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EDUCATION

California Institute of Technology <i>Ph.D. in Control and Dynamical Systems</i>	Pasadena, CA 2002
University of Arizona <i>B.S. in Mathematics</i>	Tucson, AZ 1997

EMPLOYMENT

Northwestern University <i>Professor</i>	2009-present
<i>Associate Professor</i>	2017 - present
<i>Assistant Professor</i>	2011-2017
	2009-2011
University of Colorado at Boulder <i>Assistant Professor</i>	2004-2008
Aerospace Corporation <i>Senior Technical Staff</i>	2003-2004
Northwestern University <i>Postdoctoral Scholar</i>	2002-2003

PUBLICATIONS¹ AND SOFTWARE

Submitted

- [6] A. Pervan and T. D. Murphey, "Algorithmic design for embodied intelligence in synthetic cells," *IEEE Transactions on Automation Science and Engineering*, Submitted.
- [5] I. Abraham, A. Prabhakar, and T. D. Murphey, "Dynamic coverage for active learning from equilibrium," *IEEE Transactions on Automation Science and Engineering*, Submitted.
- [4] A. T. Liu, M. Hempel, J. F. Yang, A. Pervan, V. B. K. G. Zhang, D. Kozawa, T. D. Murphey, T. Palacios, and M. S. Strano, "Colloidal state machines," *Nature Reviews Materials*, In Revision.
- [3] K. Fitzsimons, O. Kalinowska, J. Dewald, and T. Murphey, "Model-based shared control of data-driven human-machine systems," *International Journal of Robotics Research*, Submitted.
- [2] C. Chen, T. Murphey, and M. A. MacIver, "Sense organ control in moths to moles is a gamble on information through motion," *Current Biology*, Submitted.

¹Reprints of many of these can be found at <http://nrx.northwestern.edu/people/todd-murphey>

- [1] A. Broad, I. Abraham, T. Murphey, and B. Argall, "Model-based shared control of data-driven human-machine systems," *International Journal of Robotics Research*, Submitted.

Journal Articles

- [46] W. Savoie, T. A. Berrueta, Z. Jackson, A. Pervan, R. Warkentin, S. Li, T. D. Murphey, K. Wiesenfeld, and D. I. Goldman, "A robot made of robots: emergent transport and control of a smarticle ensemble," *Science: Robotics*, 2019.
- [45] K. Fitzsimons, A. M. Acosta, J. Dewald, and T. D. Murphey, "Ergodicity reveals assistance and learning in physical human robot interaction," *Science: Robotics*, vol. 4, no. 29, p. eaav6079, 2019.
- [44] I. Abraham and T. D. Murphey, "Active learning of dynamics for data-driven control using Koopman operators," *IEEE Transactions on Robotics*, 2019.
- [43] T. Berrueta, A. Pervan, K. Fitzsimons, and T. Murphey, "Dynamical system segmentation for information measures in motion," *IEEE Robotics and Automation Letters*, vol. 4, no. 1, pp. 169–176, 2019.
- [42] K. Flaßkamp and T. D. Murphey, "Structure-preserving local optimal control of mechanical systems," *Optimal Control, Applications and Methods*, vol. 40, no. 2, pp. 310–329, 2019.
- [41] E. Tzorakoleftherakis and T. D. Murphey, "Iterative sequential action control for stable, model-based control of nonlinear systems," *IEEE Transactions on Automatic Control*, vol. 64, no. 8, pp. 3170–3183, 2019.
- [40] G. Mamakoukas, M. Maciver, and T. D. Murphey, "Feedback synthesis for underactuated systems using sequential second-order needle variations," *International Journal of Robotics Research*, vol. 37, no. 13-14, pp. 1826–1853, 2019.
- [39] I. Abraham and T. Murphey, "Decentralized ergodic control: Distribution-driven sensing and exploration for multi-agent systems," *IEEE Robotics and Automation Letters*, vol. 3, no. 4, pp. 2987–2994, 2018.
- [38] A. Mavrommati, E. Tzorakoleftherakis, I. Abraham, and T. D. Murphey, "Real-time area coverage and target localization using receding-horizon ergodic exploration," *IEEE Transactions on Robotics*, vol. 34, no. 1, pp. 62–80, 2018.
- [37] M. A. MacIver, L. Schmitz, U. Mugan, T. D. Murphey, and C. D. Mobley, "A massive increase in visual range preceded the origin of terrestrial vertebrates," *Proceedings of the National Academy of Science (PNAS)*, vol. 114, no. 12, pp. E2375–E2384, 2017.
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- [34] K. Flaßkamp, A. Ansari, and T. D. Murphey, "Hybrid control for tracking of invariant manifolds," *Nonlinear Analysis: Hybrid Systems*, vol. 25, pp. 298–311, 2017.
- [33] J. Schultz, K. Flaßkamp, and T. D. Murphey, "Variational integrators for structure-preserving filtering," *ASME Journal of Computational and Nonlinear Dynamics*, vol. 12, no. 2, pp. 021005:1–021005:10, 2016.
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- [29] A. Mavrommati, J. Schultz, and T. D. Murphey, "Real-time mode scheduling using single-integration hybrid optimization for linear time-varying systems," *IEEE Transactions on Automation Science and Engineering*, vol. 13, no. 3, pp. 1385–1398, 2016.
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- [27] A. Ansari and T. D. Murphey, "Minimum sensitivity control for planning with parametric and hybrid uncertainty," *International Journal of Robotics Research*, vol. 35, no. 7, pp. 823–839, 2016.
- [26] E. Tzorakoleftherakis, A. Ansari, A. Wilson, J. Schultz, and T. D. Murphey, "Model-based reactive control for hybrid and high-dimensional robotic systems," *IEEE Robotics and Automation Letters*, vol. 1, no. 1, pp. 431–438, 2016.
- [25] T. Caldwell and T. D. Murphey, "Projection-based iterative mode scheduling for switched systems," *Nonlinear Analysis: Hybrid Systems*, vol. 21, pp. 59–83, 2016.
- [24] L. Miller, Y. Silverman, M. A. MacIver, and T. Murphey, "Ergodic exploration of distributed information," *IEEE Transactions on Robotics*, vol. 32, no. 1, pp. 36–52, 2016.
- [23] D. Pekarek and T. D. Murphey, "Discrete Lagrangian mechanics for nonsmooth nonseparable systems," *International Journal for Numerical Methods in Engineering*, vol. 105, pp. 440–463, 2016.
- [22] R. Abbott, A. Pedler, M. Sterling, J. Hides, T. D. Murphey, M. Hoggarth, and J. Elliott, "The geography of fatty infiltrates within the cervical multifidus and semispinalis cervicis in individuals with chronic whiplash-associated disorders," *Journal of Orthopaedic and Sports Physical Therapy*, vol. 45, no. 4, pp. 281–288, 2015.
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- [10] T. D. Murphey and J. Falcon, "Programming from the ground up in controls laboratories," *International Journal of Engineering Education*, vol. 26, no. 5, pp. 1241–1248, 2010.
- [9] E. Jochum and T. D. Murphey, "A Robotic Pygmalion: Choreography for an automated marionette play," *Puppetry International*, vol. 27, pp. 22–24, 2010.
- [8] E. Johnson and T. D. Murphey, "Scalable variational integrators for constrained mechanical systems in generalized coordinates," *IEEE Transactions on Robotics*, vol. 25, no. 6, pp. 1249–1261, 2009.
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- [6] T. D. Murphey and K. M. Lynch, "Case studies in planar part feeding and assembly based on design of limit sets," *International Journal of Robotics Research*, vol. 27, pp. 693–708, June 2008.
- [5] T. D. Murphey, "Teaching rigid body mechanics using student-created virtual environments," *IEEE Transactions on Education*, vol. 51, no. 1, pp. 45–52, 2008.
- [4] T. D. Murphey, "On multiple model control for multiple contact systems," *Automatica*, vol. 44, pp. 451–458, 2008.
- [3] T. D. Murphey, "Kinematic reductions for uncertain mechanical contact," *Robotica*, vol. 25, pp. 751–764, Nov 2007.
- [2] T. D. Murphey and J. W. Burdick, "The power dissipation method and kinematic reducibility of multiple model robotic systems," *IEEE Transactions on Robotics*, vol. 22, pp. 694–710, August 2006.
- [1] T. D. Murphey and J. W. Burdick, "Feedback control methods for distributed manipulation systems that involve mechanical contacts," *International Journal of Robotics Research*, vol. 23, pp. 763–782, July 2004.

Peer Reviewed Conference Papers

- [126] T. Fan and T. D. Murphey, "Generalized proximal methods for pose graph optimization," in *International Symposium on Robotics Research (ISRR)*, 2019.
- [125] T. Fan, H. Wang, M. Rubenstein, and T. D. Murphey, "CPL-Sync: Efficient and guaranteed planar pose graph optimization using the complex number representation," in *IEEE Int. Conf. on Intelligent Robots and Systems (IROS)*, 2019. Finalist for ABB Best Student Paper Award.

- [124] A. Broad, T. Murphey, and B. Argall, “Highly parallelized data-driven MPC for minimal intervention shared control,” in *Robotics: Science and Systems Proceedings*, 2019.
- [123] G. Mamakoukas, M. Castano, X. Tan, and T. D. Murphey, “Local Koopman operators for data-driven control of robotic systems,” in *Robotics: Science and Systems Proceedings*, 2019.
- [122] O. Ennasr, G. Mamakoukas, M. Castano, D. Coleman, T. D. Murphey, and X. Tan, “Adaptive single action control policies for linearly parameterized systems,” in *ASME Dynamic Systems and Control Conference (DSCC)*, 2019.
- [121] A. Kalinowska, T. Berrueta, A. Zoss, and T. D. Murphey, “Data-driven gait segmentation for walking assistance in a lower-limb assistive device,” in *IEEE Int. Conf. on Robotics and Automation (ICRA)*, 2019.
- [120] A. Broad, T. Murphey, and B. Argall, “Operation and imitation under safety-aware shared control,” in *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2018.
- [119] I. Abraham, A. Prabhakar, and T. D. Murphey, “Active area coverage from equilibrium,” in *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2018.
- [118] T. Fan, J. Schultz, and T. D. Murphey, “Efficient computation of higher-order variational integrators in robotic simulation and trajectory optimization,” in *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2018.
- [117] A. Pervan and T. D. Murphey, “Low complexity control policy synthesis for cyber-free robot design,” in *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2018.
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- [114] A. Kalinowska, K. Fitzsimons, J. Dewald, and T. D. Murphey, “Online user assessment for minimal intervention during task-based robotic assistance,” in *Robotics: Science and Systems Proceedings*, 2018.
- [113] A. Broad, I. Abraham, B. Argall, and T. D. Murphey, “Structured neural networks for model-based control,” in *Robotics: Science and Systems (RSS) Workshop on Learning and Inference in Robotics*, 2018.
- [112] A. Broad, T. D. Murphey, and B. Argall, “Demonstration and imitation of novel behaviors under safety aware control,” in *Robotics: Science and Systems (RSS) Workshop on Causal Imitation in Robotics*, 2018.
- [111] O. Ennasr, G. Mamakoukas, T. D. Murphey, and X. Tan, “Ergodic exploration for adaptive sampling of water columns using gliding robotic fish,” in *ASME Dynamic Systems and Control Conference (DSCC)*, p. V003T32A016 (9 pages), 2018.
- [110] T. Fan, H. Weng, and T. D. Murphey, “Decentralized and recursive identification for cooperative manipulation of unknown rigid body with local measurements,” in *IEEE Int. Conf. on Decision and Control (CDC)*, pp. 2842–2849, 2017.
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- [85] K. Flaßkamp and T. D. Murphey, "Variational integrators in linear optimal control and filtering," in *American Controls Conf. (ACC)*, pp. 5140 – 5145, 2015.
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- [76] E. Jochum, G. Borggreen, and T. Murphey, "INTERACT: Applying theory and methods from the visual and performing arts to robots," in *HRI-Workshop on Culture Aware Robotics*, 2014.
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- [32] T. Caldwell and T. D. Murphey, "Second-order optimal estimation of slip state for a simple slip-steered vehicle," in *IEEE Int. Conf. on Automation Science and Engineering (CASE)*, pp. 133–139, 2009.
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- [11] T. D. Murphey, D. Choi, J. Bernheisel, and K. M. Lynch, “Experiments in the use of stable limits sets for parts handling,” in *Proc. Int. Conf. MEMS, NANO, and Smart Systems (ICMENS)*, pp. 218–224, 2004.
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- [3] T. D. Murphey and J. W. Burdick, “A controllability test and motion planning primitives for overconstrained vehicles,” in *IEEE Int. Conf. on Robotics and Automation (ICRA)*, pp. 2716–2722, 2001.
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Editor Reviewed Book Chapters

- [8] T. A. Berrueta, I. Abraham, and T. D. Murphey, *The Koopman Operator in Systems and Control: Theory, Numerics, and Applications*, ch. Experimental Applications of the Koopman Operator in Active Learning for Control. Springer, In Press. Eds. I. Mezic, Y. Susuki, and A. Mauroy.

- [7] A. Pervan and T. D. Murphey, *Robotic Systems and Autonomous Platforms: Advances in Materials and Manufacturing*, ch. Algorithmic Materials: Embedding Computation within Material Properties for Autonomy. Elsevier, 2018. Eds. M. Strano and S. Walsh.
- [6] A. Mavrommati, A. Ansari, and T. D. Murphey, *Trends in Control and Decision-Making for Human-Robot Collaboration Systems*, ch. Assistive Optimal Control-on-Request with Application in Standing Balance Therapy and Reinforcement, pp. 131–156. Springer, 2017. Eds. Y. Wang and F. Zhang.
- [5] J. Schultz, E. Johnson, and T. D. Murphey, *Differential-Geometric Methods in Computational Multibody System Dynamics*, ch. Trajectory Optimization in Discrete Mechanics. CISM, 2015. Eds. Z. Terze and A. Mueller.
- [4] E. Jochum, J. Schultz, E. Johnson, and T. D. Murphey, *Art and Control*, ch. Robotic Puppets and the Engineering of Autonomous Theater. Springer-Verlag, 2013. Eds. A. LaViers and M. Egerstedt.
- [3] E. Jochum and T. D. Murphey, *New Scholarship on Puppetry and Performing Objects*, ch. Programming Play: Puppets, Robots, and Engineering. Springer-Verlag, 2012. Eds. D. Posner, J. Bell, and C. Orenstein.
- [2] T. D. Murphey, *Multi-point Interaction with Real and Virtual Objects*, ch. On Observing Contact States in Overconstrained Manipulation, pp. 151–164. Springer-Verlag, 2005. Eds. F. Barbagli, D. Prattichizzo, and K. Salisbury.
- [1] K. M. Lynch and T. D. Murphey, *Control Problems in Robotics and Automation*, ch. Control of Nonprehensile Manipulation, pp. 39–57. Springer-Verlag, 2003. Eds. A. Bicchi and H. Christensen.

Unrefereed Papers, Abstracts, and Posters

- [12] T. D. Murphey, “Sequential action control for nonlinear and hybrid systems,” in *Proceedings of the Annual Meeting of the International Association of Applied Mathematics and Mechanics (GAMM)*, 2015.
- [11] J. Schultz and T. Murphey, “Real-time trajectory generation for a planar crane using discrete mechanics,” in *IROS Workshop on Real-Time Systems*, 2014.
- [10] R. Abbott, A. Pedler, M. Sterling, J. Hides, T. Murphey, M. Hoggarth, and J. Elliott, “The distribution of muscle fat infiltration within the deep extensor muscles in whiplash-associated disorders,” in *American Physical Therapy Association Combined Sessions Meeting: Orthopaedics*, 2015.
- [9] B. Argall and T. Murphey, “Computable trust in human instruction,” in *AAAI Symposium on AI for Human-Robot Interaction*, 2014.
- [8] T. D. Murphey, D. Pekarek, and V. Seghete, “Variational methods for contact mechanics,” in *Robotics Science and Systems Workshop: Toward High-Performance Computing Support for Simulation and Planning of Robot Contact Tasks*, 2011.
- [7] B. Quist, V. Seghete, T. D. Murphey, and M. Hartmann, “Modeling forces and moments at the vibrissal base during natural motion and collisions,” in *The Royal Society*, 2011.
- [6] G. S. Chirikjian, H. M. Choset, M. A. Morales, and T. D. Murphey, “Editorial: Special issue on eighth international workshop on the algorithmic foundations of robotics,” *International Journal of Robotics Research*, 2010.
- [5] T. D. Murphey, “Topology-based variational integration of degenerate interconnected mechanical systems,” in *European Conference on Computational Mechanics (ECCM)*, 2010.
- [4] T. D. Murphey, “Poster: Hybrid sensing with physical sensors,” in *Int. Conf. on Chaos and Nonlinear Dynamics*, 2010.

- [3] K. L. Snyder and T. D. Murphey, “Abstract: Mathematical tools for tracking uncertainty through gait,” in *Dynamic Walking: Principles and Concepts of Legged Locomotion*, 2009. 1 page.
- [2] E. Johnson and T. D. Murphey, “The automated marionette project,” in *AAAI Robotics and Creativity Workshop*, 2008.
- [1] T. D. Murphey and M. E. Egerstedt, “Choreography for marionettes: Imitation, planning, and control,” in *IEEE Int. Conf. on Intelligent Robots and Systems Workshop on Art and Robotics*, 2007. 6 pages.

Books

- [1] G. S. Chirikjian, H. M. Choset, M. A. Morales, and T. D. Murphey, eds., *Algorithmic Foundation of Robotics VIII*, vol. 57 of *Springer Tracts in Advanced Robotics*. Springer-Verlag, 2009.

Publicly Available Software

- [2] A. Ansari and T. D. Murphey. The SAC library for nonlinear control can be used for approximate optimal control of general nonlinear and nonsmooth systems. It is available at <https://github.com/alexansari101/saclub>.
- [1] E. Johnson, J. Schultz, and T.D. Murphey. The `trep` environment is a computation package for simulation and control of constrained mechanical systems. The `trep` environment is available at <https://github.com/MurpheyLab/trep>.

MEDIA AND ARTS

- Exhibit: laboratory robots (including robotic marionettes, human-machine interfaces, drawing robots, and rehabilitation robotics) featured in National Robotics Week exhibit at the Chicago Museum of Science and Industry (2013-2018)
- Work featured in National Science Foundation *Science Nation* online magazine (2017).
- Panelist for Volkenburg Puppetry Symposium *The Uncanny Valley: Real Fakeness and Fake Realness*.
- Op-Ed: “Creating Content for Many to Access a Few” in *Pacific Standard Magazine*, March, 2014.
- Talk: “Context and Liveness” at panel *The Uncanny Valley Revisited: A Tribute to Masuhiro Mori* at IROS (2013)

FUNDING

- Todd Murphey (PI, 70%), Anant Mishra (Co-I, 30%). DARPA: *Interaction & Perception: Multi-Source Spectral Framework for Human-Swarm Collaboration*, \$300,000.
- Dana Randall (PI), Jeremy England, Daniel Goldman, Todd Murphey, Andrea Richi, Michael Strano, Army Research Office: *MURI: Formal Foundations of Algorithmic Matter and Emergent Computation*, \$6,000,000
- Todd D. Murphey (PI, 50%), Brenna Argall (Co-PI, 50%). National Science Foundation–Cyber-Physical Systems: *CPS: Medium: Information based Control of Cyber-Physical Systems operating in uncertain environments*. \$896,000.
- Todd D. Murphey (PI) and Xiabo Tan. National Science Foundation–Information and Intelligent Systems: *RI: Small: Collaborative Research: Information-driven Autonomous Exploration in Uncertain Underwater Environments*. \$500,000.

- Todd D. Murphey (PI). National Science Foundation–Civil and Mechanical Systems: *Stability and Optimality Properties of Sequential Action Control for Nonlinear and Hybrid Systems*. \$375,000.
- Todd D. Murphey (PI). National Science Foundation–National Robotics Initiative: *Task-Based Assistance for Software-Enabled Biomedical Devices*. \$430,000.
- Todd D. Murphey (PI), Eva Kanso, Yasamin Mostofi, Evangelos Theodorou. Army Research Office: *Study Proposal: Transforming Terrestrial Agility At All Scales*. \$60,000.
- Mitra Hartmann (PI), Todd Murphey, John Rudnicki, Sara Solla. National Institutes of Health: *Coding properties of Vibrissal-Responsive Trigeminal Ganglion Neurons*. \$1,800,000.
- Todd D. Murphey. Army Research Office: *Ergodic Control for Optimal Information Acquisition*. \$360,000.
- Todd D. Murphey (PI, 50%), J. Edward Colgate (Co-PI, 50%). National Science Foundation–National Robotics Initiative: *Autonomous Synthesis of Haptic Languages*. \$585,000.
- Malcolm A. MacIver (PI, 40%), Michael Peshkin (Co-PI, 30%), Todd D. Murphey (Co-PI, 30%). Office of Naval Research: *A Bio-Inspired Underwater Robot for Station Keeping with Omnidirectional Disturbances*. \$1,000,000.
- Todd D. Murphey (PI, 35%), Brenna Argall (Co-PI, 35%), and Magnus Egerstedt (Co-PI, 30%). National Science Foundation–Cyber-Physical Systems: *Collaborative Research: Mutually stabilized correction in physical demonstration*. \$1,000,000.
- Todd D. Murphey (PI, 50%) and Melvin Leok (Co-PI, 50%). National Science Foundation–Civil and Mechanical Systems: *Ergodic Trajectories in Discrete Mechanics*. \$430,000.
- Todd D. Murphey. National Institute of Health–R24: *Exoskeleton Evaluation for Hemiplegia Therapy*. \$50,000.
- Todd D. Murphey. National Science Foundation–Civil and Mechanical Systems: *Physical Design and Feedback Control of Hybrid Mechanical Systems*. \$350,000.
- Kevin Lynch (PI), Brenna Argall, J. Edward Colgate, Todd D. Murphey, and Ying Wu (Co-PIs). National Science Foundation: *MRI: Equipment Development: Bimanual Robotic Manipulation and Sensory Workspace*. \$400,000.
- Todd D. Murphey (PI, 50%) and Kevin Lynch (Co-PI, 50%). National Science Foundation–Robust Intelligence: *Hierarchical Planning, Estimation, and Control for Hybrid Mechanical Systems*. \$450,000.
- W. Murray (PI, 50%), T. D. Murphey (Co-PI, 50%), National Institutes of Health: *Prosthesis Control by Forward Simulation of the Intact Biomedical System*. (Northwestern portion) \$550,000.
- Todd D. Murphey (Consultant to Kinea, 10%) DARPA: *SBIR Phase I: Tactile Detection Robotic Hand System*. Murphey's portion is \$10,000.
- Todd D. Murphey (PI, 50%) and Magnus Egerstedt (Co-PI, 50%). National Science Foundation–CreativeIT: *Collaborative Research: Major: Puppet Choreography and Automated Marionettes*. \$800,000.
- Magnus Egerstedt (Co-PI, 50%) and Todd D. Murphey (PI, 50%). National Science Foundation–Software for Real-World Systems: *Collaborative Proposal: Abstraction-Based Motion Programs for Complex, Interconnected Systems*. \$450,000.
- Lucy Y. Pao (PI, 50%) and Todd D. Murphey (Co-PI, 50%). Air Force Research Laboratory: *Data Association and Sensor Management Algorithms for Tracking Applications*. \$250,000.

- Todd D. Murphey. National Science Foundation–Advanced Learning Technology: *Assessment of Controls Laboratory*. \$24,591.
- Todd D. Murphey. National Science Foundation–Civil and Mechanical Systems: *CAREER: Planning and Control for Overconstrained Mechanisms*. \$400,000.

TEACHING

Teaching Highlights

- Northwestern University Cole-Higgins Award for Excellence in Teaching (2015)
- Northwestern University Charles Deering McCormick Professor of Teaching Excellence (2014)
- Northwestern University Cole-Higgins Award for Excellence in Advising (2013)
- Participant in National Academy of Engineering Frontiers of Engineering Education Symposium (2009)
- Searle Fellow at Northwestern University (2009-2010)
- Bruce Holland Excellence in Teaching award (2007) (ECE Department at CU Boulder)

Coursera

2013-2014, www.coursera.org

- Created and taught course: *Everything Is The Same: Modeling Engineered Systems*; available at <http://www.coursera.org/course/modelsystems>.

International Centre for Mechanical Sciences (CISM)

2013, Udine, Italy

- Lecturer for *Differential-Geometric Methods in Computational Multibody Systems*. (My portion of the lectures focused on engineering applications of structured integration and optimal control in the context of structured integration.)

Northwestern University

2009-present, Evanston, IL

- Created and taught course: *Theory of Machines: Dynamics ME 314* (2009-present)
- Created and taught course: *Active Learning in Robotics, EA-3* (2018-present)
- Taught course: *Systems Dynamics, EA-3* (2009-present)
- Created and taught course: *Introduction to Optimal Control, ME 454* (2009-2017)
- Created and taught course: *Stochastic Systems in Robotics* (Spring, 2011)

University of Colorado

2004-2008, Boulder, CO

- Created and taught course: *Engineering Freshman Honors Colloquium: Everything and More—A History of Limits and the Development of Modern Calculus* (Spring 2008)
- Created and taught course: *Engineering Freshman Projects: Algorithms in Robotics, GEEN 1400* (Fall 2007, 2008)
- Created and taught course: *Introduction to Geometric Mechanics and Control ECEN 4028/5028* (Spring 2006)
- Created and taught course: *Robot Dynamics and Motion Planning ECEN 4028/5028* (Spring 2006)
- Taught course: *Control Systems Analysis ECEN 4138* (Fall 2005, 2006)
- Created and taught laboratory: *Control Systems Lab ECEN 4638* (Fall 2005, 2006, 2007, 2008)
- Created and taught course: *Robot Control ECEN 5438* (Spring 2005, 2007)

PROFESSIONAL ACTIVITIES

Service Highlights

- Member: Air Force Scientific Advisory Board (2019-present)
- Member: National Academies / National Research Council Committee on Counter-Unmanned Aircraft System (CUAS) Capability for Battalion-and-Below Operations (2016-2018)
- Presented at the Coalition for the National Science Foundation (CNSF) Capitol Hill Exhibition (2017)
- Senior Editor for *IEEE Transactions on Robotics* (2014-2018)
- Member: Northwestern University Task Force on the Undergraduate Academic Experience (2015)
- Defense Science Study Group (DSSG)—one of fifteen scientists/engineers nationwide selected to participate in the DARPA/IDA DSSG for the two year program in 2014-2015
- Invited speaker on Massive Open Online Courses (MOOCs) in universities for National Academy of Engineering Frontiers of Engineering Education Symposium in 2013

University Service

- Chair: Northwestern University Faculty Distance Learning Workgroup (2015 - 2018)
- Director and Co-Founder of Master of Science in Robotics Program (2013-present)
- Member: Northwestern University Segal Design Institute Research Council
- Member: Feinberg School of Medicine DPT/PhD T32 Steering Committee
- Participant in Kellogg School of Management Executive Education 2013 Program *Management Skills for Innovative University Leaders*.

External Service

- Associate Editor for
 - *IEEE Transactions on Automation Science and Engineering* (2010-2014)
 - *IEEE Transactions on Robotics* (2008-2012)
 - *Robotica* (2007-2011)
- Conference Organization
 - Local Arrangements Chair for the 2014 *IEEE International Conference on Intelligent Robots and Systems (IROS)*
 - Publication Chair for the 2010 *IEEE International Conference on Automation Science and Engineering (CASE)*
 - Co-Organizer (with Greg Chirikjian, Howie Choset, and Marco Morales) of 2008 *Workshop on the Algorithmic Foundations of Robotics (WAFR)*
- Workshop Organization
 - Member of advisory committee for 2017 *Midwest Workshop on Controls and Game Theory*
 - Co-Organizer (with Ken Goldberg, Vijay Kumar, and Frank van der Stappen) of 2009 *RSS Workshop on Algorithmic Automation*
 - Co-Chair (with Ken Goldberg, Jean-Paul Laumond, and Vijay Kumar) of CASE 2008 workshop: *Workshop on Algorithmic Automation*
 - Co-Organizer (with Vijay Kumar) of ICRA 2008 workshop: *Contact Models for Manipulation and Locomotion*
 - Co-Organizer (with Francisco Valero-Cuevas and Yoky Matsuoka) of ICRA 2008 workshop: *Is human-like dextrous manipulation within our robotic grasp?*

- Participant in the National Science Foundation and Computing Community Consortium (CCC) *Workshop on Robotics in Manufacturing and Automation*
- Conference Program committees
 - 2017 *Robotics: Science and Systems*: Area Chair
 - 2016 *Robotics: Science and Systems*: Area Chair
 - 2016 *Workshop on the Algorithmic Foundations of Robotics*
 - 2015 *IFAC Conference on Analysis and Design of Hybrid Systems*
 - 2012 *Workshop on the Algorithmic Foundations of Robotics*
 - 2009 *Robotics: Science and Systems*
 - 2008 *Hybrid Systems: Computation and Control*
 - 2008 *Robotics: Science and Systems*
 - 2008 *IEEE International Conference on Robotics and Automation*
 - 2008 *IEEE Conference on Automation Science and Engineering*
 - 2007 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2007 *International Conference on Advanced Robotics*
 - 2007 *International Conference on Networked Robots*
 - 2007 *IEEE International Conference on Robotics and Automation*
 - 2006 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2006 *IEEE International Conference on Robotics and Automation*
 - 2005 *Robotics: Science and Systems*
 - 2005 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
 - 2001 *IEEE/RSJ International Conference on Intelligent Robots and Systems*
- Other Conference Committees
 - ICRA Best Student Paper 2012 (Chair)
 - CASE Best Paper 2010
 - ICRA Best Student Paper 2008
- National Science Foundation Panelist for programs ranging from control, education, robotics, cyberphysical systems, and others 2006-2017
- Member, IEEE, ASME, and AAAS

STUDENTS AND POSTDOCS ADVISED

- Postdocs
 - Dr. Gerardo de la Torre (ME at Northwestern University), now at Northrop Grumman
 - Dr. Kathrin Flaßkamp (ME at Northwestern University), now a Postdoctoral Researcher at the University of Bremen
 - Dr. David Pekarek (ME at Northwestern University), now a senior scientist at Data Tactics
 - Dr. Benjamin Tovar (ME at Northwestern University), now a Research Software Engineer at Notre Dame
- Ph.D. Students
 - Brian Shucker (CS at University of Colorado), 2006 Ph.D. thesis: *Control of Distributed Robotic Macrosensors*, was at MIT Lincoln Laboratories, now at TALOS robotics.

- Matt Travers (ME at Northwestern University), 2011 Ph.D. thesis: *Impulse Smoothing for Data Association*, now a Systems Scientist at Carnegie Mellon University.
- Elliot Johnson (ME at Northwestern University), 2012 Ph.D. thesis: *Trajectory Optimization and Regulation for Constrained Discrete Mechanical Systems*, now at the Southwester Research Institute.
- Elizabeth Jochum (Performance Studies at the University of Colorado), 2013 Ph.D. thesis: *Deux Ex Machina: Towards an Aesthetics of Autonomous and Semi-Autonomous Machines*, now an Assistant Professor at Aalborg University.
- Tim Caldwell (ME at Northwestern University), 2013 Ph.D. thesis: *Iterative Methods in Switched System Optimal Control*, previously a postdoc at the University of Colorado at Boulder and now at Zoox (a driverless car startup company).
- Vlad Seghete (ME at Northwestern University), 2014 Ph.D. thesis: *Numerical Methods for Simulation and Control of Impacting Mechanical Systems*. Now at DataScope Analytics.
- Jarvis Schultz (ME at Northwestern University), 2014 Ph.D. thesis: *Discrete Mechanics Computation for Real-Time Embedded Control*, now at AZEVTEC.
- Andrew Wilson (ME at Northwestern University) 2015 Ph.D. thesis: *Information-based Trajectory Optimization for Active Estimation in Mechanical Systems*, now at Intuitive Surgical.
- Alex Ansari (ME at Northwestern University), 2015 Ph.D. thesis: *Sequential Action Control: Closed-Form Optimal Feedback for Nonlinear and Hybrid Systems*. Postdoc at Carnegie Mellon University 2015-2017, now at Uber.
- Lauren Miller (ME at Northwestern University), 2015 Ph.D. thesis: *Optimal Ergodic Control for Active Search and Information Acquisition*. Postdoc at UC Berkeley 2015-2016. Now at Marbles.
- Anastasia Mavrommati (ME at Northwestern University), 2017 Ph.D. thesis: *Real-Time Algorithms for Symbol-Based Automation*. Now at Schlumberger-Doll Research.
- Emmanouil Tzorakoleftherakis (ME at Northwestern University), 2017 Ph.D. thesis: *Stable Control Synthesis for Human-in-the-Loop Systems*. Now at Mathworks.
- Rebecca Abbott (ME/Physical Therapy at Northwestern University, co-advised with Prof. James Elliot.)
- Ahalya Prabhakar (ME at Northwestern University)
- Kathleen Fitzsimons (ME at Northwestern University)
- Giorgos Mamakoukas (ME at Northwestern University)
- Taosha Fan (ME at Northwestern University)
- Ian Abraham (ME at Northwestern University)
- Aleksandra (Ola) Kalinowska (ME at Northwestern University)
- Ana Pervan (ME at Northwestern University)
- Thomas Berrueta (ME at Northwestern University)

- Millicent Schlafly (ME at Northwestern University)
- Annalisa Taylor (ME at Northwestern University)
- Katarina Popovic (ME at Northwestern University)
- Kyra Rudy (ME at Northwestern University, co-advised with Brenna Argall)
- Undergraduate and MS Students
 - Kirk Nichols (ECE at University of Colorado)
 - Corrina Gibson (Aerospace at University of Colorado)
 - Matanya Horowitz (ECE at University of Colorado)
 - Yoke Peng Leong (ME at Northwestern University)
 - Katy Powers (ME at Northwestern University)
 - Henry Hung (ME at Northwestern University)
 - Camaria Lehman (BME at Northwestern University)
 - Elliot Hevel (ME at Northwestern University)
 - Scott Beck (ME at Northwestern University)
 - Vismaya Walawalker (ME at Northwestern University)
 - Samuel Donis (ME at Northwestern University)
 - Alex Samland (ME at Northwestern University)
 - Christopher Kim (ME at Northwestern University)
 - Andrew Kim (ME at Northwestern University)
 - Won Hee Jenny Kim (ME at Northwestern University)
- Visiting Students
 - Amy LaViers (Georgia Institute of Technology, USA)
 - Rowland O'Flaherty (Georgia Institute of Technology, USA)
 - Kathrin Flasskamp (Univ. of Paderborn, Germany)
 - Peter Kingston (Georgia Institute of Technology, USA)

EXTERNAL ACTIVITIES

- Consultant for HDT for SOCOM TALOS exoskeleton project (2016-2017)
- Member of Noursot Scientific Advisory Board (2017-)