

Prof. Kevin M. Lynch

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AFFILIATIONS

Northwestern University Neuroscience and Robotics Lab (NxR)
Northwestern Institute on Complex Systems (NICO)

POSITIONS

2013-	Mechanical Engineering Department Chair
2010-2013	Codirector, Northwestern Institute on Complex Systems (NICO)
2009-	Professor
2007-2010	Associate Chair, Mechanical Engineering
2003-2009	Associate Professor
1997-2003	Assistant Professor Mechanical Engineering Department, Northwestern University
2012-	Visiting Faculty, Northeastern University, Shenyang, China
2007	Visiting Faculty, Robotics Institute, Carnegie Mellon University
2007	Visiting Faculty, Control and Dynamical Systems, Caltech
1996-1997	NSF/STA Postdoctoral Fellow Mechanical Engineering Laboratory, AIST-MITI, Tsukuba, Japan
1996-1997	Visiting Lecturer Department of Engineering Systems, University of Tsukuba, Tsukuba, Japan

EDUCATION

1989-1996, Carnegie Mellon University
Ph.D. in Robotics, February 1996
Thesis: *Nonprehensile Robotic Manipulation: Controllability and Planning*
Advisor: Prof. Matthew T. Mason

1985-1989, Princeton University
B.S.E. with honors, Electrical Engineering, June 1989

HONORS

- IEEE Fellow, 2010, "for contributions to robotic manipulation, motion planning, and control of mechanical systems"
- DARPA Institute for Defense Analyses Defense Science Study Group, 2008-9
- Charles Deering McCormick Professorship of Teaching Excellence, 2007-10 (one of four awarded annually university-wide)
- Best Technical Paper Award, Int Conf on Climbing and Walking Robots (CLAWAR) 2011
- Best Automation Paper Award, 2007 IEEE Int Conference on Robotics and Automation

- Best Student Paper Award (student Tom Vose), 2008 Robotics: Science and Systems
- 2007 SAE Ralph R. Teetor Educational Award
- 2001 IEEE Early Academic Career Award in Robotics and Automation
“This award is intended to recognize a person in the early stage of his or her career (within seven years of being granted his or her highest academic degree) who has made contributions which have had a major impact on the robotics and/or automation fields.”
- McCormick School of Engineering and Applied Science Teacher of the Year, 1998-1999
- NSF CAREER Award, 1998
- Northwestern University June and Donald Brewer Junior Professorship, 1997-1999
- 1998 NSF New Century Scholars Engineering Education Workshop, Stanford CA
- Best Paper Award finalist, IEEE International Conference on Robotics and Automation, Nagoya, Japan, May 1995
- Anton Philips Best Student Paper Award finalist (three times), IEEE International Conference on Robotics and Automation, 1993, 1995, 1997
- NSF fellow, 1991 Summer Institute in Japan
- Princeton Charles Caldwell Scholarship for Advanced Education (given to Princeton's top four scholar / athletes continuing for advanced degrees), 1989
- Richard King Mellon National Merit Scholarship, 1985-89
- Westinghouse four year scholarship, 1985-89
- Western PA High School Scholar / Athlete of the Year, 1985 (scholarship 1985-89)

PUBLICATIONS

BOOKS

[B2] Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia Kavraki, and Sebastian Thrun. *Principles of Robot Motion*, MIT Press, 2005. ISBN 0-262-03327-5.

[B1] Bruce R. Donald, Kevin M. Lynch, and Daniela Rus, eds. *Algorithmic and Computational Robotics: New Directions*. A. K. Peters, Natick, MA, 2001. ISBN 1-56881-125-X.

JOURNAL PAPERS

[J36] Ji-Chul Ryu, Fabio Ruggiero, and Kevin M. Lynch. Control of nonprehensile rolling manipulation: Balancing a disk on a disk. *IEEE Transactions on Robotics*, in press, 2013.

[J35] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Modeling, design, and control of 6-DoF flexure-based parallel mechanisms for vibratory manipulation. *Mechanism and Machine Theory*, 64(113):111-130, 2013.

[J34] Evan Baker, Tim Reissman, Fan Zhou, Chen Wang, Kevin Lynch, and Cheng Sun. Micro-stereolithography of three-dimensional polymeric springs for vibration energy harvesting. *Smart Materials Research*, 2012.

[J33] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Sliding manipulation of rigid bodies on a controlled 6-DoF plate. *International Journal of Robotics Research*, 31(7):819-838, June 2012.

[J32] Robert D. Gregg, Yasin Y. Dhaher, Amir Degani, and Kevin M. Lynch. On the mechanics of functional asymmetry in bipedal walking. *IEEE Transactions on Biomedical Engineering*, 59(5):1310-1318, May 2012.

- [J31] Vikram Chib, Matthew Krutky, Kevin M. Lynch, and Ferdinando Mussa-Ivaldi. The separate neural control of hand movements and contact forces. *Journal of Neuroscience*, 29(12):3939-3947, March 2009.
- [J30] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Friction-induced velocity fields for parts sliding on a rigid oscillated plate. *International Journal of Robotics Research*, 28(8):1020-1039, August 2009.
- [J29] Peng Yang, Randy A. Freeman, Geoffrey J. Gordon, Kevin M. Lynch, Siddhartha S. Srinivasa, and Rahul Sukthankar. Decentralized estimation and control of graph connectivity for mobile sensor networks. *Automatica*, 46(2):390-396, February 2010.
- [J28] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Friction-induced lines of attraction and repulsion for parts sliding on an oscillated plate. *IEEE Transactions on Automation Science and Engineering*, 6(4):685-699, October 2009.
- [J27] Todd D. Murphey and Kevin M. Lynch. Case studies in planar part feeding and assembly based on design of limit sets. *International Journal of Robotics Research*, 27(6):693-708, June 2008.
- [J26] James R. Solberg, Kevin M. Lynch, and Malcolm A. MacIver. Active electrolocation for underwater target localization. *International Journal of Robotics Research*, 27(5):529-548, May 2008.
- [J25] Kevin M. Lynch, Ira B. Schwartz, Peng Yang, and Randy A. Freeman. Decentralized environmental modeling by mobile sensor networks. *IEEE Transactions on Robotics*, 24(3):710-724, June 2008.
- [J24] Paul Umbanhowar and Kevin M. Lynch. Optimal vibratory stick-slip transport. *IEEE Transactions on Automation Science and Engineering*, 5(3):537-544, July 2008.
- [J23] Peng Yang, Randy A. Freeman, and Kevin M. Lynch. Multi-agent coordination by decentralized estimation and control. *IEEE Transactions on Automatic Control*, 53(11):2480-2496, December 2008.
- [J22] Eric L. Faulring, Kevin M. Lynch, J. Edward Colgate, and Michael A. Peshkin. Haptic display of constrained dynamic systems via admittance displays. *IEEE Transactions on Robotics*, 23(1):101-111, February 2007.
- [J21] Jay D. Bernheisel and Kevin M. Lynch. Stable transport of assemblies by pushing. *IEEE Transactions on Robotics*, 22(4):740-750, August 2006.
- [J20] Tom Worsnopp, Michael A. Peshkin, Kevin M. Lynch, and J. Edward Colgate. Controlling the apparent inertia of passive human-interactive robots. *ASME Journal of Dynamic Systems, Measurement, and Control*, 128(1):44-52, March 2006.
- [J19] Vikram Chib, James Patton, Kevin M. Lynch, and Ferdinando Mussa-Ivaldi. Haptic identification of surfaces as fields of force. *Journal of Neurophysiology*, 95:1068-1077, February 2006.
- [J18] Peng Pan, Michael A. Peshkin, J. Edward Colgate, and Kevin M. Lynch. Static single-arm force generation with kinematic constraints. *Journal of Neurophysiology*, 93:2752-2765, May 2005.

- [J17] J. Edward Colgate and Kevin M. Lynch. Mechanics and control of swimming: A review. *IEEE Journal of Oceanic Engineering*, 29(3):660-673, July 2004.
- [J16] Stefano Iannitti and Kevin M. Lynch. Minimum control switch motions for the snakeboard: A case study in kinematically controllable underactuated systems. *IEEE Transactions on Robotics*, 20(6):994-1006, December 2004.
- [J15] Jay D. Bernheisel and Kevin M. Lynch. Stable transport of assemblies: Pushing stacked parts. *IEEE Transactions on Automation Science and Engineering*, 1(2):163-168, October 2004.
- [J14] Kevin M. Lynch, Michael Northrop, and Peng Pan. Stable limit sets in a dynamic parts feeder. *IEEE Transactions on Robotics and Automation*, 18(4):608-615, August 2002.
- [J13] Kevin M. Lynch. Optimal control of the thrusted skate. *Automatica*, 39(1):173-176, January 2003.
- [J12] Prasun Choudhury and Kevin M. Lynch. Rolling manipulation with a single control. *International Journal of Robotics Research*, 21(5-6):475-487, May-June 2002.
- [J11] Kevin M. Lynch, Caizhen Liu, Allan Sorensen, Michael Peshkin, J. Edward Colgate, Tanya Tickel, David Hannon, and Kerry Shiels. Motion guides for assisted manipulation. *International Journal of Robotics Research*, 21(1):27-43, January 2002.
- [J10] Francesco Bullo and Kevin M. Lynch. Kinematic controllability and decoupled trajectory planning for underactuated mechanical systems. *IEEE Transactions on Robotics and Automation*, 17(4):402-412, August 2001.
- [J9] Kevin M. Lynch and Craig K. Black. Recurrence, controllability, and stabilization of juggling. *IEEE Transactions on Robotics and Automation*, 17(2):113-124, April 2001.
- [J8] Kevin M. Lynch, Naoji Shiroma, Hirohiko Arai, and Kazuo Tanie. Collision-free trajectory planning for a 3-DOF robot with a passive joint. *International Journal of Robotics Research*, 19(12):1171-1184, December 2000.
- [J7] Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. Parts feeding on a conveyor with a one joint robot. *Algorithmica*, 26(3):313-344, March-April 2000.
- [J6] Kevin M. Lynch. Inexpensive conveyor-based parts feeding. *Assembly Automation*, 19(3):209-215, 1999.
- [J5] Kevin M. Lynch. Controllability of a planar body with unilateral thrusters. *IEEE Transactions on Automatic Control*, 44(6):1206-1211, June 1999.
- [J4] Kevin M. Lynch. Locally controllable manipulation by stable pushing. *IEEE Transactions on Robotics and Automation*, 15(2):318-327, April 1999.
- [J3] Kevin M. Lynch and Matthew T. Mason. Dynamic nonprehensile manipulation: Controllability, planning, and experiments. *International Journal of Robotics Research*, 18(1):64-92, January 1999.
- [J2] Kevin M. Lynch and Matthew T. Mason. Stable pushing: Mechanics, controllability, and planning. *International Journal of Robotics Research*, 15(6): 533-556, December 1996.

[J1] Kevin M. Lynch and Matthew T. Mason. Pulling by pushing, slip with infinite friction, and perfectly rough surfaces. *International Journal of Robotics Research*, 14(2): 174-183, April 1995.

BOOK CHAPTERS

[CH9] M. Hwang, M. L. Elwin, P. Yang, R. A. Freeman, and K. M. Lynch. Experimental validation of multi-agent coordination by decentralized estimation and control. In *Networking Humans, Robots, and Environments*, N. Y. Chong, ed., Bentham Publishing, 2013.

[CH8] Kevin M. Lynch, Anthony M. Bloch, Sergey V. Drakunov, Mahmut Reyhanoglu, and Dmitry Zenkov. Control of nonholonomic and underactuated systems. Chapter 42 in *The Control Handbook*, W. Levine, ed., Taylor and Francis, 2011.

[CH7] Imin Kao, Kevin M. Lynch, and Joel W. Burdick. Contact modeling and manipulation. Chapter 27 in *Handbook of Robotics*, B. Siciliano and O. Khatib, eds., Springer-Verlag, 2008.

[CH6] Kevin M. Lynch and Todd D. Murphey. Control of nonprehensile manipulation. Chapter in *Control Problems in Robotics and Automation*, A. Bicchi and H. Christensen, eds., Springer-Verlag, 2003.

[CH5] Prasan Choudhury and Kevin M. Lynch. Trajectory planning for kinematically controllable underactuated mechanical systems. *Algorithmic Foundations of Robotics*, J.-D. Boissonnat, J. W. Burdick, K. Y. Goldberg, and S. Hutchinson, eds., Springer-Verlag, 2003.

[CH4] Kevin M. Lynch and Michael A. Peshkin. Linear and rotational sensors. In *The Mechatronics Handbook*, R. Bishop, ed., CRC Press, 2002.

[CH3] Kevin M. Lynch. Issues in nonprehensile manipulation. In *Robotics: The Algorithmic Perspective*, P. Agarwal, L. Kavraki, and M. T. Mason, eds., pp. 237-250, A. K. Peters, Boston, MA, 1998.

[CH2] Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. Sensorless parts feeding with a one joint robot. In *Algorithms for Robotic Motion and Manipulation*, J.-P. Laumond and M. Overmars, eds., pp. 229-238, A.K. Peters, Boston, MA, 1996.

[CH1] Kevin M. Lynch and Matthew T. Mason. Stable pushing: Mechanics, controllability, and planning. In *Algorithmic Foundations of Robotics*, K. Y. Goldberg, D. Halperin, J.-C. Latombe, and R. Wilson, eds., pp. 239-262, A.K. Peters, Boston, MA, 1995.

REFEREED CONFERENCE AND WORKSHOP PUBLICATIONS

[C72] Yu-Wei Liao, Eric Schearer, Xiao Hu, Eric Perreault, Matthew Tresch, and Kevin M. Lynch. Modeling open-loop stability of a human arm driven by a functional electrical stimulation neuroprosthesis. *IEEE Engineering in Medicine and Biology Conference*, Osaka, Japan, July 2013.

[C71] Eric Schearer, Yu-Wei Liao, Matt Tresch, Eric Perreault, and Kevin M. Lynch. Optimal sampling of recruitment curves for functional electrical stimulation control. *IEEE Engineering in Medicine and Biology Conference*, San Francisco, CA, August 2012.

[C70] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Manipulation with vibratory velocity fields on a tilted plate. *IEEE Int Conf on Automation Science and Engineering (CASE)*, Seoul, Korea, 2012.

- [C69] Andrew W. Long, Amir Degani, and Kevin M. Lynch. Feedback control experiments with the ParkourBot. *Int Conf on Climbing and Walking Robots (CLAWAR)*, Baltimore, MD, 2012.
- [C68] Paul Umbanhowar, Thomas H. Vose, Atsushi Mitani, Shinichi Hirai, and Kevin M. Lynch. The effect of anisotropic friction on vibratory velocity fields. *IEEE International Conference on Robotics and Automation*, St. Paul, MN, May 2012.
- [C67] Eric M. Scheerer, Yu-Wei Liao, Eric J. Perreault, Matthew C. Tresch, William D. Mernberg, Robert F. Kirsch, and Kevin M. Lynch. System identification for 3D force control of a human arm prosthesis using functional electrical stimulation. *IEEE International Conference on Robotics and Automation*, St. Paul, MN, May 2012.
- [C66] Ji-Chul Ryu, Fabio Ruggiero, and Kevin M. Lynch. Control of nonprehensile rolling manipulation: balancing a disk on a disk. *IEEE International Conference on Robotics and Automation*, St. Paul, MN, May 2012.
- [C65] Nelson Rosa, Jr., Adam Barber, Robert D. Gregg, and Kevin M. Lynch. Stable open-loop brachiation on a vertical wall. *IEEE International Conference on Robotics and Automation*, St. Paul, MN, May 2012.
- [C64] Andrew W. Long, Robert Gregg, and Kevin M. Lynch. The simplest parkour model: experimental validation and stability analysis. *Int Conf on Climbing and Walking Robots (CLAWAR)*, Paris, France, September 2011. **(Best Technical Paper Award)**
- [C63] Maxim Kolesnikov, Davide Piovesan, Kevin M. Lynch, and Sandro Mussa-Ivaldi. On force regulation strategies in predictable environments. *Int Conf of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Boston, MA, Aug-Sept, 2011.
- [C62] Robert Gregg, Yasin Dhaher, and Kevin M. Lynch. Functional asymmetry in a five-link 3D bipedal walker. *Int Conf of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Boston, MA, Aug-Sept, 2011.
- [C61] Andrew W. Long, Todd D. Murphey, and Kevin M. Lynch. Optimal motion planning for a class of hybrid dynamical systems with impacts. *IEEE International Conference on Robotics and Automation*, Shanghai, China, May 2011.
- [C60] Amir Degani, H. Benjamin Brown, Kevin M. Lynch, Howie Choset, and Matthew T. Mason. The ParkourBot -- A dynamic BowLeg climbing robot. *IEEE International Conference on Robotics and Automation*, Shanghai, China, May 2011.
- [C59] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Sliding manipulation of rigid bodies on a controlled 6-dof plate. *Robotics: Science and Systems Conference*, June 2011.
- [C58] Robert D. Gregg, Amir Degani, Yasin Dhaher, and Kevin M. Lynch. The basic mechanics of bipedal walking lead to asymmetric behavior. *International Conference on Rehabilitation Robotics*, Zurich, Switzerland, June-July 2011.
- [C57] He Bai, Randy A. Freeman, and Kevin M. Lynch. Distributed Kalman filtering using the internal model average consensus estimator. *American Control Conference*, San Francisco, CA, June-July 2011.
- [C56] Fabio Morbidi, Randy A. Freeman, and Kevin M. Lynch. Estimation and control of UAV swarms for distributed monitoring tasks. *American Control Conference*, San Francisco, CA, June-July 2011.

[C55] He Bai, Randy A. Freeman, and Kevin M. Lynch. Robust dynamic average consensus of time-varying inputs. *IEEE Conference on Decision and Control*, Atlanta, GA, December 2010.

[C54] Randy A. Freeman, Thomas R. Nelson, and Kevin M. Lynch. A complete characterization of a class of robust linear average consensus protocols. *American Control Conference*, Baltimore, MD, June-July 2010.

[C53] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Toward the set of frictional velocity fields generable by 6-degree-of-freedom oscillatory motion of a rigid plate. *IEEE International Conference on Robotics and Automation*, Anchorage, AK, May 2010.

[C52] Michael Epstein, Kevin M. Lynch, Karl Johansson, and Richard M. Murray. Using hierarchical decomposition to speed up average consensus. *International Federation of Automatic Control (IFAC) World Congress*, Seoul, Korea, July 2008.

[C51] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Friction-induced velocity fields for parts sliding on a rigid oscillated plate. *2008 Robotics: Science and Systems*, Zurich, Switzerland, June 2008. (**Best Student Paper Award**, the only conference award)

[C50] Peng Yang, Randy Freeman, Geoffrey J. Gordon, Kevin M. Lynch, Siddhartha Srinivasa, and Rahul Sukthankar. Decentralized estimation and control of graph connectivity in mobile sensor networks. *American Control Conference*, Seattle, WA, June 2008.

[C49] Thomas H. Vose, Paul Umbanhowar, and Kevin M. Lynch. Vibration-induced frictional force fields on a rigid plate. *IEEE International Conference on Robotics and Automation*, Rome, Italy, April 2007. (**Best Automation Paper Award**)

[C48] James Solberg, Kevin M. Lynch, and Malcolm A. MacIver. Robotic electrolocation: Active underwater target localization with electric fields. *IEEE International Conference on Robotics and Automation*, Rome, Italy, April 2007.

[C47] Peng Yang, Kevin M. Lynch, and Randy A. Freeman. Distributed cooperative active sensing using consensus filters. *IEEE International Conference on Robotics and Automation*, Rome, Italy, April 2007.

[C46] Peng Yang, Randy A. Freeman, and Kevin M. Lynch. A general stability condition for multi-agent coordination by coupled estimation and control. *American Control Conference*, New York, NY, July 2007.

[C45] Randy A. Freeman, Peng Yang, and Kevin M. Lynch. Stability and convergence properties of dynamic average consensus estimators. *IEEE Conference on Decision and Control*, San Diego, CA, December 2006.

[C44] Heeseon Hwang, Kevin M. Lynch, and Youngil Youm. Locomotion via impact switching between decoupling vector fields. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Beijing, China, October 2006.

[C43] Randy A. Freeman, Peng Yang, and Kevin M. Lynch. Distributed estimation and control of swarm formation statistics. *American Control Conference*, Minneapolis, MN, June 2006.

[C42] Peng Yang, Randy A. Freeman, and Kevin M. Lynch. Optimal information propagation in sensor networks. *IEEE International Conference on Robotics and Automation*, Orlando, FL, May 2006.

- [C41] Peng Pan, Kevin M. Lynch, Michael Peshkin, J. Edward Colgate. Human interaction with passive assistive robots. *International Conference on Rehabilitation Robotics*, June 2005.
- [C40] Jay D. Bernheisel and Kevin M. Lynch. Stable pushing of assemblies. *IEEE International Conference on Robotics and Automation*, Barcelona, Spain, April 2005.
- [C39] Eric Faulring, Kevin M. Lynch, J. Edward Colgate, and Michael A. Peshkin. Haptic interaction with constrained dynamic systems. *IEEE International Conference on Robotics and Automation*, Barcelona, Spain, April 2005.
- [C38] Vikram S. Chib, James L. Patton, Kevin M. Lynch, and Sandro Mussa-Ivaldi. The effect of stiffness and curvature on the haptic discrimination of surfaces. *First Joint EuroHaptics Conference on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, Pisa, Italy, March 2005.
- [C37] Vikram S. Chib, James L. Patton, Kevin M. Lynch, and Sandro Mussa-Ivaldi. Haptic discrimination of perturbing fields and object boundaries. *International Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems*, pp. 375-82, Chicago, IL, March 2004.
- [C36] Todd D. Murphey, David Choi, Jay Bernheisel, and Kevin M. Lynch. Experiments in the use of stable limit sets for parts handling. *International Conference on MEMS, NANO, and Smart Systems (ICMENS)*, Banff, Alberta, Canada, August 2004.
- [C35] Prasun Choudhury, Benjamin Stephens, and Kevin M. Lynch. Inverse kinematics-based motion planning for underactuated systems. *IEEE International Conference on Robotics and Automation*, New Orleans, LA, April 2004.
- [C34] Tom Worsnopp, J. Edward Colgate, Michael Peshkin, and Kevin M. Lynch. Controlling the apparent inertia of passive human-interactive robots. *IEEE International Conference on Robotics and Automation*, New Orleans, LA, April 2004.
- [C33] Peng Pan, J. Edward Colgate, Michael Peshkin, and Kevin M. Lynch. Static single-arm force generation with kinematic constraints. *IEEE International Conference on Robotics and Automation*, New Orleans, LA, April 2004.
- [C32] J. Edward Colgate and Kevin M. Lynch. Control problems solved by a fish's body and brain: A review. *13th Annual Symposium on Unmanned Untethered Submersible Technology*, Durham, NH, August 2003.
- [C31] Stefano Iannitti and Kevin M. Lynch. Exact minimum control switch motion planning for the snakeboard. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Las Vegas, NV, October 2003.
- [C30] Jay D. Bernheisel and Kevin M. Lynch. Stable transport of assemblies — Pushing stacked parts. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Las Vegas, NV, October 2003.
- [C29] Francesco Bullo, Andrew D. Lewis, and Kevin M. Lynch. Controllable kinematic reductions for mechanical systems: Concepts, computational tools, and examples. *2002 International Symposium on Mathematical Theory of Networks and Systems*, Notre Dame, IN, August 2002.

- [C28] Tanya Tickel, David Hannon, Kevin M. Lynch, Michael A. Peshkin, and J. Edward Colgate. Kinematic constraints for assisted single-arm manipulation. *IEEE International Conference on Robotics and Automation*, Washington, D.C., May 2002.
- [C27] Kevin M. Lynch, Michael Northrop, and Peng Pan. Stable limit set behavior in a dynamic parts feeder. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Maui, HI, November 2001.
- [C26] Prasun Choudhury and Kevin M. Lynch. Rolling manipulation with a single control. *Conference on Control Applications*, Mexico City, Mexico, September 2001.
- [C25] Francesco Bullo and Kevin M. Lynch. Kinematic controllability and decoupled trajectory planning for underactuated mechanical systems. *IEEE International Conference on Robotics and Automation*, Seoul, Korea, May 2001.
- [C24] Allan Sorensen, Caizhen Liu, Songho M. Kim, Kevin M. Lynch, and Michael A. Peshkin. Experiments in ergonomic robot-guided manipulation. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, Takamatsu, Japan, November 2000.
- [C23] Kevin M. Lynch and Craig K. Black. Controllability and stabilizability of single input planar juggling. *38th Allerton Conference on Communication, Control, and Computing*, Monticello, IL, October 2000.
- [C22] Kevin M. Lynch and Caizhen Liu. Designing motion guides for ergonomic collaborative manipulation. *IEEE International Conference on Robotics and Automation*, San Francisco, CA, April 2000.
- [C21] Prasun Choudhury and Kevin M. Lynch. Controllability of single input rolling manipulation. *IEEE International Conference on Robotics and Automation*, San Francisco, CA, April 2000.
- [C20] Kevin M. Lynch and Craig K. Black. Control of underactuated manipulation by real-time nonlinear optimization. *1999 International Symposium on Robotics Research*, Snowbird, UT, October 1999.
- [C19] Kevin M. Lynch. Toppling manipulation. *1999 IEEE International Conference on Robotics and Automation*, Detroit, MI, May 1999.
- [C18] Craig K. Black and Kevin M. Lynch. Planning and control for planar batting and hopping. *36th Annual Allerton Conference on Communication, Control, and Computing*, Monticello, IL, September 1998.
- [C17] Kevin. M. Lynch, Naoji Shiroma, Hirohiko Arai, and Kazuo Tanie. Motion planning for a 3-DOF robot with a passive joint. *1998 IEEE International Conference on Robotics and Automation*, pp. 1958-1963, Leuven, Belgium, May 1998.
- [C16] Kevin. M. Lynch, Naoji Shiroma, Hirohiko Arai, and Kazuo Tanie. The roles of shape and motion in dynamic manipulation: The butterfly example. *1998 IEEE International Conference on Robotics and Automation*, pp. 927-932, Leuven, Belgium, May 1998.
- [C15] Kevin M. Lynch. Locally controllable polygons by stable pushing. *1997 IEEE International Conference on Robotics and Automation*, Albuquerque, NM, April 1997.

[C14] Kevin M. Lynch and Matthew T. Mason. Dynamic manipulation with a one joint robot. *1997 IEEE International Conference on Robotics and Automation*, Albuquerque, NM, April 1997. **(Best Student Paper Award finalist)**

[C13] Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. Sensorless parts orienting with a one joint manipulator. *1997 IEEE International Conference on Robotics and Automation*, Albuquerque, NM, April 1997.

[C12] Kevin M. Lynch and Matthew T. Mason. Dynamic underactuated nonprehensile manipulation. *1996 IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 889-896, Osaka, Japan, November 1996.

[C11] Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. From robotic juggling to robotic parts feeding. *Yale Workshop on Adaptive and Learning Systems*, New Haven, CT, June 1996.

[C10] Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. Planar manipulation on a conveyor with a one joint robot. *Seventh International Symposium on Robotics Research*, pp. 265-276, Munich, Germany, October 1995.

[C9] Kevin M. Lynch and Matthew T. Mason. Controllability of pushing. *IEEE/RSJ International Conference on Robotics and Automation*, pp. 112-119, Nagoya, Japan, May 1995. **(Best Paper and Best Student Paper Award finalist)**

[C8] Matthew T. Mason and Kevin M. Lynch. Dynamic robotic manipulation: Progress and plans. *Eighth Yale Workshop on Adaptive and Learning Systems*, New Haven, CT, June 1994.

[C7] Matthew T. Mason and Kevin M. Lynch. Throwing a club: Early results. *Sixth International Symposium on Robotics Research*, Hidden Valley, PA, October 1993.

[C6] Kevin M. Lynch. Planning pushing paths. *International Conference on Advanced Mechatronics*, pp. 451-456, Tokyo, Japan, August 1993.

[C5] Matthew T. Mason and Kevin M. Lynch. Dynamic manipulation. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 152-159, Yokohama, Japan, July 1993.

[C4] Kevin M. Lynch. Estimating the friction parameters of pushed objects. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 186-193, Yokohama, Japan, July 1993.

[C3] Kevin M. Lynch and Matthew T. Mason. Pulling by pushing, slip with infinite friction, and perfectly rough surfaces. *IEEE International Conference on Robotics and Automation*, v. 1, pp. 745-751, Atlanta, GA, May 1993. **(Best Student Paper Award finalist)**

[C2] Kevin M. Lynch, Hitoshi Maekawa, and Kazuo Tanie. Manipulation and active sensing by pushing using tactile feedback. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 416-421, Raleigh, NC, July 1992.

[C1] Kevin M. Lynch. The mechanics of fine manipulation by pushing. *IEEE International Conference on Robotics and Automation*, pp. 2269-2276, Nice, France, May 1992.

ABSTRACTS, POSTERS, AND OTHER PUBLICATIONS

[A8] Max Kolesnikov, Maura Casadio, Kevin M. Lynch, and Sandro Mussa-Ivaldi. Investigating control strategies in force regulation tasks. *Neuroscience*, November 2010.

[A7] Vikram S. Chib, Matthew A. Krutky, Kevin M. Lynch, and Sandro Mussa-Ivaldi. The nervous system independently controls motions and forces. *Advances in Computational Motor Control Workshop*, Atlanta, GA, October 2006.

[A6] Peng Pan, Kevin Lynch, Michael Peshkin, J. Edward Colgate, and Mitra Hartmann. Static single-arm force generation with kinematic constraints. *Neuroscience*, San Diego, CA, October 2004.

[A5] Vikram Chib, James Patton, Kevin Lynch, and F. Mussa-Ivaldi. Interaction with surfaces of varying stiffness and curvature. *Neural Control of Movement*, Sitges, Spain, March 2004.

[A4] Vikram Chib, James Patton, Kevin Lynch, and F. Mussa-Ivaldi. The effect of stiffness and curvature on surface interaction. *Neuroscience*, New Orleans, LA, November 2003.

[A3] Vikram Chib, James Patton, Kevin Lynch, and F. Mussa-Ivaldi. Surface stiffness threshold detection through haptic feedback. *Neuroscience*, New Orleans, LA, November 2003.

[A2] Peng Pan, Kevin Lynch, Michael Peshkin, and J. Edward Colgate. Static single-arm force generation with kinematic constraints. *Neural Control of Movement*, Santa Barbara, CA, April 2003.

[A1] Vikram Chib, James Patton, Kevin Lynch, and F. Mussa-Ivaldi. Haptic discrimination of fields and surfaces. *Neural Control of Movement*, Santa Barbara, CA, April 2003.

PATENTS

[P1] Parts Manipulation Method and Apparatus, K. M. Lynch and P. Umbanhowar, July 31, 2012.

INVITED TALKS

- Chicago Museum of Science and Industry, April 2013
- University of Illinois Urbana Champaign, February 2013
- University of Delaware, September 2012
- Plenary, IEEE International Conference on Automation Science and Engineering, Seoul, Korea, August 2012
- Plenary, IEEE International Conference on Information and Automation, Shenyang, China, June 2012
- Georgia Institute of Technology, April 2012
- Chicago Museum of Science and Industry, Education Staff, March 2012
- Workshop on Contact Modeling and Simulation, RSS 2011, June 2011
- Institute of Automation, Chinese Academy of Sciences, Beijing, May 2011
- Beijing Institute of Technology, May 2011
- Tianjin University, May 2011
- Hebei University of Technology, May 2011
- Georgia Institute of Technology, May 2011
- Northwestern Institute on Complex Systems, October 2010
- JAIST LRC Summer School on Robotics, Kanazawa, Japan, August 2010
- University of Illinois Urbana-Champaign, February 2010
- Nagoya University, Nagoya, Japan, May 2009
- Ritsumeikan University, Kyoto, Japan, May 2009

- Minta Martin Distinguished Lecturer, Aerospace Engineering, University of Maryland, April 2009
- Cornell University, April 2009
- University of Siena, Siena, Italy, March 2009
- University of Pisa, Pisa, Italy, March 2009
- University of Rome “La Sapienza,” Rome, Italy, March 2009
- Distinguished Lecturer, University of California San Diego, Winter School of the Institute of Nonlinear Science, San Diego, CA, January 2009
- Carnegie Mellon University Center for Foundations of Robotics, November 2008
- ICRA 2008 Workshop on Contact Models for Manipulation and Locomotion, Pasadena, CA, May 2008
- Mathematical Biosciences Institute, Ohio State University, January 2008
- California Institute of Technology, June 2007
- University of California, Berkeley, May 2007
- University of California, Los Angeles, May 2007
- University of California, Santa Barbara, May 2007
- University of Southern California, April 2007
- Jet Propulsion Lab, April 2007
- University of Maryland, September 2006
- Carnegie Mellon University, March 2006
- AMS Workshop on Mathematical Problems in Robotics, Northwestern U., October 2004
- University of Pennsylvania, December 2003
- Stanford University, November 2003
- Japan Advanced Institute of Science and Technology, September 2003
- Intelligent Systems Institute, AIST, Tsukuba, Japan, September 2003
- University of Iowa, April 2003
- University of Michigan Control Seminar, April 2003
- Johns Hopkins University, March 2003
- Conference on Decision and Control Workshop on Control Problems in Robotics and Automation, Las Vegas, NV, December 2002
- Future Directions in Nonlinear Control of Mechanical Systems, NSF-ONR Workshop at UIUC, October 2002
- Mathematical Theory of Networks and Systems Special Session on Dynamics and Control of Mechanical Systems, August 2002 (presented by Andrew Lewis)
- Belgian Royal Academy of Sciences, Brussels, Belgium, July 2002
- University of Liege, Liege, Belgium, July 2002
- National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan, July 2001
- Advanced Science Institute, New Frontiers in Intelligent Robotics, Tokyo, Japan, July 2001
- Carnegie Mellon University, Pittsburgh, PA, December 2000
- Allerton Conference on Communication, Control, and Computing, Special Session on Motion Planning, Monticello, IL, October 2000
- Special Session on Nonholonomy on Purpose, International Conference on Intelligent Robot Systems, Takamatsu, Japan, October 2000
- Tutorial on Sensing and Actuation Toward the 21st Century, International Conference on Intelligent Robot Systems, Takamatsu, Japan, October 2000
- US-EU Workshop on Key Research Issues and Opportunities in Motion Planning, Toulouse, France, June 2000
- University of Michigan Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI, May 2000
- IEEE International Conference on Robotics and Automation, Special Session on Grasping and Contact, San Francisco, CA, May 2000
- Ninth International Symposium on Robotics Research, Snowbird, UT, October 1999
- Stanford Workshop on Motion Support for Virtual Prototyping, Stanford, CA, May 1999
- Allerton Conference on Communication, Control, and Computing, Special Session on Control

Issues in Locomotion, Monticello, IL, September 1998

- University of Illinois at Urbana-Champaign, Beckman Institute, Artificial Intelligence Seminar, Urbana-Champaign, IL, September 1998
- University of Tokyo Department of Mechano-informatics, Tokyo, Japan, August 1997
- University of Minnesota Computer Science Department, Minneapolis, MN, May 1997
- University of California Irvine Mechanical Engineering Department, Irvine, CA, May 1997
- Stanford University Computer Science Department, Stanford, CA, April 1997
- Vanderbilt University Computer Science Department, Nashville, TN, April 1997
- Westinghouse Science and Technology Center, Pittsburgh, PA, January 1997
- University of Pennsylvania GRASP Lab, Philadelphia, PA, January 1997
- Boston University Department of Manufacturing Engineering, Boston, MA, January 1997
- IEEE Robotics and Automation Society, Tokyo chapter meeting, Tsukuba, Japan, September 1996
- SONY Production Systems Design Department, Tokyo, Japan, September 1996
- Workshop on the Algorithmic Foundations of Robotics (WAFR), San Francisco, CA, February 1994
- University of Tokyo Department of Mathematical Engineering and Information Physics, Tokyo, Japan, January 1994
- Kawasaki Heavy Industries, Japan, January 1994
- International Conference on Advanced Mechatronics, Tokyo, Japan, August 1993

CONFERENCE AND WORKSHOP ORGANIZATION

- General Chair, 2014 IEEE/RSJ International Conference on Intelligent Robots and Systems, Chicago
- Senior Program Committee, 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems, Tokyo, Japan
- Program Committee, ANTS 2012 (International Conference on Swarm Intelligence)
- Awards Co-chair, 2012 IEEE Int Conf Robotics and Automation
- Senior Program Committee, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, San Francisco
- Workshop Chair, 2010 Robotics: Science and Systems Conference
- Program Committee, 2010 IEEE Workshops on Advanced Robotics and its Social Implications (ARSO), South Korea
- Program Committee, 2009 IEEE Workshops on Advanced Robotics and its Social Implications (ARSO), Tokyo, Japan
- Program co-chair for the Americas, 2009 IEEE Int Conf Robotics and Automation
- Co-organizer, NSF US-Japan Workshop on Robotics for Safety, Security, and Society, San Francisco, CA, August 2008
- Program Committee, 2008 Workshop on the Algorithmic Foundations of Robotics
- Area Chair, 2008 Robotics: Science and Systems Conference
- Program co-chair, 2006 IEEE International Conference on Robotics and Automation
- Area Chair, 2005 Robotics: Science and Systems Conference
- Advisory Committee, 2005 International Conference on Rehabilitation Robotics (ICORR)
- Program committee, 2005 IEEE International Conference on Robotics and Automation, Barcelona, Spain
- Program committee, 2005 International Symposium on Assembly and Task Planning, Montreal, Canada
- Program committee, 2004 IEEE/RSJ International Conference on Intelligent Robots and Systems, Sendai, Japan
- Program committee, 2004 IEEE International Conference on Robotics and Automation, New Orleans, LA
- Program committee, 2002 IEEE International Conference on Robotics and Automation, Washington D.C.

- Program committee, 2001 IEEE/RSJ International Conference on Intelligent Robots and Systems, Hawaii
- Invited session organizer, 2001 Conference on Control Applications, Mexico City, Mexico
- Program co-chair, 2000 Workshop on the Algorithmic Foundations of Robotics
- Program committee, 2000 World Automation Conference, Maui, Hawaii
- Program committee, IEEE International Conference on Robotics and Automation 2000, San Francisco, CA
- Workshop and Tutorials Review Committee, 2000 IEEE International Conference on Robotics and Automation
- Founder, Midwest Mechanical Motion Meeting
- Program committee, 1999 International Conference on Advanced Robotics, Tokyo, Japan
- Program committee, 1999 International Joint Conference on Artificial Intelligence
- Program committee, 1997 International Joint Conference on Artificial Intelligence

JOURNAL EDITING

- Editor, IEEE Transactions on Automation Science and Engineering, 2011-
- Senior Editor, 2009 Special Issue on Rehabilitation Robotics, IEEE Transactions on Robotics
- Senior Editor, IEEE Transactions on Robotics, 2005-11
- Associate Editor, IEEE Transactions on Robotics, 2004-5
- Associate Editor, IEEE Transactions on Robotics and Automation, 2002-2004
- Guest editor, International Journal of Robotics Research special issue, 2002

OTHER PROFESSIONAL ACTIVITIES

- Various technical and legal consulting
- External advisor, Project 111, Northeastern University, Shenyang, China, 2012-
- Advisor, Chicago Museum of Science and Industry "Robot Revolution" exhibit, 2012-
- Parliamentarian (Executive Committee), IEEE Robotics and Automation Society, 2013
- Chair, IEEE Robotics and Automation Society Steering Committee for Technical Programs, 2012-13
- Chair, IEEE Robotics and Automation Society Early Career Award Evaluation Panel, 2012-13
- Secretary, IEEE Robotics and Automation Society, 2010-11
- Member of the DARPA Institute for Defense Analyses Defense Science Study Group, 2008-9
- Kellogg Business and Leadership for Scientists and Engineers Executive Course, 2007-8
- Elected member of IEEE Robotics and Automation Society Administrative Committee, 2006-8
- Secretary, IEEE Robotics and Automation Society, 2004-2005
- Secretary, IEEE Robotics and Automation Long Range Planning Committee, 2002-2003
- 2004 IEEE Robotics and Automation Society Early Career Award Committee
- Member, Sigma Xi and IEEE
- Reviewer for several funding agencies: NSF, NASA, US Department of State Russian Nonproliferation Office, Research Grants Council of Hong Kong, Netherlands Organization for Scientific Research, State of Indiana 21st Century Fund, Austrian Competence Centre Programme, European Commission
- Reviewer for many journals (IEEE Transactions on Robotics and Automation; IEEE Transactions on Automatic Control; IEEE Transactions on Systems, Man, and Cybernetics; International Journal of Robotics Research; Journal of Robotic Systems; International Journal of Robotics and Automation; Journal of the Franklin Institute; International Journal of Control; SIAM Journal on Control and Optimization; Systems and Control Letters; ASME Journal of Engineering Materials and Technology; ASME Journal of Dynamic Systems, Measurement, and Control; ASME Journal of Mechanical Design; IEEE Transactions on Control Systems Technology; Automatica; Robotica; Journal of Nonlinear Science; others), MIT Press, Wiley and Sons, McGraw-Hill, Oxford Press, and conferences (IEEE ICRA, IROS, IJCAI, CDC, IMECE, ACC, ICORR, others)

- Carnegie Mellon Japanese Science, Technology, and Manufacturing Program
- Participant, 1992 University of Pittsburgh Workshop on US Human Resource Needs in Japanese Science, Technology, and Manufacturing
- Co-winner, 1994 Carnegie Mellon School of Computer Science programming contest

SERVICE TO NORTHWESTERN

- Faculty Senate, 2010-
- University Committee, 2008-
- Technological Institute Engineering Life Science building committee, 2008-
- ME ABET reaccreditation coordinator, 2003-6
- ME undergraduate NCA accreditation coordinator, 2003-4
- Updated ME grad school catalog, 1998; undergrad catalog, 2000
- Faculty advisor, Pi Tau Sigma, 1998-2007
- Faculty advisor, Theta Tau, 2001-2
- Undergraduate curriculum committee, 1998-
- Mechanical Engineering information session for freshmen, Spring (annually)
- Departmental representative, New Student Week information panel, 1999
- Chairman of the undergraduate curriculum committee, 1999-2000
- MC for "Evening with McCormick," New Student Week, periodically 1999-
- Dean's Scholar Advisor, 2000, 2004
- McCormick Teacher of the Year committee, 1999- 2002
- ME space committee, 2000
- Ford Engineering Design Studio planning subcommittee, 2001
- Day at Northwestern/Preview NU (prospectives) design contest, periodically 1999-
- McCormick Identity (image) Committee, 2002-3

EDUCATIONAL INITIATIVES

- Developed new course, ME 333 Introduction to Mechatronics (first taught Winter 2000)
Course description: Introduction to microprocessor-controlled electromechanical systems. Interfacing sensors and actuators to computers, electrical and mechanical prototyping, dissection of a commercial product. Final team project.
- Developed new course, ME 449 Robotic Manipulation (first taught as ME D95, Fall 1998)
Course description: Mechanics of robotic manipulation, computer representations and algorithms for manipulation planning, applications to industrial automation, parts feeding, grasping, fixturing, and assembly.
- Developed new course, ME 450 Geometry in Robotics (first taught as ME 495, Spring 2001)
Course description: Application of tools from differential geometry and Lie groups to problems in dynamics, controllability, and motion planning for mechanical systems, particularly with non-Euclidean configuration spaces.
- Developed new course, ME 495 Motion Planning and Control Under Uncertainty, Spring 2006
Course description: Classical techniques from stochastic optimal control theory including Kalman filtering and linear quadratic Gaussian problems; recent computational techniques in Bayesian inference and Markov decision processes; applications to control of robot systems under sensor and actuator uncertainty.
- Developed new course, ME 495 Nonlinear Control, Fall 2010
- Developed the Mechatronics Design Laboratory, open 24/7 for classes and student design

projects, part of Northwestern's Ford Motor Company Engineering Design Center. Also leading the ongoing development of the supporting mechatronics design wiki page, http://hades.mech.northwestern.edu/index.php/Main_Page (or google "mechatronics wiki").