

# Taeyoung Lee: Curriculum Vitae

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## Education

Ph. D	Department of Aerospace Engineering UNIVERSITY OF MICHIGAN, Ann Arbor, MI <i>Thesis: Computational Geometric Mechanics and Control of Rigid Bodies</i> <i>Advisors: N. Harris McClamroch, Melvin Leok (Mathematics, Purdue University)</i> <i>Committee: Daniel Scheeres, Anthony Bloch, Jessy Grizzle</i>	Sep 2004-May 2008
M. S	Department of Mathematics UNIVERSITY OF MICHIGAN, Ann Arbor, MI	Sep 2007-May 2008
M. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea <i>Thesis: Nonlinear Adaptive and Robust Flight Control Using the Backstepping Algorithm</i> <i>Advisor: Youdan Kim</i>	1998-2000
B. S	Department of Aerospace Engineering SEOUL NATIONAL UNIVERSITY, Korea <i>Thesis: F-16 Nonlinear Simulator Development using OpenGL</i>	1994-1998

## Professional Experience

Assistant Professor	Department of Mechanical and Aerospace Engineering FLORIDA INSTITUTE OF TECHNOLOGY, Melbourne FL	Aug 2008-present
Postdoctoral Scholar	Department of Aerospace Engineering UNIVERSITY OF MICHIGAN, Ann Arbor, MI	May 2008-Jul 2008
Military Service	Second lieutenant, Tactical Control Officer The 3rd Air Defense Artillery Division, Republic of Korea Air Force	2001-2004

## Research Interests

**Computational Geometric Mechanics:** Applying geometric techniques to the construction of the structure-preserving numerical algorithms for dynamics of rigid bodies on Lie groups.

**Computational Geometric Control & Estimation:** Construction of optimal control and estimation algorithms for mechanical systems on Lie groups using computational geometric mechanics and control theory.

**Dynamics and Control of Multibody:** Development of a feedback control law for multibody systems with applications to robotics and aerospace systems.

## Honor & Awards

<i>Distinguished Achievement Award</i> , College of Engineering, University of Michigan	2008
<i>Ivor K. McIvor Award</i> , College of Engineering, University of Michigan (outstanding research in applied mechanics)	2008
<i>SIAM Conference on Computational Science and Engineering, BGCE Student Paper Prize, finalist</i>	2007
<i>Rackham Predoctoral Fellowship</i> , University of Michigan	2006-2007
<i>Rackham International Students Fellowship</i> , University of Michigan	2006
<i>Rackham Travel Grant</i> , University of Michigan	Feb, Aug 2006
<i>International Scholarship</i> , Ministry of Education & Human Resources Development, Korea	2004

## Publications

(Available for download at <http://www.umich.edu/~tylee/>)

### Computational Geometric Mechanics

- T. Lee, M. Leok, and N. H. McClamroch, “Lagrangian mechanics and variational integrators on two-spheres,” *International Journal for Numerical Methods in Engineering*, 2008, submitted. Available: <http://arxiv.org/abs/0707.0022>
- N. Chaturvedi, T. Lee, M. Leok, and N. H. McClamroch, “Nonlinear dynamics of the 3D pendulum,” 2008, under revision.
- 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*, vol. 98, no. 2, pp. 121–144, June 2007, doi:10.1007/s10569-007-9073-x.
- T. Lee, M. Leok, and N. H. McClamroch, “Lie group variational integrators for the full body problem,” *Computer Methods in Applied Mechanics and Engineering*, vol. 196, pp. 2907–2924, May 2007, doi:10.1016/j.cma.2007.01.017.
- E. Fahnestock, T. Lee, M. Leok, N. H. McClamroch, and D. J. Scheeres, “Polyhedral potential and variational integrator computation of the full two body problem,” in *Proceedings of the AIAA/AAS Astrodynamics Specialist Conference and Exhibit*, 2006, AIAA 2006-6289. Available: <http://arxiv.org/abs/math.OC/0601424>
- 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*, 2005, pp. 962–967.

### Computational Geometric Optimal Control

- T. Lee, M. Leok, and N. H. McClamroch, “Geometric optimal control of rigid bodies,” *Communications in Information and Systems, special issue dedicated to R. W. Brockett*, 2007, submitted.
- T. Lee, M. Leok, and N. H. McClamroch, “Time optimal attitude control for a rigid body,” in *Proceedings of the American Control Conference*, 2008, pp. 5210–5215. Available: <http://arxiv.org/abs/0709.2514>
- T. Lee, M. Leok, and N. H. McClamroch, “Discrete control systems,” in *Invited article for the Encyclopedia of Complexity and System Science*. Springer, 2007, accepted. Available: <http://arxiv.org/abs/0705.3868>
- T. Lee, M. Leok, and N. H. McClamroch, “A combinatorial optimal control problem for spacecraft formation re-configuration,” in *Proceedings of the IEEE Conference on Decision and Control*, 2007, pp. 5370–5375. Available: <http://arxiv.org/abs/math.OC/0702738>
- T. Lee, M. Leok, and N. H. McClamroch, “Optimal attitude control for a rigid body with symmetry,” in *Proceedings of the American Control Conference*, 2007, pp. 1073–1078. Available: <http://arxiv.org/abs/math.OC/06009482>
- 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*, 2006, pp. 2170–2175. Available: <http://arxiv.org/abs/math.OC/0602588>
- 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*, 2007, accepted. Available: <http://arxiv.org/abs/math.OC/0601424>
- 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*, 2005, pp. 1742–1747. Available: <http://arxiv.org/abs/math.NA/0509299>

### Uncertainty Propagation / Estimation

- 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*, 2008, submitted. Available: <http://arxiv.org/abs/0803.1515>
- 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*, 2007, pp. 2689–2694. Available: <http://arxiv.org/abs/math.DS/0702737>
- T. Lee, M. Leok, N. H. McClamroch, and A. Sanyal, “Global attitude estimation using single direction measurements,” in *Proceedings of the American Control Conference*, 2007, pp. 3659–3664. Available: <http://arxiv.org/abs/math.OC/06009481>
- A. Sanyal, T. Lee, M. Leok, and N. H. McClamroch, “Global optimal attitude estimation using uncertainty ellipsoids,” *Systems and Control Letters*, vol. 57, no. 3, pp. 236–245, 2008, doi:10.1016/j.sysconle.2007.08.014.
- T. Lee, A. Sanyal, M. Leok, and N. H. McClamroch, “Deterministic global attitude estimation,” in *Proceedings of the IEEE Conference on Decision and Control*, 2006, pp. 3174–3179. Available: <http://arxiv.org/abs/math.OC/0602589>

## Nonlinear Flight Control

- T. Lee and Y. Kim, “Nonlinear adaptive flight control using backstepping and neural networks controller,” *Journal of Guidance, Control, and Dynamics*, vol. 24, no. 4, pp. 675–682, 2001.
- T. Lee and Y. Kim, “Nonlinear adaptive flight control using neural networks and backstepping,” *Journal of Control, Automation and Systems Engineering*, vol. 6, no. 12, pp. 1070–1078, 2000.
- 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, 2000.
- 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, Oct. 1999.
- 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*, Korea, Nov. 1999.
- 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*, vol. 27, no. 4, pp. 94–103, 1999.
- 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*, Korea, Oct. 1999.

## Teaching/Research Assistant Experience

Instructor	Part-time (50%) Lecturing on <i>AE740: Analytical and Computational Dynamics</i> Department of Aerospace Engineering, University of Michigan	Fall 2007
Research Assistant	Computational Geometric Mechanics for the Control of Clusters of Rigid Bodies Margaret and Herman Sokol Research Grant, Department of Mathematics, University of Michigan	2006
Research Assistant	Computational Geometric Mechanics Department of Mathematics, University of Michigan	2005
Teaching Assistant	Course note development, <i>AE245: Steady Aircraft Flight and Aircraft Performance</i> Department of Aerospace Engineering, University of Michigan	2005
Research Assistant	Medium Range Missile Trajectory Optimization Agency for Defense Development, Korea	1998–2000
Research Assistant	Institute of Advanced Machinery and Design Seoul National University, Korea	1998–2000

## Invited Conference & Seminar Talks

Computational Geometric Mechanics and Control of Rigid Bodies <i>Florida Institute of Technology</i> , Melbourne, Florida	Feb 2008
Computational Geometric Mechanics, Control, and Estimation of Rigid Bodies on Lie Groups <i>SIAM Conference on Computational Science and Engineering</i> , Costa Mesa, California	Feb 2007
Optimal Control of a Rigid Body using Geometrically Exact Computations on Lie Groups <i>Flight Dynamics and Control Student Seminar</i> , University of Michigan	Oct 2006
Attitude Maneuvers of a Rigid Spacecraft in a Circular Orbit <i>Flight Dynamics and Control Student Seminar</i> , University of Michigan	Nov 2005
Lie Group Variational Integrator for the Attitude dynamics of a Rigid body <i>Flight Dynamics and Control Student Seminar</i> , University of Michigan	Feb 2005

## Professional Service & Memberships

*Reviewer*: International Journal of Control, International Journal of Adaptive Control and Signal Processing, IEEE Conference on Decision and Control 2006, 2008, IEEE Multi-conference on Systems and Control 2007, American Control Conference 2008, AIAA Guidance, Navigation and Control Conference 2008  
*Memberships*: SIAM member, IEEE member

## References

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