

Tony Dear

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Education	Carnegie Mellon University, The Robotics Institute Doctor of Philosophy, Robotics Master of Science, Robotics - Thesis: Extensions of the Principal Fiber Bundle Model for Locomoting Robots - Completed the Future Faculty Program at the Eberly Center for Teaching Excellence	GPA: 4.0 August 2018 May 2015
	University of California, Berkeley Bachelor of Science, Electrical Engineering and Computer Science (EECS) - Graduated with highest honors (<i>summa cum laude</i>) - Completed EECS Honors Program, minor program in Physics	GPA: 3.96 May 2012
Research Experience	Carnegie Mellon University Prof. Howie Choset Expanded applicability of geometric methods for modeling and controlling locomoting systems, including wheeled, snake, and swimming robots. By combining the tools of geometric mechanics with nonlinear control methods, we extend intuitive motion planning techniques to systems that deviate from ideal conditions, such as those with passive joints or those that have to coordinate their degrees of freedom with environmental interactions. We also validate the newly established theory through experiments on simple but representative robots, such as a multi-link wheeled snake robot with compliant joints.	September 2012 - August 2018
	University of California, Berkeley Prof. Stuart Russell Developed and tested a seismic inference system in accordance with the Comprehensive Test Ban Treaty Organization (CTBTO) to detect nuclear explosions and seismic events worldwide; first system of its kind to use Bayesian inference. Implemented algorithms and computation through parallel and distributed computing on Amazon EC2, with results of up to 30 times speedup.	February 2011 - February 2012
	Space Sciences Lab (UC Berkeley) Dr. James McFadden Project: Mars Atmosphere and Volatile EvolutioN (MAVEN) mission. Assisted with PCB design, layout, and verification of modules in the Particles and Field package of a Mars orbiter designed to measure solar and magnetic properties of the atmosphere.	June 2009 - August 2010
Pedagogical Experience	Carnegie Mellon University Course Developer 16-384, Robot Kinematics and Dynamics (undergraduate) Course instructor: Prof. Howie Choset Produced a suite of online course materials in the form of lecture videos and curriculum hosted on CMU's Open Learning Initiative (OLI). Lecture videos (hosted on Panopto) consist of the instructor conveying a specific concept, are navigable with corresponding lecture slides, and are fully captioned between 5 and 10 minutes on average. The OLI curriculum interleaves these videos into course modules and units, accompanied by review text and images, as well as interactive practice problems. The problems, both quantitative and qualitative, are designed with targeted hints and feedback in order to accommodate individual student submissions.	Fall 2013 - present www.robotkinematics.org
	Future Faculty Program , Eberly Center for Teaching Excellence Completed program designed for graduate students to develop teaching skills and strategies. Milestones included attendance of interactive seminars on a variety of pedagogical topics, two teaching feedback consultations following lecture observations, a course and syllabus design project, and an individualized project. The latter included development of materials for a flipped version of 16-384, as well as a report on the approach and experience of the implementation.	Fall 2015
	Teaching Assistant 16-742, Geometry of Locomotion (graduate, 20 students) Course instructor: Prof. Howie Choset Developed and maintained course materials, including lecture notes, relevant scientific papers,	Fall 2015

and homework assignments. Graded assignments and advised 10 separate course projects, comprised of original research, a presentation, and a paper writeup. Continued to work with several groups post-course to submit project results as conference publications.

Teaching Assistant

Fall 2013

16-384, Robot Kinematics and Dynamics (undergraduate, 40 students)

Course instructor: Prof. Howie Choset

Developed paper-and-pencil homework assignments as well as exams, held weekly office hours, and guided students through lab projects utilizing KUKA youBot robotic arms. Projects included trajectory tracking, pick-and-place, and drawing with the arm gripper.

University of California, Berkeley

Course ratings: <https://hkn.eecs.berkeley.edu/coursesurveys/instructor/7113>

Instructor of Record

Summer 2012

EE 42/43/100, Electronic Techniques for Engineering (undergraduate, approx 160 students) Introductory circuits engineering course for computer science and non-electrical engineering majors. Components included 6 hours of lecture per week, weekly homework and lab assignments, weekly discussion and lab sections (run by TAs), 2 quizzes, and midterm and final exam. I designed and delivered lectures, as well as homeworks, course notes, exams, and solutions. Homework assignments consisted of paper-and-pencil problems; labs developed in coordination with department staff included design of simple circuits such as oscillators, filters, boost converters, and ADCs. Supported by a staff of 4 teaching assistants, 4 lab assistants, and 3 graders.

Teaching Assistant

Summer 2010 - Spring 2012

EE 42/43/100, Electronic Techniques for Engineering (undergraduate)

Course instructors: Howard Lei, Prof. Ali Niknejad, Prof. Kameshwar Poolla, and Brian Gawalt Course format as above. Delivered review lectures and worked through example problems in discussion sections (20-40 students). Guided students through circuit and device implementations and provided debugging support in lab sections (15-25 students). Designed homework assignments, solutions, and grading; held weekly office hours for student support. Interfaced among professor, other TAs, and students as head TA.

Journal Publications

R. L. Hatton, **T. Dear**, and H. Choset. "Kinematic Cartography and the Efficiency of Viscous Swimming". IEEE Transactions on Robotics. February 2017.

Conference Publications

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Locomotion of a Multi-link Nonholonomic Snake Robot". Proceedings of the ASME 2017 Dynamic Systems and Control Conference. Tysons Corner, VA, October 2017.

T. Dear, S. D. Kelly, and H. Choset. "Control and Locomotion of Hydrodynamically Coupled Rigid Spheres". Proceedings of the 2017 American Control Conference. Seattle, WA, May 2017.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Locomotive Analysis of a Single-Input Three-Link Snake Robot". Proceedings of the 55th IEE Conference on Decision and Control. Las Vegas, NV, December 2016.

H. Salman, **T. Dear**, S. Babikian, E. Shammas, and H. Choset. "A Physical Parameter-Based Skidding Model for the Snakeboard". Proceedings of the 55th IEE Conference on Decision and Control. Las Vegas, NV, December 2016.

A. Agrawal, H. Zaini, **T. Dear**, and H. Choset. "Experimental Gait Analysis of Waveboard Locomotion". Proceedings of the ASME 2016 Dynamic Systems and Control Conference. Minneapolis, MN, October 2016.

T. Dear, S. D. Kelly, and H. Choset. "Variations on the Role of Principal Connections in Robotic Locomotion". Proceedings of the ASME 2016 Dynamic Systems and Control Conference. Minneapolis, MN, October 2016.

R. Shu, A. Siravuru, A. Rai, **T. Dear**, K. Sreenath, and H. Choset. "Optimal Control for

Geometric Motion Planning of a Robot Diver". Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems. Daejon, South Korea, October 2016.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "The Three-Link Nonholonomic Snake as a Hybrid Kinodynamic System". Proceedings of the American Control Conference. Boston, MA, July 2016.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Motion Planning and Differential Flatness of Mechanical Systems on Principal Bundles". Proceedings of the ASME 2015 Dynamic Systems and Control Conference. Columbus, OH, October 2015.

J. Dai, M. Travers, **T. Dear**, C. Gong, H. C. Astley, D. I. Goldman, and H. Choset. "Robot-Inspired Biology: The Compound-Wave Control Template". Proceedings of the IEEE International Conference on Robotics and Automation. Seattle, WA, May 2015.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Snakeboard Motion Planning with Viscous Friction and Skidding". Proceedings of the IEEE International Conference on Robotics and Automation. Seattle, WA, May 2015.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Dissipation-Induced Self-Recovery in Systems on Principal Bundles". Proceedings of the ASME 2014 Dynamic Systems and Control Conference. San Antonio, TX, October 2014.

T. Dear, R. L. Hatton, and H. Choset. "Nonlinear Dimensionality Reduction for Kinematic Cartography with an Application toward Robot Locomotion". Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems. Chicago, IL, September 2014.

T. Dear, R. L. Hatton, M. Travers, and H. Choset. "Snakeboard Motion Planning with Local Trajectory Information". Proceedings of the ASME 2013 Dynamic Systems and Control Conference. Stanford, CA, October 2013. Nominated for Best Student Paper.

T. Dear, S. D. Kelly, M. Travers, and H. Choset. "Mechanics and Control of a Terrestrial Vehicle Exploiting a Nonholonomic Constraint for Fishlike Locomotion". Proceedings of the ASME 2013 Dynamic Systems and Control Conference. Stanford, CA, October 2013.

Presentations

T. Dear, S. D. Kelly, and H. Choset. "Locomotion and Coordination of Underactuated Bodies in An Ideal Fluid". SIAM Annual Meeting, Pittsburgh, PA, July 2017.

T. Dear, S. D. Kelly, and H. Choset. "Compliant Joints and Locomotion of Wheeled Robotic Systems". SIAM Conference on Applications of Dynamic Systems, Snowbird, UT, May 2017.

J. A. Adams, H. Choset, and **T. Dear**. "Biologically Inspired Human Supervision and Control of Agent Teams". ONR Science of Autonomy Meeting, Arlington, VA, August 2014.

H. Choset, **T. Dear**, and R. L. Hatton. "Mapping Effort: Cartographically Inspired Methods for Representing the Energetic Cost of Locomotion". SIAM Annual Meeting, Chicago, IL, July 2014.

Posters

T. Dear and H. Choset. "Flipping Undergraduate Robotics and Creating Interactive Online Content". Teaching and Learning Summit 2016, CMU, Pittsburgh PA, October 2016.

S. Russell, S. Meyers, N. Arora, D. Moore, **T. Dear**, and E. Sudderth. "Bayesian Treaty Monitoring". Berkeley EECS Annual Research Symposium, Berkeley, CA, February 2012.

N. Arora, **T. Dear**, and S. Russell. "Scalable Probabilistic Inference for Global Seismic Monitoring". Eos Transactions of the American Geophysical Union, 92(53), Fall Meeting Supplement, Abstract S43B-2238, December 2011.

Authored Grants

NSF CMMI-1727889, "An Expanded Analysis and Design Framework for Robots that Move by Reshaping their Limbs and Bodies", 2017. PI: H. Choset.

Fellowships	National Defense Science and Engineering Graduate (NDSEG) Fellowship Jim & Donna Gray Endowment Award (UC Berkeley)	2014-2017 2011-2012
Service	Reviewer for refereed journals, including IEEE T-ASE and NODY, and refereed conferences, including ICRA, IROS, CDC, ACC, DSAC, among others.	
	Mentor for undergraduate students (including international) participating in the Robotics Institute Summer Scholars (RISS) program to perform research in our laboratory.	
	Organized tour groups of Robotics Institute labs, including for K-12 students of the Big Brothers Big Sisters of Greater Pittsburgh program.	
	Language interpreter for international student finalists in the Intel International Science and Engineering Fair (ISEF), Pittsburgh, PA, May 2015.	
	IT lead and staff member for Pioneers in Engineering at UC Berkeley, 2011-2012. Organized robotics competitions and other STEM mentoring opportunities for local high school students.	
Professional Affiliations	<ul style="list-style-type: none"> - ASME Student Member - SIAM Student Member - Tau Beta Pi, Initiated CA-Alpha Chapter, Fall 2009 - IEEE-Eta Kappa Nu, Initiated CA-Alpha Chapter, Spring 2009 	
Skills	<p><i>Programming/Tools:</i> Mathematica, MatLab, Python, Java, C, Arduino, L^AT_EX</p> <p><i>Languages:</i> English, Mandarin, Cantonese, conversational Spanish</p>	