Taeyoung Lee: Curriculum Vitae

Department of Mechanical and Aerospace Engineering, The George Washington University
800 22nd St NW, Suite 3610, Washington DC 20052
Tel: 202-994-8710,   Fax: 202-994-0238,   Email: tylee@gwu.edu

Education

Ph. D	Department of Aerospace Engineering	Sep 2004-Apr 2008
	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	
M. S	Department of Mathematics	Sep 2007-Apr 2008
	UNIVERSITY OF MICHIGAN, Ann Arbor, MI	
M. S	Department of Aerospace Engineering	1998-2000
	SEOUL NATIONAL UNIVERSITY, Korea	
	Thesis: Nonlinear Adaptive and Robust Flight Control Using the Backstepping Algorithm	
	Advisor: Youdan Kim	
B. S	Department of Aerospace Engineering	1994-1998
	SEOUL NATIONAL UNIVERSITY, Korea	

Professional Experience

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

Research Interests

Geometric Control on Manifolds: Global, intrinsic formulation of control systems on nonlinear manifold

Machine Learning for Control and Estimation: Concurrent stochastic learning and Bayesian estimation; Supervised learning for control of periodic motion with Floquet stability; Safe reinforcement learning for medical application; Neural-network based adaptive control

Aerial Robotics: Geometric mechanics, control, optimization, planning, estimation, vision-based perception for autonomous aerial systems, including multirotor UAV and micro flapping-wing UAV

Flight Experiments: Indoor/outdoor flight experiments for agile maneuvering, aerial transportation, autonomous landing on a ship, and aerial mapping; Design and development of flight software and hardware for autonomous aerial systems

Stochastic Analysis on Manifolds: Uncertainty propagation and Bayesian estimation on a manifold

Geometric Numerical Integration: Structure-preserving numerical integration schemes for Hamiltonian systems

Research Grants (total award: over $5.32M)

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

US Naval Academy *($72K, PI)* 2019-2021
  Autonomous Landing on a Ship

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

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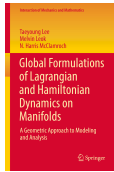
[1] T. Lee, M. Leok, and N.H. McClamroch. *Global Formulation of Lagrangian and Hamiltonian Dynamics on Manifolds*. Springer, 2018.

Computational Geometric Control

*[1] 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 American Control Conference*, 2021. submitted.

[2] 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*, December 2020.

[3] M. Bisheban and T. Lee. Geometric adaptive control with neural networks for a quadrotor UAV in wind fields. *IEEE Transactions on Control Systems Technology*, 2020. accepted. doi:10.1109/TCST.2020.3006184.

[4] 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*, June 2019.

[5] 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.

[6] 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, October 2018. doi:10.1115/1.4041447.

[7] 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.

[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*, January 2018. AIAA 2018-1461.

[9] 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.

[10] 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.

[11] T. Wu, B. Flewelling, F. Leve, and T. Lee. Spacecraft attitude formation tracking using line-of-sight measurements. *AIAA Journal of Guidance, Control, and Dynamics*, 40(10):2616–2629, October 2017. doi:10.2514/1.G001727.

[12] 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.

[13] 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.

[14] 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.

[15] 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.

---

* pending

[16] 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.

[17] 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.

[18] 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.

[19] 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.

[20] 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.

[21] T. Lee. Geometric adaptive control for aerial transportation of a rigid body. In *Proceedings of the IMA Conference on Mathematics of Robotics*, September 2015.

[22] F. Goodarzi, D. Lee, and T. Lee. Geometric adaptive tracking control of a quadrotor unmanned aerial vehicle on SE(3). *ASME Journal of Dynamic Systems, Measurement, and Control*, 137(9), September 2015. doi:10.1115/1.4030419.

[23] F. Goodarzi and T. Lee. Dynamics and control of quadrotor UAVs transporting a rigid body connected via flexible cables. In *Proceedings of the American Control Conference*, pages 4677–4682, July 2015.

[24] 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.

[25] 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.

[26] 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.

[27] 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.

[28] 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.

[29] 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.

[30] 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.

[31] 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.

[32] 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.

[33] 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.

[34] 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.

[35] 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.

4

[36] T. Lee. Robust adaptive tracking on SO(3) with an application to the attitude dynamics of a quadrotor UAV. *IEEE Transactions on Control Systems Technology*, 21(5):1924–1930, September 2013. doi:10.1109/TCST.2012.2209887.

[37] M. Camblor, A. Xie, G. Cruz, S. Esteban, T. Lee, and D. Bernstein. A numerical comparison of inertia-free attitude control laws for a spacecraft with a discrete flexible mode. In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, Boston, MA, August 2013. AIAA 2013-4562.

[38] F. Goodarzi, D. Lee, and T. Lee. Geometric nonlinear PID control of a quadrotor UAV on SE(3). In *Proceedings of the European Control Conference*, pages 3845–3850, Zurich, July 2013.

[39] T. Lee. Robust global exponential attitude tracking controls on SO(3). In *Proceedings of the American Control Conference*, pages 2103–2108, Washington, DC, June 2013.

[40] T. Wu, B. Flewelling, F. Leve, and T. Lee. Spacecraft relative attitude formation tracking on SO(3) based on line-of-sight measurements. In *Proceedings of the American Control Conference*, pages 4827–4832, Washington, DC, June 2013.

[41] T. Lee, M. Leok, and N.H. McClamroch. Nonlinear robust tracking control of a quadrotor UAV on SE(3). *Asian Journal of Control*, 15(2):391–408, March 2013. doi:10.1002/asjc.567.

[42] 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.

[43] T. Lee, M. Leok, and N.H. McClamroch. Nonlinear robust tracking control of a quadrotor UAV on SE(3). In *Proceedings of the American Control Conference*, pages 4649–4654, Montreal, Canada, June 2012.

[44] 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.

[45] T. Lee. Exponential stability of an attitude tracking control system on SO(3) for large-angle rotational maneuvers. *Systems and Control Letters*, 61(1):231–237, January 2012. doi:10.1016/j.sysconle.2011.10.017.

[46] T. Fernando, J. Chandiramani, T. Lee, and H. Gutierrez. Robust adaptive geometric tracking controls on SO(3) with an application to the attitude dynamics of a quadrotor UAV. In *Proceedings of the IEEE Conference on Decision and Control*, pages 7380–7385, Orlando, FL, December 2011.

[47] T. Lee, M. Leok, and N.H. McClamroch. Geometric tracking control of a quadrotor UAV for extreme maneuverability. In *Proceedings of the World Congress of the International Federation of Automatic Control*, pages 6337–6342, Milano, Italy, August 2011.

[48] T. Lee. Geometric tracking control of the attitude dynamics of a rigid body on SO(3). In *Proceedings of the American Control Conference*, pages 1200–1205, San Francisco, CA, June 2011.

[49] 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] S. Kulumani and T. Lee. Bayesian shape reconstruction and optimal guidance for autonomous landing on asteroids. *Journal of the Astronautical Sciences*, 2020. submitted.

[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, March 2019. doi:10.1007/s40295-018-00139-y.

[3] 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.

[4] 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.

[5] 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.

[6] T. Lee. Discrete-time optimal feedback control via the discrete Hamilton-Jacobi theory with applications to hybrid systems. In *Proceedings of the IEEE Conference on Decision and Control*, pages 7055–7062, Maui, HI, December 2012.

[7] T. Lee, M. Leok, and N.H. McClamroch. Computational geometric optimal control of connected rigid bodies in a perfect fluid. In *Proceedings of the American Control Conference*, pages 5985–5990, Baltimore, MD, June 2010. url:http://arxib.org/abs/0705.3868.

[8] T. Lee, M. Leok, and N.H. McClamroch. Discrete control systems. In *the Encyclopedia of Complexity and System Science*, pages 2002–2019. Springer, 2009.

[9] T. Lee, M. Leok, and N.H. McClamroch. Optimal attitude control of a rigid body using geometrically exact computations on SO(3). *Journal of Dynamical and Control Systems*, 14(4):465–487, October 2008. doi:10.1007/s10883-008-9047-7.

[10] T. Lee, M. Leok, and N.H. McClamroch. Time optimal attitude control for a rigid body. In *Proceedings of the American Control Conference*, pages 5210–5215, Seattle, WA, June 2008.

[11] T. Lee, M. Leok, and N.H. McClamroch. Computational geometric optimal control of rigid bodies. *Communications in Information and Systems, special issue dedicated to R. W. Brockett*, 8(4):445–472, 2008.

[12] T. Lee, M. Leok, and N.H. McClamroch. A combinatorial optimal control problem for spacecraft formation reconfiguration. In *Proceedings of the IEEE Conference on Decision and Control*, pages 5370–5375, New Orleans, LA, December 2007.

[13] T. Lee, M. Leok, and N.H. McClamroch. Optimal attitude control for a rigid body with symmetry. In *Proceedings of the American Control Conference*, pages 1073–1078, New York, NY, July 2007.

[14] T. Lee, M. Leok, and N.H. McClamroch. Optimal control of a rigid body using geometrically exact computations on SE(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 2170–2175, San Diego, CA, December 2006.

[15] T. Lee, M. Leok, and N.H. McClamroch. Attitude maneuvers of a rigid spacecraft in a circular orbit. In *Proceedings of the American Control Conference*, pages 1742–1747, Minneapolis, MN, June 2006.

Computational Geometric Mechanics

[1] M. Sridhar, J. Pohly, C. Kang, T. Lee, and H. Aono. Effects of vein structures on fluid-structure interaction of flexible flapping wings at high altitudes. In *Proceedings of the AIAA Scitech Forum*, 2021. accepted.

[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*, pages 2826–2831, July 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*, January 2020. AIAA 2020-1962.

[4] T. C, M. Sridhar, C. Kang, and T. Lee. Effects of abdomen undulation in energy consumption and stability for the flights of monarch butterfly. *Bioinspiration & Biomemetics*, 2020. accepted. doi:10.1088/1748-3190/abce4d.

[5] M. Sridhar, C. Kang, D. Landrum, H. Aono, S. Mathis, and T. Lee. Effects of flight altitude on the lift generation of monarch butterflies: from sea level to overwintering mountain. *Bioinspiration & Biomemetics*, 2020. accepted.

[6] H. Sharma and T. Lee. Energy-preserving, adaptive time-step lie group variational integrators for the attitude dynamics of a rigid body. In *Proceedings of the American Control Conference*, pages 5487–5492, June 2019.

[7] J. Pohly, C. Kang, M. Sridhar, D. Landrum, F. Fahimi, J. Bluman, H. Aono, and T. Lee. Scaling bioinspired Mars flight vehicles for hover. In *Proceedings of the AIAA Scitech Forum*, January 2019. AIAA 2019-0567.

[8] T. Lee, M. Leok, and N.H. McClamroch. Geometric formulations of Furuta pendulum control problems. *Mathematics in engineering, science and aerospace*, 7(1):69–81, 2016.

[9] T. Lee, M. Leok, and N.H. McClamroch. Global formulations of Lagrangian and Hamiltonian mechanics on two-spheres. In *Proceedings of the IEEE Conference on Decision and Control*, pages 6010–6015, Osaka, Japan, December 2015.

[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.

[11] T. Lee, F. Leve, M. Leok, and N.H. McClamroch. Lie group variational integrators for spacecraft with variable speed control moment gyros. In *Proceedings of the U.S. National Congress on Computational Mechanics*, July 2015.

[12] T. Lee and F. Leve. Lagrangian mechanics and Lie group variational integrators for spacecraft with imbalanced reaction wheels. In *Proceedings of the American Control Conference*, pages 3122–3127, June 2014.

[13] T. Lee, M. Leok, and N.H. McClamroch. High-fidelity numerical simulation of complex dynamics of tethered spacecraft. *Acta Astronautica*, 99(1):215–230, June 2014. doi:10.1016/j.actaastro.2014.02.021.

[14] T. Lee and M. Keidar. Low-thrust orbital maneuver analysis for Cubesat with micro-cathode thruster. In *Proceedings of the International Electric Propulsion Conference*, Washington, DC, October 2013. IEPC-2013-365.

[15] T. Lee, M. Leok, and N.H. McClamroch. Stable manifolds of saddle points for pendulum dynamics on S^2 and SO(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 3915–3921, Orlando, FL, December 2011.

[16] T. Lee, M. Leok, and N.H. McClamroch. Geometric numerical integration for complex dynamics of tethered spacecraft. In *Proceedings of the American Control Conference*, pages 1885–1891, San Francisco, CA, June 2011.

[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.

[18] N. Chaturvedi, T. Lee, M. Leok, and N.H. McClamroch. Nonlinear dynamics of the 3D pendulum. *Journal of Nonlinear Science*, 21(1):3–32, February 2011. doi:10.1007/s00332-010-9078-6.

[19] T. Lee, M. Leok, and N.H. McClamroch. Dynamics of a 3D elastic string pendulum. In *Proceedings of IEEE Conference on Decision and Control*, pages 3347–3352, Shanghai, China, December 2009.

[20] T. Lee, M. Leok, and N.H. McClamroch. Lagrangian mechanics and variational integrators on two-spheres. *International Journal for Numerical Methods in Engineering*, 79(9):1147–1174, August 2009. doi:10.1002/nme.2603.

[21] T. Lee, M. Leok, and N.H. McClamroch. Dynamics of connected rigid bodies in a perfect fluid. In *Proceedings of the American Control Conference*, pages 408–413, St. Louis, MO, June 2009.

[22] T. Lee. *Computational Geometric Mechanics and Control of Rigid Bodies*. PhD thesis, University of Michigan, 2008.

[23] T. Lee, M. Leok, and N.H. McClamroch. Lie group variational integrators for the full body problem in orbital mechanics. *Celestial Mechanics and Dynamical Astronomy*, 98(2):121–144, June 2007. doi:10.1007/s10569-007-9073-x.

[24] T. Lee, M. Leok, and N.H. McClamroch. Lie group variational integrators for the full body problem. *Computer Methods in Applied Mechanics and Engineering*, 196:2907–2924, May 2007. doi:10.1016/j.cma.2007.01.017.

[25] E. Fahnestock, T. Lee, M. Leok, N.H. McClamroch, and D. Scheeres. Polyhedral potential and variational integrator computation of the full two body problem. In *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference and Exhibit*, Keystone, CO, August 2006. AIAA 2006-6289.

[26] T. Lee, M. Leok, and N.H. McClamroch. A Lie group variational integrator for the attitude dynamics of a rigid body with application to the 3D pendulum. In *Proceedings of the IEEE Conference on Control Application*, pages 962–967, Toronto, Canada, August 2005.

Uncertainty Propagation / Estimation

[1] W. Wang and T. Lee. Higher-order central moments of matrix Fisher distribution on SO(3). *Statistics and Probability Letters*, 169, 2021. doi:https://doi.org/10.1016/j.spl.2020.108983.

*[2] T. Lee. Continuous-time attitude smoothing with matrix Fisher distribution on SO(3). In *Proceedings of the American Control Conference*, 2021. submitted.

[3] 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*, pages 1803–1808, July 2020.

[4] T. Lee. Adaptive learning Kalman filter with Gaussian process. In *Proceedings of the American Control Conference*, pages 4442–4447, July 2020.

[5] W. Wang and T. Lee. Matrix Fisher–Gaussian distribution on $\mathsf{SO}(3) \times \Re^n$ for attitude estimation with a gyro bias. In *Proceedings of the American Control Conference*, pages 4429–4434, July 2020.

[6] W. Wang and T. Lee. Spectral bayesian estimation for general stochastic hybrid systems. *Automatica*, 117, July 2020. doi:10.1016/j.automatica.2020.108989.

[7] E. Kaufman, K. Takami, Z. Ai, and T. Lee. Bayesian mapping-based autonomous exploration and patrol of 3D structured indoor environments with multiple flying robots. *Journal of Intelligent and Robotic Systems*, 98:403–419, May 2020. doi:10.1007/s10846-019-01066-2.

*[8] W. Wang, K. Gamagedara, and T. Lee. On the observability of attitude with single direction measurements. *IEEE Transactions on Automatic Control*, 2020. submitted.

*[9] K. Gamagedara and T. Lee. Geometric adaptive controls of a quadrotor uav with decoupled attitude dynamics. *IEEE Transactions on Aerospace and Electronic Systems*, 2020. submitted.

*[10] K. Gamagedara, T. Lee, and M. Snyder. Quadrotor state estimation with IMU and delayed real-time kinematic GPS. *IEEE Transactions on Aerospace and Electronic Systems*, 2020. submitted.

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

*[12] W. Wang and T. Lee. Matrix Fisher–Gaussian distribution on $\mathsf{SO}(3) \times \Re^n$ for Bayesian attitude estimation. *IEEE Transactions on Automatic Control*, 2020. submitted.

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

[14] K. Gamagedara, T. Lee, and D. Chang. Attitude observer on SO(3) with time-varying reference directions. In *Proceedings of the European Control Conference*, pages 4034–4039, July 2019.

[15] T. Lee. Spacecraft attitude estimation with a single magnetometer using matrix Fisher distributions on SO(3). In *Proceedings of the AIAA Guidance, Navigation and Control Conference*, January 2019. AIAA 2019-1173.

[16] K. Gamagedara, T. Lee, and M. Snyder. Real-time kinematics GPS based telemetry system for airborne measurements of ship air wake. In *Proceedings of AIAA Aerospace Sciences Meeting*, January 2019. AIAA 2019-2377.

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

[18] T. Lee. Bayesian attitude estimation with approximate matrix Fisher distributions on SO(3). In *Proceedings of IEEE Conference on Decision and Control*, pages 5319–5325, December 2018.

[19] E. Kaufman, K. Takami, T. Lee, and Z. Ai. Autonomous exploration with exact inverse sensor models. *Journal of Intelligent and Robotic Systems*, 92(3–4):435–452, December 2018. doi:10.1007/s10846-017-0710-7.

[20] T. Lee. Bayesian attitude estimation with the matrix Fisher distribution on SO(3). *IEEE Transactions on Automatic Control*, 63(10):3377–3392, October 2018. doi:10.1109/TAC.2018.2797162.

[21] S. Kulumani and T. Lee. Real time adaptive shape reconstruction for asteroid landing. In *Proceedings of the AAS/AIAA Astrodynamics Specialist Conference*, August 2018. AAS 18-319.

[22] K. Takami and T. Lee. Environment dependent depth enhancement with multi-modal sensor fusion learning. In *Proceedings of the IEEE International Conference on Robotic Computing*, pages 232–237, January 2018.

[23] E. Kaufman, K. Takami, and T. Lee. Autonomous quadrotor 3d mapping and exploration using exact occupancy probabilities. In *Proceedings of the IEEE International Conference on Robotic Computing*, pages 49–55, January 2018.

[24] F. Goodarzi and T. Lee. Global formulation of an extended Kalman filter on SE(3) for geometric control of a quadrotor UAV. *Journal of Intelligent and Robotic Systems*, 88(2–4):395–416, December 2017. doi:10.1007/s10846-017-0525-6.

[25] M. Bisheban and T. Lee. Computational geometric system identification for the attitude dynamics on SO(3). *International Journal of Control, Automation, and Systems*, 15(6):2776–2785, December 2017. doi:10.1007/s12555-016-0714-2.

[26] M. Bisheban and T. Lee. Computational geometric identification for the quadrotor dynamics in wind fields. In *Proceedings of the IEEE Conference on Control Technology and Applications*, pages 1153–1158, August 2017.

[27] M. Bisheban and T. Lee. Computational geometric system identification for the attitude dynamics on SO(3). In *Proceedings of the American Control Conference*, pages 2249–2254, May 2017.

[28] S. Kulumani and T. Lee. Bayesian attitude estimation on SO(3) with matrix Fisher mixtures. In *Proceedings of the AIAA/AAS Spaceflight Mechanics Meeting*, February 2017. AAS 17-324.

[29] C. Mallon, B. Muthig, K. Gamagedara, K. Patil, C. Friedman, T. Lee, and M. Snyder. Measurements of ship air wake using airborne anemometers. In *Proceedings of AIAA Aerospace Sciences Meeting*, January 2017. AIAA 2017-0252.

[30] E. Kaufman, Z. Ai, and T. Lee. Autonomous exploration by expected information gain from probabilisitic occupancy grid mapping. In *Proceedings of the IEEE Conference on Simulation, Modeling, and Programming for Autonomous Robots*, December 2016.

[31] E. Kaufman, T. Lovell, and T. Lee. Minimum uncertainty JPDA filters and coalescence avoidance for multiple object tracking. *Journal of the Astronautical Sciences*, 63(4):308–334, December 2016. doi:10.1007/s40295-016-0092-2.

[32] T. Wu and T. Lee. Angular velocity observer for velocity-free attitude tracking control on SO(3). *International Journal of Control, Automation, and Systems*, 14(5):1289–1298, October 2016. doi:10.1007/s12555-015-0163-3.

[33] E. Kaufman, T. Lee, Z. Ai, and I. Moskowitz. Bayesian occupancy grid mapping via an exact inverse sensor model. In *Proceedings of the American Control Conference*, pages 5709–5715, Boston, MA, July 2016.

[34] T. Lee. Global unscented attitude estimation via the matrix Fisher distributions on SO(3). In *Proceedings of the American Control Conference*, pages 4942–4947, Boston, MA, July 2016.

[35] F. Goodarzi and T. Lee. Extended Kalman filter on SE(3) for geometric control of a quadrotor UAV. In *Proceedings of the IEEE International Conference on Unmanned Aircraft Systems*, pages 1371–1380, Washington, DC, June 2016.

[36] E. Kaufman, T. Lovell, and T. Lee. Nonlinear observability for relative orbit determination with angles-only measurements. *Journal of the Astronautical Sciences*, 63(1):60–80, March 2016. doi:10.1007/s40295-015-0082-9.

[37] J. Dougherty and T. Lee. Monocular estimation of ground orientation for autonomous landing of a quadrotor. *AIAA Journal of Guidance, Control, and Dynamics*, 39(6):1407–1416, 2016. doi:10.2514/1.G001229.

[38] T. Wu, E. Kaufman, and T. Lee. Globally asymptotically stable attitude observer on SO(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 2164–2168, Osaka, Japan, December 2015.

[39] T. Wu and T. Lee. Angular velocity observer on the special orthogonal group for velocity-free rigid-body attitude tracking control. In *Proceedings of the European Control Conference*, pages 1824–1829, Linz, Austria, July 2015.

[40] T. Lee. Stochastic optimal motion planning for the attitude kinematics of a rigid body with non-gaussian uncertainties. *ASME Journal of Dynamic Systems, Measurement, and Control*, 137(3):034502, March 2015. doi:10.1115/1.4027950.

[41] E. Kaufman, A. Lovell, and T. Lee. Nonlinear observability measure for relative orbit determination with angles-only measurements. In *Proceedings of the AAS/AIAA Space Flight Mechanics Meeting*, February 2015. AAS 15-451.

[42] 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.

[43] E. Kaufman and T. Lee. Optimal joint probabilistic data association filter avoiding coalescence in close proximity. In *Proceedings of the European Control Conference*, pages 2709–2714, June 2014.

[44] T. Lovell and T. Lee. Nonlinear observability for relative satellite orbits with angles-only measurements. In *Proceedings of the International Symposium on Space Flight Dynamics*, May 2014.

[45] T. Lee. Stochastic optimal motion planning and global estimation for the attitude kinematics on SO(3). In *Proceedings of the IEEE Conference on Decision and Control*, volume 588–593, Florence, Italy, December 2013.

[46] T. Lee and M. Leok. Computational geometric uncertainty propagation and global estimation for Hamiltonian systems on a Lie group. Proceedings of the NSF CMMI Research and Innovation Conference, July 2012.

[47] 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.

[48] T. Lee, M. Leok, and N.H. McClamroch. Global symplectic uncertainty propagation on SO(3). In *Proceedings of the IEEE Conference on Decision and Control*, pages 61–66, Cancun, Mexico, December 2008.

[49] A. Sanyal, T. Lee, M. Leok, and N.H. McClamroch. Global optimal attitude estimation using uncertainty ellipsoids. *Systems and Control Letters*, 57(3):236–245, March 2008. doi:10.1016/j.sysconle.2007.08.014.

[50] T. Lee, N. Chaturvedi, A. Sanyal, M. Leok, and N.H. McClamroch. Propagation of uncertainty in rigid body attitude flows. In *Proceedings of the IEEE Conference on Decision and Control*, pages 2689–2694, New Orleans, LA, December 2007.

[51] T. Lee, M. Leok, N.H. McClamroch, and A. Sanyal. Global attitude estimation using single direction measurements. In *Proceedings of the American Control Conference*, pages 3659–3664, New York, NY, July 2007.

[52] T. Lee, A. Sanyal, M. Leok, and N.H. McClamroch. Deterministic global attitude estimation. In *Proceedings of the IEEE Conference on Decision and Control*, pages 3174–3179, San Diego, CA, December 2006.

Nonlinear Flight Control

[1] N.H. McClamroch and T. Lee. Optimal flight planning for a jet aircraft mission. In K. Murty, editor, *Case Studies in Operations Research*, volume 212 of *International Series in Operations Research and Management Science*, , pages 355–390. Springer, 2015.

[2] T. Lee and Y. Kim. Nonlinear adaptive flight control using backstepping and neural networks controller. *AIAA Journal of Guidance, Control, and Dynamics*, 24(4):675–682, July 2001. doi:10.2514/2.4794.

[3] T. Lee, Y. Kim, and D. Kim. Stability analysis of nonlinear flight control using neural networks. In *Proceedings of the 3rd Asian Control Conference*, Shanghai, China, July 2000.

[4] T. Lee and Y. Kim. Nonlinear adaptive flight control using neural networks and backstepping. *Journal of Control, Automation and Systems Engineering*, 6(12):1070–1078, 2000.

[5] 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.

[6] 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.

[7] J. Ahn, T. Lee, and Y. Kim. Real-time missile trajectory optimization using parameter optimization. In *Proceedings of the Japan Society for Aeronautical and Space Sciences (JSASS) 13th International Sessions in 37th Aircraft Symposium*, Tokyo, Japan, October 1999.

[8] J. Ahn, T. Lee, and Y. Kim. Real time formulation of missile trajectory optimization using a parameter optimization technique. *Journal of Korean Society for Aeronautical and Space Sciences*, 27(4):94–103, 1999.

Control of Biomedical Systems

[1] L. Lin, Z. Hou, X. Yao, Y. Liu, J. Sirigiri, T. Lee, and M. Keidar. Introducing adaptive cold atmospheric plasma: The perspective of adaptive cold plasma cancer treatments based on real-time electrochemical impedance spectroscopy. *Physics of Plasma*, 27(6):063501, 2020. doi:10.1063/5.0003528.

[2] T. Lee and M. Keidar. Adaptive plasma and machine learning. In M. Keidar, editor, *Plasma Cancer Treatment*, pages 223–250. Springer, 2020.

[3] Y. Lyu, L. Lin, E. Gjika, T. Lee, and M. Keidar. Mathematical modeling and control for cancer treatment with cold atmospheric plasma jet. *Journal of Physics D: Applied Physics*, 52(18):185202, May 2019. doi:10.1088/1361-6463/ab061d.

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

[1]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* University of Minnesota (virtual)	Nov 2020
[2]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Rutgers University, New Brunswick NJ	Oct 2019
[3]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* University of Maryland, College Park MD	Oct 2019
[4]	*Stochastic Hybrid Systems on a Manifold* Air Force Office of Scientific Research, Arlington VA	Aug 2019
[5]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* University of Maryland, College Park MD	Oct 2018
[6]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Virginia Tech, Blacksburg VA	Apr 2018
[7]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* University of Alabama, Huntsville, Huntsville AL	Mar 2018
[8]	*Intrinsic Formulation of Bayesian Estimation on a Lie Group* Electrical Engineering, KAIST, Daejeon, South Korea	Aug 2017
[9]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Aerospace Engineering, KAIST, Daejeon, South Korea	Aug 2017
[10]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* University of Michigan, Ann Arbor, MI	Mar 2016
[11]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* MAE Seminar Series, Syracuse University, Syracuse, NY	Mar 2016
[12]	*Global Formulations of Stochastic Analysis on Manifolds* NSF Workshop on Learning, Perception and Control in Robots and Humans, Arlington VA	Aug 2015
[13]	*Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* MAE Seminar Series, Seoul National University, South Korea	Sep 2014

[14] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* Department Seminar Series, Yonsei University, South Korea	Sep 2014
[15] *Stochastic Optimal Motion Planning and Estimation for the Attitude Kinematics on SO(3)* AMS Eastern Sectional Meeting, Special Session on Mechanics and Control, Baltimore MD	Mar 2014
[16] *Geometric Mechanics and Control on Nonlinear Manifolds for Complex Aerospace Systems* AFRL Seminar Series, Kirtland AFB, Albuquerque NM	Jul 2013
[17] *Computational Geometric Mechanics and Controls for Complex Aerospace Systems* ECE Seminar Series, University of Virginia	Mar 2013
[18] *Computational Geometric Mechanics and Control on Nonlinear Manifolds* Mathematics Colloquium Series, University of Maryland Baltimore County	Nov 2011
[19] *Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems* Physical Sciences Department Colloquium Series, Embry-Riddle Aeronautical University	Apr 2011
[20] *Geometric Control on Nonlinear Manifolds for Complex Aerospace Systems* MAE Seminar, George Washington University	Mar 2011
[21] *Discrete Geometric Mechanics* Young Researchers Workshop on Geometry, Mechanics and Control, University of La Laguna, Spain	Dec 2010
[22] *Computational Geometric Mechanics and Control of Multibody Systems* University of Michigan	May 2010
[23] *Lie Group Variational Integrator for Dynamics and Control of Multibody Systems* Structured Integrators Workshop, University of California, San Diego	Apr 2010
[24] *Computational Geometric Mechanics and Control of Rigid Bodies* Florida Institute of Technology, Melbourne, Florida	Feb 2008
[25] *Computational Geometric Mechanics, Control, and Estimation of Rigid Bodies on Lie Groups* SIAM Conference on Computational Science and Engineering, Costa Mesa, California	Feb 2007
[26] *Optimal Control of a Rigid Body using Geometrically Exact Computations on Lie Groups* Flight Dynamics and Control Seminar, University of Michigan	Oct 2006
[27] *Attitude Maneuvers of a Rigid Spacecraft in a Circular Orbit* Flight Dynamics and Control Seminar, University of Michigan	Nov 2005
[28] *Lie Group Variational Integrator for the Attitude dynamics of a Rigid body* Flight Dynamics and Control Seminar, University of Michigan	Feb 2005

Editorial Services

Senior Editor: Conference Editorial Board International Conference on Ubiquitous Robotics	2018-2021
Committee Member: Technical Program Committee American Control Conference	2016, 2018
Associate Editor: Conference Editorial Board, IEEE Robotics and Automation Society 2015, 2016, 2017, 2018, 2019 IEEE Conference on Robotics and Automation	2014-2020
Associate Editor: Conference Editorial Board, IEEE Control System Society 2014, 2015, 2016, 2017, 2018, 2019, 2020 American Control Conference 2014, 2015, 2016, 2017, 2018, 2019, 2020 IEEE Conference on Decision and Control	2013-2020
Committee Member: Program Committee, Conference Organization Board IMA Conference on Mathematics on Robotics	2015, 2021

Conference Organization and Service

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

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

Organizer, Chair: Synergies and Interplay of Nonlinear Dynamics and Control   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: NASA   2019
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 Transactions on Aerospace and Electronic Systems; 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   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 Chair: Faculty Search Committee, Mechanical and Aerospace Engineering, GWU   2019-2020
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   2018-2021
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	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
	Tse-Huai Wu : Geometric control and estimation on SO(3)	2013-2015
	Farhad Goodarzi : Geometric control of quadrotor UAV	2011-2015
Masters Students	Tejaswi K. C. : Flapping wing UAV	2019-present
	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	2018-2020
	Noah Curtiss : Development of multirotor UAV	2017-2019
	Carolyn Fisk : Cubesat mission analysis and design	2017-2019
	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

NSF Graduate Research Fellow: (Allegra Farrar)   2020

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 2018-2020
MAE6254: Applied Nonlinear Control   Spring 2012,2014,2016,2018,2019
MAE6292: Special Topic: Robotics Vision and Perception   Spring 2021
MAE6292: Special Topic: Optimal Control and Estimation   Spring 2015, 2020
MAE6277: Spacecraft Attitude Control   Spring 2013, 2017
MAE6246: Electromechanical Control Systems (Linear 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