Taeyoung Lee: Curriculum Vitae

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Education

Ph. D	Department of Aerospace Engineering UNIVERSITY OF MICHIGAN, Ann Arbor, MI *Thesis: Computational Geometric Mechanics and Control of Rigid Bodies* *Advisors: N. Harris McClamroch, Melvin Leok (Mathematics)* *Committee: Daniel Scheeres, Anthony Bloch, Jessy Grizzle*	Sep 2004-Apr 2008
M. S	Department of Mathematics UNIVERSITY OF MICHIGAN, Ann Arbor, MI	Sep 2007-Apr 2008
M. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea *Thesis: Nonlinear Adaptive and Robust Flight Control Using the Backstepping Algorithm* *Advisor: Youdan Kim*	1998-2000
B. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea	1994-1998

Professional Experience

Professor	Department of Mechanical and Aerospace Engineering THE GEORGE WASHINGTON UNIVERSITY, Washington DC	Aug 2020-present
Associate Professor	Department of Mechanical and Aerospace Engineering THE GEORGE WASHINGTON UNIVERSITY, Washington DC	Aug 2015- Jul 2020
Assistant Professor	Department of Mechanical and Aerospace Engineering THE GEORGE WASHINGTON UNIVERSITY, Washington DC	Aug 2011-Jul 2015
Assistant Professor	Department of Mechanical and Aerospace Engineering FLORIDA INSTITUTE OF TECHNOLOGY, Melbourne FL	Aug 2008-Aug 2011
Military Service	Second Lieutenant, Tactical Control Officer The 3rd Air Defense Artillery Division, Republic of Korea Air Force	2001–2004

Research Interests

Geometric Control on Manifolds: Developing control nonlinear systems for dynamic systems evolving on nonlinear configuration manifolds to achieve global stability properties in a unified way

Computational Geometric Mechanics: Construction of structure-preserving numerical integration algorithms for complex dynamic systems to obtain long-term structural stability, reliability, and high fidelity in computational results

Uncertainty Propagation and Estimation on Manifolds: Developing computational techniques to propagate uncertainties through complex dynamics on a manifold, and designing coordinate-free estimation schemes

Autonomous Space Systems: Applying geometric approaches for dynamics, control, optimization, and estimation to complex space systems, such as spacecraft attitude dynamics, low-thrust orbital transfer, asteroid shape construction, autonomous landing on asteroid, Mars surface exploration, and flapping-wing aerial vehicle in Mars

Autonomous Aerial Systems: Developing hardware systems and flight software for multirotor unmanned aerial vehicles, such as quadrotors, to illustrate aggressive autonomous flight maneuvers utilizing geometric adaptive controls with neural network, such as aerial transportation of payload, autonomous landing on ship

Robotics: Autonomous exploration algorithm for cooperating heterogeneous vehicles to construct a three-dimensional map of an unknown area; motion planning with emotional awareness

Research Grants (total award: over $4.58M)

NSF CNS Computer and Network Systems #1837382 *($1M, Co-PI)* 2019-2022
CPS: Medium: Edge-Cloud Support for Predictable, Global Situational-Awareness for Autonomous Vehicle

Air Force Office of Scientific Research (AFOSR) *($600K, PI)* 2018-2021
Uncertainty Quantification, Estimation, and Optimal Control for Stochastic Hybrid Systems on a Manifold

NSF CMMI Dynamics, Control and Systems Diagnostics #1760928 *($261K, PI)* 2018-2021
Dynamics and Control of Long Range Micro Air Vehicles Inspired by Monarch Butterflies

NASA Innovative Advanced Concepts (NIAC) Award *($125K, co-PI)* 2018-2019
Marsbee - Swarm of Flapping Wing Flyers for Enhanced Mars Exploration

NSF IUCRC #1747760 *($750K, co-PI)* 2018-2023
Center for High Pressure Plasma Energy, Agriculture, and Biomedical Technologies

Office of Naval Research (ONR) Grant #N00014-15-1-2043 *($655K, co-PI)* 2015-2018
Analysis of Ship Air Wakes

Naval Research Laboratory (NRL) Contract #N00173-14-F-0584 *($326K, PI)* 2015-2017
Collaborative Autonomous Aerial Exploration

NSF CMMI Control Systems #1335008 *($220K, PI)* 2013-2018
Stochastic Motion Planning and Estimation with Non-Gaussian Uncertainty Distributions on a Lie Group

NSF CNS Major Research Instrumentation #1337722 *($500K, co-PI)* 2013-2018
Development of Large-Scale Dense Scene Capture and Tracking Instrument

NSF CMMI Dynamic Systems #1029551 *($150K, PI)* 2010-2014
Computational Geometric Uncertainty Propagation for Hamiltonian Systems on a Lie Group

GWU Institute For Biomedical Engineering Interdisciplinary Research Grant *(PI)* 2011-2012
Optimal Control of Anti-Tachycardia Pacing Therapy

FIT Faculty Professional Development Grant *(PI)* 2010-2011
Development of an Autonomous Quadrotor UAV for Educational Research

Honor & Awards

Air Force Summer Faculty Fellowship, Air Force Office of Scientific Research, Kirtland AFB, Albuquerque NM 2013
Vision-Based Spacecraft Formation Control and Estimation Network

Air Force Summer Faculty Fellowship, Air Force Office of Scientific Research, Kirtland AFB, Albuquerque NM 2012
Vision-Based Spacecraft Relative Attitude Control and Estimation

Best Student Course Evaluation, Mechanical and Aerospace Engineering, Florida Institute of Technology 2010
Distinguished Dissertation Award, honorable mention, University of Michigan 2009
Distinguished Achievement Award, College of Engineering, University of Michigan 2008
Ivor K. McIvor Award, College of Engineering, University of Michigan (outstanding research in applied mechanics) 2008
SIAM Conference on Computational Science and Engineering, BGCE Student Paper Prize, finalist 2007
Rackham Predoctoral Fellowship, University of Michigan 2006-2007
Rackham International Students Fellowship, University of Michigan 2006
Rackham Travel Grant, University of Michigan Feb, Aug 2006
International Scholarship, Ministry of Education & Human Resources Development, Korea 2004

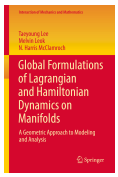
Publications

(available at Google scholar)

Category	Published (or accepted)	Submitted	Total
Book	1	0	1
Journal	44	10	54
Peer-reviewed Conference	95	3	98
Total			153

(Citation:3339, h-index=29, i10-index=51)

Book



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[2] T. Lee, M. Leok, and N.H. McClamroch. *Global Formulation of Lagrangian and Hamiltonian Dynamics on Manifolds*. Springer, 2018.

Computational Geometric Control

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*[2] K. Gamagedara and T. Lee. Geometric controls of a quadrotor uav with the decoupled yaw dynamics. *IEEE Transactions on Control Systems Technology*, 2020. in preparation.

*[3] B. Yu, K. Gamagedara, S. Kim, T. Lee, and J. Suk. Geometric control and experimental validation for a quadrotor UAV transporting a payload. In *Proceedings of IEEE Conference on Decision and Control*, 2020. submitted.

*[4] T. C, C. Kang, and T. Lee. Dynamics and control of a flapping wing uav with abdomen undulation inspired by monarch butterfly. In *Proceedings of the IEEE Conference on Decision and Control*, 2020. submitted.

[5] K. Gamagedara, M. Bisheban, E. Kaufman, and T. Lee. Geometric controls of a quadrotor with a decoupled yaw control. In *Proceedings of the American Control Conference*, 7 2019.

*[6] M. Bisheban and T. Lee. Geometric adaptive control with neural networks for a quadrotor UAV in wind fields. *IEEE Transactions on Control Systems Technology*, 2019. submitted.

[7] T. Lee, D. Chang, and Y. Eun. Semi-global non-memoryless attitude controls on the special orthogonal group. *ASME Journal of Dynamic Systems, Measurement, and Control*, 141(2):021005, 10 2018. doi:10.1115/1.4041447.

[8] L. Simon, R. Agnes, K. Gamagedara, K. Takami, M. Snyder, and T. Lee. Studies on autonomous landing of an unmanned aerial vehicle on a vessel. In *Proceedings of AIAA Information Systems*, 1 2018. AIAA 2018-1461.

[9] M. Bisheban and T. Lee. Geometric adaptive control for a quadrotor UAV with wind disturbance rejection. In *Proceedings of IEEE Conference on Decision and Control*, pages 2816–2821, December 2018.

[10] Z. Zhao, G. Cruz, T. Lee, and D. Bernstein. Adaptive attitude control of a dual-rigid-body spacecraft with unmodeled nonminimum-phase dynamics. In *Proceedings of the American Control Conference*, pages 2503–2508, June 2018.

[11] T. Lee. Geometric control of quadrotor UAVs transporting a cable-suspended rigid body. *IEEE Transactions on Control Systems Technology*, 26(1):255–264, January 2018. doi:10.1109/TCST.2017.2656060.

* pending

[12] S. Kulumani and T. Lee. Constrained geometric attitude control on SO(3). *International Journal of Control, Automation, and Systems*, 15(6):2796–2809, December 2017. doi:10.1007/s12555-016-0607-4.

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[14] S. Kulumani, K. Takami, and T. Lee. Geometric control for autonomous landing on asteroid Itokawa using visual localization. In *Proceedings of the AAS/AIAA Astrodynamics Specialist Conference*, August 2017. AAS 17-720.

[15] T. Lee, D. Chang, and Y. Eun. Attitude control strategies overcoming the topological obstruction on SO(3). In *Proceedings of the American Control Conference*, pages 4942–4947, May 2017.

[16] T. Lee. Optimal hybrid controls for global exponential tracking on the two-sphere. In *Proceedings of the IEEE Conference on Decision and Control*, pages 3331–3337, Las Vegas, NV, December 2016.

[17] F. Goodarzi and T. Lee. Stabilization of a rigid body payload with multiple cooperative quadrotors. *ASME Journal of Dynamic Systems, Measurement, and Control*, 138(12):121001–121001–17, December 2016. doi:10.1115/1.4033945.

[18] S. Kulumani, C. Poole, and T. Lee. Geometric adaptive control of attitude dynamics on SO(3) with state inequality constraint. In *Proceedings of the American Control Conference*, pages 4936–4941, Boston, MA, July 2016.

[19] K. Lee, C. Park, T. Lee, and S. Park. Spacecraft formation keeping via discrete-time Hamilton-Jacobi theory. In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, January 2016. AIAA 2016-0874.

[20] T. Lee. Geometric controls for a tethered quadrotor UAV. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2749–2754, Osaka, Japan, December 2015.

[21] F. Goodarzi, D. Lee, and T. Lee. Geometric control of a quadrotor UAV transporting a payload connected to a quadrotor UAV via flexible cable. *International Journal of Control, Automation, and Systems*, 13(6):1–13, December 2015. doi:10.1007/s12555-014-0304-0.

[22] T. Lee. Global exponential attitude tracking controls on SO(3). *IEEE Transactions on Automatic Control*, 60(10):2837–2842, October 2015. doi:10.1109/TAC.2015.2407452.

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[26] T. Lee. Collision avoidance via Voronoi tessellation for quadrotor UAVs transporting a payload. In *Proceedings of the American Control Conference*, pages 1842–1848, July 2015.

[27] E. Kaufman and T. Lee. Geometric adaptive control for aerial transportation of a rigid body. Presented at International Conference on Robotics and Automation, May 2015.

[28] T. Wu and T. Lee. Spacecraft attitude formation stabilization using lines-of-sight without angular velocity measurements. In *Proceedings of the AAS/AIAA Space Flight Mechanics Meeting*, February 2015. AAS 15-441.

[29] S. Dai, T. Lee, and D. Bernstein. Adaptive control of a quadrotor UAV transporting a cable-suspended load with unknown mass. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6149–6154, December 2014.

[30] T. Wu and T. Lee. Spacecraft position and attitude formation control using line-of-sight observations. In *Proceedings of the IEEE Conference on Decision and Control*, pages 970–975, December 2014.

[31] T. Lee. Geometric control of multiple quadrotor UAVs transporting a cable-suspended rigid body. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6155–6160, December 2014.

[32] F. Goodarzi, D. Lee, and T. Lee. Geometric stabilization of a quadrotor UAV with a payload connected by flexible cable. In *Proceedings of the American Control Conference*, pages 4925–4930, June 2014.

[33] J. Dougherty, D. Lee, and T. Lee. Laser-based guidance of a quadrotor UAV for precise landing on an inclined surface. In *Proceedings of the American Control Conference*, pages 1210–1215, June 2014.

[34] E. Kaufman, K. Caldwell, D. Lee, and T. Lee. Design and development of a free-floating hexrotor UAV for 6-dof maneuvers. In *Proceedings of the IEEE Aerospace Conference*, March 2014.

[35] T. Lee, K. Sreenath, and V. Kumar. Geometric control of cooperating multiple quadrotor UAVs with a suspended load. In *Proceedings of the IEEE Conference on Decision and Control*, volume 5510–5515, Florence, Italy, December 2013.

[36] K. Sreenath, T. Lee, and V. Kumar. Geometric control and differential flatness of a quadrotor UAV with a cable-suspended load. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2269–2274, Florence, Italy, December 2013.

[37] T. Wu, T. Lee, and M. Keidar. Low-thrust attitude control for nano-satellite with micro-cathode thrusters. In *Proceedings of the International Electric Propulsion Conference*, Washington, DC, October 2013. IEPC-2013-366.

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[44] T. Lee, M. Leok, and N.H. McClamroch. Dynamics and control of a chain pendulum on a cart. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2502–2508, Maui, HI, December 2012.

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[46] T. Lee. Relative attitude control of two spacecraft on SO(3) using line-of-sight observations. In *Proceedings of the American Control Conference*, pages 167–172, Montreal, Canada, June 2012.

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[51] T. Lee, M. Leok, and N.H. McClamroch. Geometric tracking control of a quadrotor UAV on SE(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 5420–5425, Atlanta, GA, December 2010.

Computational Geometric Optimization

1. tmp

[2] S. Kulumani and T. Lee. Systematic design of optimal low-thrust transfers for the three-body problem. *Journal of the Astronautical Sciences*, 66(1):1–31, 3 2019. doi:10.1007/s40295-018-00139-y.

*[3] S. Kulumani and T. Lee. Bayesian shape reconstruction and optimal guidance for autonomous landing on asteroids. *AIAA Journal of Guidance, Control, and Dynamics*, 2018. submitted.

[4] S. Kulumani and T. Lee. Low-thrust trajectory design using reachability sets near asteroid 4769 Castalia. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference*, September 2016. AIAA 2016-5376.

[5] S. Kulumani and T. Lee. Systematic design of optimal low-thrust transfers for the three-body problem. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference*, August 2015. AAS 15-757.

[6] T. Lee. Optimal control of partitioned hybrid systems via discrete-time Hamilton-Jacobi theory. *Automatica*, 50(8):2062–2069, August 2014. doi:10.1016/j.automatica.2014.05.024.

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Computational Geometric Mechanics

1. tmp

[2] H. Sharma, T. Lee, M. Patil, and C. Woolsey. Symplectic accelerated optimization on SO(3) with Lie group variational integrators. In *Proceedings of the American Control Conference*, 7 2020.

[3] M. Sridhar, C. Kang, and T. Lee. Geometric formulation for the dynamics of Monarch butterfly with the effects of abdomen undulation. In *Proceedings of the AIAA Scitech Forum*, 1 2020. AIAA 2020-1962.

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[10] T. Lee, M. Leok, and N.H. McClamroch. Global formulations of Lagrangian and Hamiltonian dynamics on embedded manifolds. In *Proceedings of the IMA Conference on Mathematics of Robotics*, September 2015.

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[17] T. Lee, M. Leok, and N.H. McClamroch. Computational dynamics of a 3D elastic string pendulum attached to a rigid body and an inertially fixed reel mechanism. *Nonlinear Dynamics*, 64(1-2):97–115, April 2011. doi:10.1007/s11071-010-9849-5.

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Uncertainty Propagation / Estimation

1. tmp

[2] W. Wang and T. Lee. Spectral uncertainty propagation for generalized stochastic hybrid systems with applications to a bouncing ball. In *Proceedings of the American Control Conference*, 7 2020.

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*[5] D. Chang and T. Lee. A global, continuous, and exponentially convergent observer for gyro bias and attitude of a rigid body. *Mechatronics*, 2020. submitted.

*[6] K. Gamagedara, T. Lee, and M. Snyder. Pose estimation with delayed real-tiem kinematics GPS and IMU for quadrotor UAV. *IEEE Transactions on Aerospace and Electronic Systems*, 2020. in preparation.

*[7] W. Wang and T. Lee. Higher-order central moments of matrix Fisher distribution on SO(3). *Statistics and Probability Letters*, 2020. submitted.

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*[9] T. Lee. Continuous-time attitude smoothing with matrix Fisher distribution on SO(3). In *Proceedings of IEEE Conference on Decision and Control*, 2020. submitted.

[10] W. Wang and T. Lee. Spectral bayesian estimation for general stochastic hybrid systems. *Automatica*, 2020. accepted.

*[11] T. Lee. Real harmonic analysis on the special orthogonal group. *Applied and Computational Harmonic Analysis*, 2020. submitted.

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[13] E. Kaufman and T. Lee. Autonomous aerial exploration for topological mapping of Mars environments. In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, 1 2019. AIAA 2019-1915.

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[41] E. Kaufman, A. Lovell, and T. Lee. Minimum uncertainty JPDA filter and coalescence avoidance performance evaluations. In *Proceedings of the AAS/AIAA Space Flight Mechanics Meeting*, February 2015. AAS 15-451.

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[46] T. Lee and M. Leok. Computational geometric uncertainty propagation for Hamiltonian systems on a Lie group. Proceedings of the NSF CMMI Research and Innovation Conference, February 2011.

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Nonlinear Flight Control

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[6] T. Lee and Y. Kim. Robust nonlinear control of flight dynamics using backstepping controller. In *Proceedings of the Korean Society for Aeronautical and Space Sciences Fall Conference*, Kyoungki, Korea, November 1999.

[7] T. Lee and Y. Kim. Nonlinear adaptive control of flight dynamics using backstepping and neural networks controller. In *Proceedings of the Institute of Control, Automation, and System Engineering 5th Conference*, Yongin, Korea, October 1999.

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Control of Biomedical Systems

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[2] Z. Hou, T. Lee, and M. Keidar. Reinforcement learning for adapative plasma cancer treatmetn. *IEEE Transactions on Plasma Science*, 2020. in preparation.

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Open-Source Software Development

[1] T. Lee. *Fast Fourier Transform on SO(3)*, `https://fdcl-gwu.github.io/FFTSO3`, 2018

[2] T. Lee. *Matrix Fisher Distribution on SO(3)*, `https://github.com/tylee-fdcl/Matrix-Fisher-Distribution`, 2018

[3] T. Lee. *Geometric Formulations for the Flapping Wing UAV*, `https://github.com/fdcl-gwu/FWUAV`, 2019

Invited Talks

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Oct 2018
University of Maryland, College Park MD

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Apr 2018
Virginia Tech, Blacksburg VA

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Mar 2018
University of Alabama, Huntsville, Huntsville AL

Intrinsic Formulation of Bayesian Estimation on a Lie Group — Aug 2017
Electrical Engineering, KAIST, Daejeon, South Korea

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Aug 2017
Aerospace Engineering, KAIST, Daejeon, South Korea

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Mar 2016
University of Michigan, Ann Arbor, MI

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Mar 2016
MAE Seminar Series, Syracuse University, Syracuse, NY

Global Formulations of Stochastic Analysis on Manifolds — Aug 2015
NSF Workshop on Learning, Perception and Control in Robots and Humans, Arlington VA

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Sep 2014
MAE Seminar Series, Seoul National University, South Korea

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Sep 2014
Department Seminar Series, Yonsei University, South Korea

Stochastic Optimal Motion Planning and Estimation for the Attitude Kinematics on SO(3) — Mar 2014
AMS Eastern Sectional Meeting, Special Session on Mechanics and Control, Baltimore MD

Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems — Jul 2013
AFRL Seminar Series, Kirtland AFB, Albuquerque NM

Computational Geometric Mechanics and Controls for Complex Aerospace Systems — Mar 2013
ECE Seminar Series, University of Virginia

Computational Geometric Mechanics and Control on Nonlinear Manifolds — Nov 2011
Mathematics Colloquium Series, University of Maryland Baltimore County

Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems — Apr 2011
Physical Sciences Department Colloquium Series, Embry-Riddle Aeronautical University

Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems — Mar 2011
MAE Seminar, George Washington University

Discrete Geometric Mechanics — Dec 2010
Young Researchers Workshop on Geometry, Mechanics and Control, University of La Laguna, Spain

Computational Geometric Mechanics and Control of Multibody Systems — May 2010
University of Michigan

Lie Group Variational Integrator for Dynamics and Control of Multibody Systems — Apr 2010
Structured Integrators Workshop, University of California, San Diego

Computational Geometric Mechanics and Control of Rigid Bodies — Feb 2008
Florida Institute of Technology, Melbourne, Florida

Computational Geometric Mechanics, Control, and Estimation of Rigid Bodies on Lie Groups — Feb 2007
SIAM Conference on Computational Science and Engineering, Costa Mesa, California

Optimal Control of a Rigid Body using Geometrically Exact Computations on Lie Groups — Oct 2006
Flight Dynamics and Control Seminar, University of Michigan

Attitude Maneuvers of a Rigid Spacecraft in a Circular Orbit — Nov 2005
Flight Dynamics and Control Seminar, University of Michigan

Lie Group Variational Integrator for the Attitude dynamics of a Rigid body — Feb 2005
Flight Dynamics and Control Seminar, University of Michigan

Editorial Services

Senior Editor: Conference Editorial Board — 2018
2018 International Conference on Ubiquitous Robotics

Committee Member: Technical Program Committee — 2018
2018 American Control Conference

Committee Member: Technical Program Committee — 2016
2016 American Control Conference

Associate Editor: Conference Editorial Board, IEEE Robotics and Automation Society — Dec 2014-present
2015, 2016, 2017, 2018, 2019 IEEE Conference on Robotics and Automation

Associate Editor: Conference Editorial Board, IEEE Control System Society — Jun 2013-present
2014, 2015, 2016, 2017, 2018, 2019 American Control Conference
2014, 2015, 2016, 2017, 2018, 2019 IEEE Conference on Decision and Control

Committee Member: Program Committee, Conference Organization Board — Oct 2014-Sep 2015
2015 IMA Conference on Mathematics on Robotics

Conference Organization and Service

Committee Member: Local Arrangement Committee, Conference Organization Board — Jun 2013
American Control Conference

Organizer, Chair: Geometric Control on Nonlinear Manifolds — Dec 2010
Invited Session at IEEE Conference on Decision and Control, Atlanta

Organizer, Chair: Synergies and Interplay of Nonlinear Dynamics and Control — May 2010
Symposium in honor of Dr. Harris McClamroch, University of Michigan
"HarrisFest [Conference Report]," *IEEE Control System Magazine*, vol. 30, no. 5, pp. 81-83, 2010

Media Coverage

Inquisitr: GWU Engineer To Develop Robo Bees That Will Map The Surface Of Mars — 2018

Gizmodo: Buzz Buzz, NASA Funds Project to Put Bee Robots on Mars — 2018

The engineer: "Marsbees" chosen as potential pioneers of Martian exploration — 2018

Mars daily: UAH gets NASA early-stage funding for "Marsbees" concept — 2018

Professional Service and Review

Review Panelist: National Science Foundation (NSF) 2013, 2015

Reviewer: National Science Foundation (NSF); Air Force Office of Scientific Research (AFOSR); IEEE Transactions on Automatic Control; IEEE Transactions on Control Systems Technology; IEEE Transactions on Mechatronics; IEEE Transactions on Neural Networks; IEEE Transaction on Plasma Science; IEEE Transactions on Industrial Electronics; IEEE Robotics and Automation Magazine; SIAM Journal on Control and Optimization; ASME Journal of Dynamics, Measurements, and Control; AIAA Journal of Guidance, Control, and Dynamics; International Journal of Aerospace Engineering; International Journal of Adaptive Control and Signal Processing; International Journal of Advanced Robotic Systems; International Journal of Control; International Journal of Control, Automation and Systems; International Journal of Robust and Nonlinear Control; Asian Journal of Control; Acta Astronautica; Aerospace Science & Technology; Automatica; Celestial Mechanics and Dynamical Astronomy; The Astronomical Journal; Control Engineering Practice; Computer Physics Communications; Chinese Journal of Aeronautics; The Astronomical Journal; Journal of Aerospace Engineering; Journal of Geometric Mechanics; Journal of Nonlinear Science; Mathematics of Control, Signals, and Systems; Transactions of the Japan Society for Aeronautical and Space Sciences, Aerospace Technology; Robotica; Symmetry, Integrability and Geometry: Methods and Applications; Systems and Control Letters; IEEE Conference on Decision and Control; IEEE Multi-conference on Systems and Control; IEEE International Conference on Robotics and Automation; IEEE International Conference on Intelligent Robots and Systems; AIAA Guidance, Navigation and Control Conference; American Control Conference; Applied Mathematical Modelling; European Control Conference; International Conference on Unmanned Aircraft Systems; IMA Conference on Mathematics of Robotics

Assessment Coordinator: FIT University coordinator for Southern Association of Colleges and Schools (SACS) accreditation 2011

Judge: SSPI Mid-Atlantic Regional Chapter Scholarship Competition Apr 2011

Judge: GWU SEAS Research and Development Showcase 2013, 2014

Judge: GWU Research Day 2017

Judge: GWU SEAS Pelton Senior Project Award 2017

University Service

Committee Member: Finance Committee, School of Engineering and Applied Science, GWU 2018-2019

Committee Member: Faculty Search Committee, Mechanical and Aerospace Engineering, GWU 2018-2019

Committee Member: Undergraduate Curriculum Committee, Mechanical and Aerospace Engineering, GWU 2018-2020

Committee Member: Research Committee, Faculty Senate, GWU 2013-2014

Committee Member: Graduate Curriculum Committee, Mechanical and Aerospace Engineering, GWU 2013-2015

Faculty secretary: Mechanical and Aerospace Engineering, GWU 2012-2013

Dissertation Directed

[1] M. Bisheban, *Geometric Estimation and Control of Quadrotor UAVs in Wind Fields*, Ph.D Dissertation, The George Washington University, 2018

[2] E. Kaufman, *Multi-Robot Probabilistic Mapping and Exploration*, Ph.D Dissertation, The George Washington University, 2018

[3] S. Kulumani, *Geometric Mechanics and Control for Small Body Missions*, Ph.D Dissertation, The George Washington University, 2018

[4] T. Wu, *Geometric Attitude Controls And Estimations On The Special Orthogonal Group*, Ph.D Dissertation, The George Washington University, 2016

[5] F. Goodarzi, *Geometric Nonlinear Controls for Multiple Cooperative Quadrotor UAVs Transporting a Rigid Body*, Ph.D Dissertation, The George Washington University, 2015

[6] J. Dougherty, *Laser-Guided Autonomous Landing of a Quadrotor UAV on an Inclined Surface*, MS Thesis, 2014

[7] T. Wu, *Spacecraft Relative Attitude Formation Tracking on SO(3) Based on Line-of-Sight Measurements*, MS Thesis, 2013

Mentoring Experiences

Postdoctoral Scientist	Dr. Kuya Takami: Autonomous aerial exploration	2016-2017
	Dr. Daewon Lee: Adaptive control of autonomous load transportation	2012-2014
Doctoral Students	Harshvardhan Uppaluru : urban situation awareness	2019-present
	Zichao Hou : Autonomous cancer treatment	2019-present
	Weixin Wang : Hybrid systems on a manifold	2019-present
	Kanishke Gamagedar : Autonomous landing on a ship	2018-present
	Mahdis Bisheban : Geometric control of quadrotors under wind	2015-2018
	Shankar Kulumani : Low thrust optimal orbital maneuvers	2014-2018
	Evan Kaufman : Autonomous aerial exploration	2012-2018
	Dr. Tse-Huai Wu : Geometric control and estimation on SO(3)	2013-2015
	Dr. Farhad Goodarzi : Geometric control of quadrotor UAV	2011-2015
Masters Students	Zichao Hou : Autonomous exploration of Mars	2018-2019
	Kanishke Gamagedar : Development of telemetry for ship air wakes	2016-2017
	Kalpesh Patil : Development of telemetry for ship air wakes	2015-2017
	Kiren Caldwell : Outdoor flight of quadrotor UAV via differential GPS	2014-2015
	John A. Dougherty : Laser-based guidance of quadrotor UAV	2013-2014
	Tse-Huai Wu : Vision-based spacecraft formation control	2011-2013
Undergraduate Students	Allegra Farrar : Interaction between UAV and human	2018-present
	Noah Curtiss : Development of multirotor UAV	2017-present
	Carolyn Fisk : Cubesat mission analysis and design	2017-present
	Chris Poole : Development of multirotor UAV	2015-2018
	Kiren Caldwell : Development of user interface for UAV control	2013-2014
	John Dougherty: Development of i2c interface circuit board	2012-2013
	Ryan Mossbarger: Development of thrust stand	2012-2013
Visiting Scholar	Prof. S. Kim (CNU South Korea) : Autonomous aerospace system	2019-2020
	Harsh Sharmar (VaTech) : Geometric numerical integration	2018, 2019

Student Recognition

AFRL Scholar: (Carolyn Fisk) 2018
Kirtland AFB, Albuquerque NM

Most Innovative/Creative Project Award: (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
The 7th Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

Mechanical and Aerospace Engineering – 1st Place: (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
GWU Research Day

Best Theoretical Poster – Runner-up (Shankar Kulumani) 2017
Spacecraft trajectory design near asteroid 4769 Castalia
SEAS R&D Showcase, George Washington University

Entrepreneurship Prize (Evan Kaufman) 2017
A robotic vacuuming software tool with autonomous exploration via exact occupancy grid mapping
SEAS R&D Showcase, George Washington University

Best Theoretical Poster – 3rd Place (Mahdis Bisheban) 2017
Computational geometric system identification
SEAS R&D Showcase, George Washington University

Student Travel Award: (Mahdis Bisheman), American Control Conference 2017

Student Travel Award: (Evan Kaufman, Shankar Kulumani), American Control Conference 2016

Experimental Research Awards– 1st Place (Shankar Kulumani, Christopher Poole) 2016
Geometric adaptive control of attitude dynamics on SO(3) with state inequality constraints
SEAS R&D Showcase, George Washington University

Heatherington Family Annual Scholarship: (Shankar Kulumani) 2016

Most Innovative/Creative Project Award: (Shankar Kulumani) 2015
Systematic design of optimal low-thrust orbital transfers in the three-body problem
The 5th Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

Second Prize: (John Dougherty)
Laser-based onboard sensing and estimation for precise landing of a quadrotor UAV on an inclined surface 2014
AIAA Region I Student Conference

Second Prize: (Tse-Huai Wu), Vision-based spacecraft attitude formation control 2014
GWU Research Day

Student Travel Award: (Farhad Goodarzi, John Dougherty), American Control Conference 2014

AFRL Scholar: (Evan Kaufman) 2014
Kirtland AFB, Albuquerque NM

AFRL Scholar: (Evan Kaufman) 2013
Kirtland AFB, Albuquerque NM

Third Place Prize: (Tse-Huai Wu), Vision-Based Spacecraft Formation Control and Estimation Network 2013
The 3rd Annual Student Competition, Society for Satellite Professional Internationals (SSPI)

SUPER Fellowship: (Kiren Caldwell), Spacecraft Formation Control Testbed with Free-Floating Aerial Vehicles 2013
Summer Undergraduate Program in Engineering Research, The George Washington University

Teaching Experience (average student evaluation: 4.8/5.0)

MAE3145: Orbital Mechanics and Space Dynamics — Fall 2011-2016
MAE4182: Electromechanical Control Systems — Fall 2018
MAE6254: Applied Nonlinear Control — Spring 2012,2014,2016,2018,2019
MAE6292: Special Topic: Optimal Control and Estimation — Spring 2015
MAE6277: Spacecraft Attitude Control — Spring 2013, 2017
MAE6246: Electromechanical Control Systems — Spring 2013, Fall 2013-2016
Department of Mechanical and Aerospace Engineering, The George Washington University

MAE5690: Special Topic: Spacecraft Dynamics and Control — Spring 2011
MAE5690: Special Topic: Nonlinear Systems — Fall 2010
MAE4600: Engineering Astrodynamics — Fall 2009
MAE4242: Aircraft Stability and Control — Fall 2008-2010
MAE4014: Control Systems — Spring 2009-2011
MAE2082: Dynamics — Spring, Summer 2010
Department of Mechanical and Aerospace Engineering, Florida Institute of Technology

Outreach

Introduction to Control System Engineering — May 2015
Workshop for Robotics Group at Bell Multicultural High School

Introduction to Control System Engineering — May 2014
Workshop for Robotics Group at Bell Multicultural High School

Introduction to Control System Engineering — Jul 2010
Engineering Summer Camp for K-12 Students, Florida Institute of Technology