development and Construction for a Small UAV," September 2005-January 2005
- Sean Tamblyn, "Development and Construction for a Small UAV," May 2005-August 2005.
- Daniel Jegeman, "Development of PID Controllers for a Small UAV," September 2006-December 2006.
- Eiji Ozawa, "A Virtual Environment for UAV Autopilot Design," September 2005-May 2006.

- Jeffrey Staub, "Development of a GUI for a UAV Ground Station," June 2006–December 2006.
- Phillip Hom, "Development for a Simulink GUI Interface for Simulating a Half-Car Model," May 2006–August 2006.
- Andrew Earl, "Development and Construction for a Small UAV," March 2005–December 2005.
- Jason Yu, "Adaptive Wavelet Denoising", August 2005–December 2005.
- Brandon Lunders, "Application of an Extended Kalman Filter in UAV Autopilot Design," June 2004–May 2005 (PURA Fellowship).
- Aurelien Drevon, "Spacecraft Autonomous Rendezvous and Docking," August 2004–May 2005
- Maria Galvis, "Autopilot Software Development for a Small UAV," October 2004 – May 2005
- Terry Williams, "Design of an Autopilot for a Radio-Controlled Airplane," October 2003–December 2004.
- Rebecca Fink, "Design of an Autopilot for a Radio-Controlled Airplane," October 2003–May 2005.
- Jonathan Moshe, "Design of an Autopilot for a Radio-Controlled Airplane," October 2003–Dec. 2004.
- David Lambeth, "A MATLAB Interface for Solving Two Point Boundary Value Problems using BNDSCO," NSF - REU research grant, May 2002–Dec. 2002.
- Kriengsiri Malasri, "Experimental Stiffness Determination of the REVOLVE Active Magnetic Bearing," NSF - REU research grant, March 2002–Aug. 2002.
- Anne Bergeron, "Computer Interface for Control of Active Magnetic Bearings," NSF - REU research grant, Feb. 2001–April 2002.
- Aromal Prasannan, "Design of a Crane Experiment for AE4525," NSF - REU research grant, Summer 2001; exchange student from IIT, Madras.
- Pat Kriengsiri, "Design of a Spacecraft Simulator Facility," NSF - REU research grant, Oct. 2000–Dec. 2001.
- Emmanuel Witrant, "Applications of Linear Matrix Inequalities in Control," June 2000 – May 2001.
- Christopher Hanlon, "Aircraft Simulator for AE 3521," NSF - REU research grant, March 1999–Aug. 2000.
- Ancil Marshal, "Attitude Control of Small Sats using Magneto-torquers," NSF - REU research grant, March 1999–Aug. 2000.
- Jason Stauch, "Modelling of Geomagnetic Field for an Attitude Control System," Mar. 1999–June 1999.
- Alejandro Morin, "A Preliminary Design for a Tethered Orbiting Interferometer to Observe High Radio Frequencies," senior thesis, May 1995, Univ. of Virginia.
- 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.
- 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.
- Andrew Turner, "Design of Autonomous and Semi-autonomous Aerospace Vehicles," Feb. 1998–Aug. 1998, Univ. of Virginia.

- 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

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

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

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

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

AE 4380, *Astronautics*, S01

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

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*

A 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 of axisymmetric and triaxial bodies; 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; longitudinal flying qualities; lateral/yaw modes of motion and approximations; lateral flying qualities. A flight simulator, based on the commercial software AVDS (Aviator Visual Design Simulator) was developed to allow students fly an airplane and "feel" the aircraft modes and their varying degrees of stability.

**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.

Department of Mechanical and Aerospace Engineering, University of Virginia

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

This is a dual-level graduate and advanced undergraduate course in the modelling 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. Theory is applicable to many disciplines: Mechanical Engineering, Aerospace Engineering, Systems Engineering, Electrical Engineering, Biomedical Engineering and Engineering Physics. 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. Specifically, in the revised manual the experiment descriptions are supplemented by the text of lecture notes; additional material for each experiment was added; all figures and schematics have been re-drawn; new homework assignments have been included using the input from all faculty members of the Flight Mechanics and Controls group. 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. This aircraft simulator is based on the AVDS (Aviator Visual Design Simulator) software developed by Artificial Horizons, Inc. It runs on a high-end Graphics Workstation and it provides realistic animations of aircraft in flight. The simulator is used to demonstrate 3-D rotations corresponding to roll, pitch and yaw, and display aircraft orientation measurements such as angle of attack, sideslip angle, etc. The simulator can be used to either animate pre-recorded or on-line flight data. Students can change the aerodynamic and stability derivatives and verify their impact of the aircraft handling qualities and stability characteristics.

### Teaching Fellows Program

During the Winter quarter of 1999 participated in the Georgia Tech Teaching Fellows Program. This program is organized and offered by the Center for the Enhancement of Teaching and Learning (CETL) at Georgia Tech. The program allows faculty, at an early stage of their careers, to develop their pedagogical techniques and to sharpen their individual teaching skills through classroom observations, videotape critiques, and student dialogues conducted by CETL. As part of the participation to the TF program the project "A New Approach for Teaching Aircraft Flight Mechanics and Control" was carried out. The scope of the project was to incorporate a realistic flight simulator for teaching Aircraft Flight Dynamics.

### Mentoring Program

During 1996 and 1997 participated in the University of Virginia Mentoring Program. This program, sponsored by the office of African-American Affairs at the University has as its top priority the retention of African-American students. The objectives of this program were: (i) to provide a structured approach for faculty to have a positive impact on African-American students, (ii) to motivate and inspire African-American students through moral, intellectual, academic and social support (iii) to contribute to developing strong self-concept and self-esteem among African-American students, and (iv) to promote diversity and cultural learning experience.

### Graduate Student Advisory Committees

#### Georgia Institute of Technology

Clayton Tino, Doctor of Philosophy (December 2013)  
 Yibiao Lu, Doctor of Philosophy/ISyE (December 2013)  
 Richard Roberts, Doctor of Philosophy/CS (December 2013)  
 Jason Bentley, Doctor of Philosophy/ChBE (May 2013)  
 Claus Christmann, Doctor of Philosophy (December 2011)  
 Brad Steinfeldt, Doctor of Philosophy (December 2011)  
 Michael Grant, Doctor of Philosophy (May 2011)  
 Tansel Yucelen, Doctor of Philosophy (May 2011)  
 Girish Chowdhary, Doctor of Philosophy (December 2010)  
 Konstantyn Volyanskyy, 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

1. Bernstein D. S. and Tsiotras, P., *A Course in Classical Optimal Control*, (in preparation).
2. Tsiotras, P., "Invariant Manifold Techniques for Control of Underactuated Mechanical Systems," in *Modelling and Control of Mechanical Systems*, Eds: A. Astolfi, D. Limebeer, C. Melchiorri, A. Tornambe, and R. Vinter, World Scientific, London, 1997, pp. 277–292.
3. Tsiotras, P., "Attitude Controls," in *Encyclopedia of Electrical and Electronics Engineering*, John Wiley & Sons, New Jersey, 1999.
4. Canudas de Wit, C., R. Horowitz, and P. Tsiotras, "Model-Based Observer for Tire/Road Contact Friction Prediction," in *New Directions in Nonlinear Observer Design*, Eds: Nijmeijer, H. and T.L. Fossen, *Lecture Notes in Control and Information Science*, Vol. 244, Springer-Verlag, London, May 1999, pp. 23–42.
5. C. Canudas-de-Wit, P. Tsiotras, X. Claeys, J. Yi, and R. Horowitz, "Friction Tire/Road Modeling, Estimation and Optimal Braking Control," in *Nonlinear and Hybrid Systems in Automotive Control*, Eds: Rolf Johansson and Anders Rantzer, *Lecture Notes in Control and Information Science*, Springer-Verlag, London, October 2002, pp. 165–229.

### B. Journal Publications

1. Tsiotras, P., and Kelley, H. J., "Drag-Law Effects in the Goddard Problem," *Automatica*, Vol. 27, pp. 481–490, May 1991.
2. Tsiotras, P., and Kelley, H. J., "The Goddard Problem with Constrained Time-of-Flight," *AIAA Journal of Guidance, Control, and Dynamics*, Vol. 15, No. 2, pp. 289–296, March-April 1992.

3. Tsiotras, P., and Longuski, J. M., "A Complex Analytic Solution for the Attitude Motion of a Near-Symmetric Rigid Body Under Body-Fixed Torques," *Celestial Mechanics and Dynamical Astronomy*, Vol. 51, pp. 281–301, 1991.
4. Longuski, J. M., and Tsiotras P., "Analytic Solutions for a Spinning Rigid Body Subject to Time-Varying Body-Fixed Torques. Part I: Constant Axial Torque," *ASME Journal of Applied Mechanics*, Vol. 60, pp. 970–975, 1993.
5. Tsiotras, P., and Longuski, J. M., "Analytic Solutions for a Spinning Rigid Body Subject to Time-Varying Body-Fixed Torques. Part II: Time-Varying Axial Torque," *ASME Journal of Applied Mechanics*, Vol. 60, pp. 976–981, 1993.
6. Tsiotras, P., and Longuski, J. M., "New Kinematic Relations for the Large Angle Problem in Rigid Body Attitude Dynamics," *Acta Astronautica*, Vol. 32, No. 3, pp. 181–190, 1994.
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#### **D. Book Reviews**

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2. *Optimal Control with Engineering Applications* by H. P. Geering, Springer, in *IEEE Control Systems Magazine*, (to appear).

#### **E. Presentations**

##### Invited Seminars

- Department of Engineering Mechanics and Astronautics, University of Wisconsin, Madison, WI, April 6, 1993
- Department of Aeronautics and Astronautics, Stanford University, Stanford, CA, June 1, 1993

- Dept. of Mechanical and Aerospace Engineering, University of California, Irvine, CA, June 7, 1993
- Guidance and Control Branch, Jet Propulsion Laboratory, Pasadena, CA, June 8, 1993
- Dept. of Aerospace Engineering, The University of Michigan, Ann Arbor, MI, July 7, 1993
- Dynamics and Controls Branch, NASA Langley Research Center, Hampton, VA, April 7, 1995
- Dept. of Aerospace Engineering, Univ. of Illinois, Urbana-Champaign, IL, Sept. 25, 1995
- Dept. of Electrical Engineering University of Virginia, Charlottesville, VA, Oct. 27, 1995
- Guidance and Control Branch, NASA Goddard Space Flight Center, Greenbelt, MD, Nov. 9, 1995
- Electromechanical Systems Branch, NASA Goddard Space Flight Center, Greenbelt, MD, Feb. 14, 1996
- Department of Mechanical Engineering, University 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
- Department of Aerospace and Ocean Engineering, Virginia Tech, Blacksburg, VA, Feb. 16, 1998
- Department of Aerospace Engineering, The University of Michigan, Ann Arbor, MI, May 11, 1998
- Spacecraft Engineering Department, Naval Research Laboratory, Washington, DC, Oct. 14, 1998
- Department 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 Automatique 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, Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM, October 14, 2003
- Space Vehicles Directorate, Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM, October 14, 2003
- Space Vehicles Directorate, Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM, October 15, 2003
- Guidance, Navigation and Control Systems Engineering, NASA GSFC, Greenbelt, MD, November 18, 2003
- Guidance, Navigation and Optimization Branch, NASA MSFC, Huntsville, AL, April 20, 2005

- Department of Mechanical and Process Engineering, ETH Zürich, Switzerland, December 20, 2006
- Space Vehicles Directorate, Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM, February 16, 2006
- Department of Mechanical Engineering, The University of New Mexico, *Mechanical Engineering Excellence Seminar Speaker* series, February 17, 2006
- Department 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, Research and Innovation Center, Ford Motor Company, Dearborn, MI, September 3, 2008.
- Active Safety Group, Research and Innovation Center, 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.
- Department of Aerospace Engineering, University of Illinois at Urbana Champaign, Champaign, IL, October 19, 2009.
- Department of Aeronautics and Astronautics, Purdue University, West Lafayette, IN, October 20, 2009.
- Department of Electrical Engineering and Computer Sciences, University of California at Berkeley, Berkeley, CA, November 3, 2009.
- Decision and Control Seminar Series, Georgia Institute of Technology, Atlanta, GA, January 22, 2010.
- Air Transportation Center, School of Industrial and Systems Engineering, Georgia Institute of Technology, GA, April 27, 2010.
- Department of Mechanical and Aerospace Engineering, Rutgers University, October 6, 2010.

#### Conference and Workshop 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 University, 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, August 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, October 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.

## F. Other Scholarly Accomplishments

### Patents

- (a) "Control of Magnetic Bearing-Supported Rotors," R. Bartlett, P. Tsiotras and P. Allaire, 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 Application US20110082623.

## V. Service

### A. Professional Contributions

#### Associate Editorships

- 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–  
Published monthly by the Institute of Electrical and Electronics Engineers
- IEEE Control Systems Magazine*, 2003–2009  
Published monthly by the Institute of Electrical and Electronics Engineers
- AIAA Journal of Guidance, Control, and Dynamics*, 1999–2007  
Published bi-monthly by the American Institute of Aeronautics and Astronautics
- Dynamics and Control: An International Journal*, 2000–2002  
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 Organizer

- 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.

Publications Reviewed

Automatica; IEEE Trans. on Automatic Control; ASME Journal of Dynamics Systems, Measurement, and Control; AIAA Journal of Guidance, Control, and Dynamics; IEEE Trans. on Robotics and Automation; AIAA Journal of Spacecraft and Rockets; Journal of the Astronautical Sciences; Acta Astronautica; European Journal of Control; Int. Journal of Mechanical Science; Int. Journal of Robust and Nonlinear Control; Phil. Trans. A of the Royal Society; Mathematics of Control, Signals and Systems; IEEE Trans. on Control Systems Technology; IEEE Control Systems Magazine; Shock and Vibration Journal; ASME Journal of Applied Mechanics; Proc. IEEE Conference on Decision and Control; Proc. American Control Conference; Proc. IEEE Mediterranean Conference on Control and Automation; IEEE Trans. on Aerospace and Electronic Systems

Proposal Review Panels

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

Professional Committees and Service

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.

## B. Campus Contributions

### Georgia Institute of Technology

- Sigma Xi Undergraduate Research Award Institute Committee  
Member, 2011–2012
- AE School, Space Systems Area Faculty Search Committee  
Member, 2011–2012
- AE School, Reappointment, Tenure and Promotion Committee  
Member, 2011–2012
- 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–

AE School, Student Honors Program Committee  
 Member, 2001–

AE School, Graduate Committee  
 Member, 2000–

AE School, Laboratory Facilities Committee  
 Member, 2000–

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. "CAREER: Robust and Optimal Control of Nonlinear Mechanical Systems with Rotating Components," amount \$220,000, NSF, June 1996 – May 2000.
2. "Robust and Optimal Control of Nonlinear Mechanical Systems with Rotating Components," amount \$107,000, NSF, June 1996 – May 1999, (supplement to CAREER award).
3. "A User-Friendly Environment for Numerical Solution of Optimal Control Problems," amount \$5,000, NSF (REU Program), May 1997–Sept. 1997.
4. Carlos E. Farrar Fellowship (for Haijun Shen), amount \$6,000, SEAS, Univ. of Virginia, Sept 1997–May 1998.
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. "A Simulator Facility for Attitude Control and Energy Storage of Spacecraft," amount \$230,000, DURIP/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. "A 5-DOF Test-Bed for Autonomous Spacecraft Rendezvous and Docking," amount \$237,500, DURIP/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/CMII, 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 for Agile Mobility of Autonomous Ground Vehicles," amount \$6,250,000, ARO, September 2010-August 2015.

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

30. "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.
31. "Design of a Magnetic Bearing Test Rig," (PI: P. Allaire), amount \$24,000 (\$10,000), RDC, Inc., Oct. 1995–Apr. 1996.
32. "Magnetic Bearings for Flywheel Systems," (PI: P. Allaire), amount \$38,000 (\$12,000), RDC, Inc., Jan. 1997–June 1997.
33. "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.
34. "Integrated Lab Project," amount \$30,000 (\$10,000), (Co-PIs: J. Seitzman and J. Craig), GTF, July 1999–September 2000.
35. "Gain-Scheduled Control of Magnetic Bearing Milling Spindles," (PI: C. Knospe), amount \$250,000 (\$100,000), NSF, Nov. 1997-Oct. 2000.
36. "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.
37. "Prototype Controller for Elastic Spacecraft," (PI: W. Singhose) amount \$69,000 (\$10,000), Northrop-Grumman, Dec. 2003–May 2005.
38. "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.
39. "Rapid Reconnaissance and Response (R<sup>3</sup>) Mission," (PI: D. Spencer), amount \$110,000, AFOSR (University NanoSat Program), Jan. 2009–Dec. 2010.
40. "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.

## **VII. Honors and Awards**

### Awards

Sigma Xi Best Undergraduate Research Award (advisor of Luis Reyes Castro)

Sigma Xi Society, Georgia Institute of Technology, 2011

Best conference paper 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

Teaching Certificate Award, Spring 2007, Spring 2008

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

“Thank-a-Teacher” Program, Center for the Advancement of Teaching and Learning, Georgia Tech  
 Luther Long Award, 2006  
 for best doctoral thesis at Georgia Tech in the area of Engineering Mechanics (advisor of E. Velenis)  
 Best paper session award, *Multi-Vehicle Control I* session  
 American Control Conference, Minneapolis, Minnesota, 2006  
 Best paper session award, *Linear Matrix Inequalities* session  
 13th IEEE Mediterranean Conf. on Control and Automation, Limassol, Cyprus, 2005  
Top Ten Best Paper list, AIAA Paper 03-5654  
 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  
 Guidance, Navigation and Control Conference, San Diego, 1996  
 Best paper session award, *Benchmark Problem for Nonlinear Control Design* session  
 American Control Conference, Seattle, Washington, 1995  
 Best paper session award, *Nonlinear Control - I*  
 American Control Conference, Baltimore, Maryland, 1994  
 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  
 Purdue Research Foundation Fellowship  
 Purdue University, 1991-1993  
 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

Research Fellowship  
Interdisciplinary Center of Applied Mathematics, Virginia Polytechnic Institute  
and State University, 1989

Research Scholarship  
Virginia Polytechnic Institute and State University, 1986-1987

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