

# Curriculum Vitae

Matthew T. Mason

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## Personal information

Born: August 24, 1952 in Oklahoma City, Oklahoma.

Married, two children.

## Degrees

PhD, Artificial Intelligence, 1982.

Massachusetts Institute of Technology, Cambridge, MA  
Dissertation: *Manipulator Grasping and Pushing Operations*.  
Advisors: Tomás Lozano-Pérez and Berthold K. P. Horn.

MS, Artificial Intelligence, 1978.

Massachusetts Institute of Technology, Cambridge, MA  
Thesis: *Compliance and Force Control for Computer Controlled Manipulators*.  
Advisor: Berthold K. P. Horn.

BS, Computer Science, 1976.

Massachusetts Institute of Technology, Cambridge, MA.

## Experience

1982 – . Carnegie Mellon University.

Professor, Computer Science Department and Robotics Institute.  
Chair, Robotics Doctoral Program, 1995–2004.  
Director, Robotics Institute, 2004– .

July 1994, July 1995. Sandia National Labs.

Research visitor.

Summer, 1978. IBM Thomas J. Watson Research Center.

Research visitor.

## Honors

Pioneer Award, IEEE Robotics and Automation Society. 2009.

Fellow of the Institute of Electrical and Electronics Engineers. 2000.

Robotics Graduate Student Organization's Cool Person Award. 1999, 2005.

Fellow of the American Association for Artificial Intelligence. 1992.

System Development Foundation Prize. 1983.

National Science Foundation Fellow, 1976-1980.

## Publications

### Books

- Matthew T. Mason, *Mechanics of Robotic Manipulation*, MIT Press: Cambridge, MA. 2001.
- Pankaj Agarwal, Lydia Kavraki, and Matthew T. Mason, editors. *Robotics: the Algorithmic Perspective: 1998 Workshop on the Algorithmic Foundations of Robotics*, A K Peters: Boston. 1998.
- Matthew T. Mason and J. Kenneth Salisbury, *Robot Hands and the Mechanics of Manipulation*, MIT Press: Cambridge, MA. 1985.
- J. Michael Brady, John M. Hollerbach, Timothy Johnson, Tomas Lozano-Perez, and Matthew T. Mason, *Robot Motion: Planning and Control*, MIT Press: Cambridge, MA. 1982.

### Papers in Refereed Journals

- Hamidreza Chitsaz, Steven M. LaValle, Devin J. Balkcom, and Matthew T. Mason. Minimum Wheel-Rotation Paths for Differential-Drive Mobile Robots. *International Journal of Robotics Research*, 28:1, pp. 66–80, January 2009.
- Ravi Balasubramanian, Alfred A. Rizzi, and Matthew T. Mason. Legless Locomotion: A Novel Locomotion Technique for Legged Robots. *International Journal of Robotics Research*, 27:5, pp. 575–594, May 2008.
- Devin J. Balkcom and Matthew T. Mason. Robotic Origami Folding. *International Journal of Robotics Research*, 27:5, pp. 613–627, May 2008.
- Devin J. Balkcom, Paritosh A. Kavathekar and Matthew T. Mason. Time-optimal Trajectories for an Omni-directional Vehicle. *International Journal of Robotics Research*, 25:10, pp. 985–999, October 2006.
- Devin J. Balkcom and Matthew T. Mason. Time Optimal Trajectories for Bounded Velocity Differential Drive Vehicles. *International Journal of Robotics Research*, 21:3, pp. 199–218, March 2002.
- Srinivas Akella, Wesley Huang, Kevin M. Lynch, and Matthew T. Mason. Parts Feeding on a Conveyor with a One Joint Robot. *Algorithmica* 26: 313–344, 2000.
- Srinivas Akella and Matthew T. Mason. Orienting toleranced polygonal parts. *International Journal of Robotics Research*, 19:12, pp. 1147–1170, December 2000.
- Wesley Huang and Matthew T. Mason. Mechanics, planning, and control for tapping. *International Journal of Robotics Research*, 19:10, pp. 883–894, October 2000.
- Matthew T. Mason. Progress in Nonprehensile Manipulation. *International Journal of Robotics Research*, 18:11, pp. 1129–1141, November 1999.
- Srinivas Akella and Matthew T. Mason. Using partial sensor information to orient parts. *International Journal of Robotics Research*, 18:10, pp. 963–997, October 1999.
- Kevin M. Lynch and Matthew T. Mason. Dynamic nonprehensile manipulation: Controllability, planning, and experiments. *International Journal of Robotics Research*, 18:1, pp. 64–92, January 1999.
- Srinivas Akella and Matthew T. Mason. Posing polygonal objects in the plane by pushing. *International Journal of Robotics Research*, 17:1, pp. 70–88, January 1998.
- Kevin M. Lynch and Matthew T. Mason. Stable pushing: Mechanics, controllability, and planning. *International Journal of Robotics Research*, 15(6): 533–556, December 1996.
- 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, pp. 174–183, April 1995.

- Michael A. Erdmann, Matthew T. Mason, and G. Vanecek. Mechanical Parts Orienting: The Case of a Polyhedron on a Table. *Algorithmica*, 10:2/3/4, August/Sept/October 1993.
- Yu Wang and Matthew T. Mason, Two dimensional rigid body collisions with friction. *Trans ASME; J Applied Mechanics*, 59:3, pp 635–642, September 1992.
- Alan D. Christiansen, Matthew T. Mason, and T. M. Mitchell. Learning reliable manipulation strategies without initial physical models. *Robotics and Autonomous Systems* 8, pp 7–18, 1991.
- Michael A. Erdmann and Matthew T. Mason, An Exploration of Sensorless Manipulation. *IEEE Journal of Robotics and Automation*, 4:4, pp. 369–379, August 1988.
- Matthew T. Mason, Mechanics and Planning of Manipulator Pushing Operations. *International Journal of Robotics Research*, 5:3, 1986.
- Tomas Lozano-Perez, Matthew T. Mason, and Russell H. Taylor, Automatic Synthesis of Fine-Motion Strategies for Robots. *International Journal of Robotics Research*, 3:1, 1984.
- Matthew T. Mason, Compliance and Force Control for Computer-Controlled Manipulators. *IEEE Trans. on Systems, Man, and Cybernetics*, 11:6, 1981.

### Papers at Refereed Conferences

- Matthew T. Mason, Siddhartha S. Srinivasa, and Andres S. Vazquez. Generality and Simple Hands. *International Symposium on Robotics Research*, 2009.
- Ross A. Knepper and Matthew T. Mason. Path Diversity Is Only Part of the Problem. *2009 IEEE International Conference on Robotics and Automation*, Kobe Japan, May 12–17, 2009. pp. 3224–3229.
- Ross A. Knepper and Matthew T. Mason. Empirical Sampling of Path Sets for Local Area Motion Planning. *International Symposium on Experimental Robotics*, IFRR, July, 2008.
- Amir Degani, Amir Shapiro, Howie Choset, Matthew T. Mason. A Dynamic Single Actuator Vertical Climbing Robot. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2007)*. pp. 2901–2906. 2007.
- Ravi Balasubramanian, Alfred A. Rizzi, and Matthew T. Mason. Toward Legless Locomotion Control. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, October, 2006.
- Devin J. Balkcom, Paritosh A. Kavatthekar and Matthew T. Mason. The Minimum-time Trajectories for an Omni-directional Vehicle. *Proceedings, The Seventh International Workshop on the Algorithmic Foundations of Robotics*, New York City, July 16–18, 2006.
- Hamidreza Chitsaz, Steven M. Lavalle, Devin J. Balkcom, and Matthew T. Mason. Minimum Wheel-Rotation Paths for Differential-Drive Mobile Robots. *Proceedings of the 2006 IEEE International Conference on Robotics and Automation*, Orlando, FL, May 2006, pp. 1616–1623.
- Hamidreza Chitsaz, Steven M. LaValle, Devin J. Balkcom, Matthew T. Mason. An Explicit Characterization of Minimum Wheel-Rotation Paths for Differential-Drives. *Proceedings of 12th IEEE International Conference on Methods and Models in Automation and Robotics (MMAR)*, 2006.
- Siddhartha Srinivasa, Michael A. Erdmann, and Matthew T. Mason. Using projected dynamics to plan dynamic contact manipulation. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, August, 2005.
- Siddhartha Srinivasa, Michael A. Erdmann, and Matthew T. Mason. Control synthesis for dynamic contact manipulation. *IEEE International Conference on Robotics and Automation*, April 2005.
- Devin J. Balkcom and Matthew T. Mason. Introducing robotic origami folding. *Proceedings of the 2004 IEEE International Conference on Robotics and Automation*.
- Ravi Balasubramanian, Alfred A. Rizzi, and Matthew T. Mason. Legless Locomotion: Models and Experimental Demonstration. *IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 1803–1808, 2004.

- Ravi Balasubramanian, Alfred Rizzi, and Matthew Mason. Legless Locomotion for Legged Robots. *Proceedings of the International Conference on Robotics and Intelligent Systems*. October, 2003.
- Siddhartha S. Srinivasa, Michael A. Erdmann, and Matthew T. Mason. Bilateral Time-Scaling for Control of Task Freedoms of a Constrained Nonholonomic System *Proceedings of the 2003 IEEE International Conference on Robotics and Automation*.
- Siddhartha S. Srinivasa, Christopher Baker, Elisha Sacks, Grigoriy Reshko, Matthew Mason, and Michael Erdmann. Experiments with nonholonomic manipulation. *Proceedings of the 2002 IEEE International Conference on Robotics and Automation*.
- Devin J. Balkcom and Matthew T. Mason. Extremal Trajectories for Bounded Velocity Mobile Robots. *Proceedings of the 2002 IEEE International Conference on Robotics and Automation*.
- Devin J. Balkcom and Matthew T. Mason. Geometric Construction of Time Optimal Trajectories for Differential Drive Robots. *Algorithmic and Computational Robotics: New Directions*, The Fourth Workshop on the Algorithmic Foundations of Robotics, pp. 377-390, Natick MA, 2001. A. K. Peters.
- Devin J. Balkcom and Matthew T. Mason. Time Optimal Trajectories for Bounded Velocity Differential Drive Robots. *Proceedings of the 2000 IEEE International Conference on Robotics and Automation*, pp. 2479-2484, San Francisco CA.
- Devin J. Balkcom and Matthew T. Mason. Extremal Trajectories for Bounded Velocity Differential Drive Robots. *Proceedings of the 2000 IEEE International Conference on Robotics and Automation*, pp. 2499-2504, San Francisco CA.
- Matthew T. Mason, Dinesh Pai, Daniela Rus, Lee Taylor, Michael A. Erdmann. A Mobile Manipulator. *Proceedings of the 1999 IEEE International Conference on Robotics and Automation*, pp. 2322-2327, Detroit MI.
- Matthew T. Mason, Dinesh K. Pai, Daniela Rus, Jon Howell, Lee R. Taylor, and Michael A. Erdmann. Experiments with Desktop Mobile Manipulators. *Proceedings of the Sixth International Symposium on Experimental Robotics*, pp. 37-46, Springer-Verlag, 2000.
- Srinivas Akella and Matthew T. Mason. Parts Orienting with Shape Uncertainty. *Proceedings, 1998 IEEE International Conference on Robotics and Automation*, Leuven, Belgium, May 1998.
- Srinivas Akella and Matthew T. Mason. Parts Orienting with Partial Sensor Information. *Proceedings, 1998 IEEE International Conference on Robotics and Automation*, Leuven, Belgium, May 1998.
- Wesley Huang and Matthew T. Mason. Experiments in Impulsive Manipulation. *Proceedings, 1998 IEEE International Conference on Robotics and Automation*, Leuven, Belgium, May 1998.
- Wesley Huang and Matthew T. Mason. Mechanics, Planning, and Control for Tapping. *Third International Workshop on the Algorithmic Foundations of Robotics*, 1998.
- Srinivas Akella, Wesley Huang, Kevin M. Lynch, and Matthew T. Mason. Sensorless Parts Orienting with a One-Joint Manipulator. *Proceedings, 1997 IEEE International Conference on Robotics and Automation*, Albuquerque, NM, April 1997.
- Wesley H. Huang and Matthew T. Mason. Mechanics for Vibratory Manipulation. *Proceedings, 1997 IEEE International Conference on Robotics and Automation*, Albuquerque, NM, April 1997.
- Kevin M. Lynch and Matthew T. Mason. Dynamic manipulation with a one joint robot. *Proceedings, 1997 IEEE International Conference on Robotics and Automation*, pp. 359-366, Albuquerque, NM, April 1997.
- Kevin M. Lynch and Matthew T. Mason. Dynamic underactuated nonprehensile manipulation. *1996 IEEE/RSJ International Conference on Intelligent Robots and Systems*, pp. 889-896.
- Wesley H. Huang, Eric P. Krotkov, and Matthew T. Mason. Impulsive Manipulation. *1995 IEEE International Conference on Robotics and Automation*, Nagoya Japan, May 1995.

- Srinivas Akella and Matthew T. Mason. Parts Orienting by push-aligning. *1995 IEEE International Conference on Robotics and Automation*, pp. 414–420, Nagoya, Japan, May 1995.
- Kevin M. Lynch and Matthew T. Mason. Controllability of pushing. *1995 IEEE International Conference on Robotics and Automation*, pp. 112–119, Nagoya, Japan, May 1995.
- Matthew T. Mason and Kevin M. Lynch. Dynamic manipulation. *Proceedings, IROS '93—IEEE/RJSJ International Workshop on Intelligent Robots and Systems*, July 1993. Yokohama, Japan.
- Kevin M. Lynch and Matthew T. Mason. Pulling by pushing, slip with infinite friction, and perfectly rough surfaces. *Proceedings, 1993 IEEE International Conference on Robotics and Automation*, pp. 745–751. May 2–6, 1993, Atlanta, Georgia.
- Srinivas Akella and Matthew T. Mason. Posing polygonal objects in the plane by pushing. *IEEE International Conference on Robotics and Automation*, Nice, May 1992.
- Matthew T. Mason. Two graphical methods for planar contact problems. *Proceedings, IROS '91—IEEE/RJSJ International Workshop on Intelligent Robots and Systems*, pp. 443–448. November 3–5, 1991. Osaka, Japan.
- Kenneth Y. Goldberg, Matthew T. Mason, and Michael Erdmann, Generating Stochastic Plans for a Programmable Parts Feeder. *IEEE International Conference on Robotics and Automation*, Sacramento, Calif. April 1991.
- Michael Erdmann, Matthew T. Mason, and George Vanecek, Jr., Mechanical Parts Orienting: The Case of a Polyhedron on a Table. *IEEE International Conference on Robotics and Automation*, Sacramento, Calif. April 1991.
- Alan D. Christiansen, Tom Mitchell, and Matthew T. Mason, Learning reliable manipulation strategies without initial physical models. *Proceedings of the 1990 IEEE International Conference on Robotics and Automation*, May 13-18, 1990, Cincinnati, OH.
- Kenneth Y. Goldberg and Matthew T. Mason, Bayesian grasping. *Proceedings of the 1990 IEEE International Conference on Robotics and Automation*, May 13-18, 1990, Cincinnati, OH.
- Matthew T. Mason, Alan D. Christiansen, and Tom Mitchell, Experiments in robot learning. *Proceedings of the Sixth International Workshop on Machine Learning*, Morgan Kaufmann, 1989.
- Matthew T. Mason, How to push a block along a wall. *Proceedings, NASA Conference on Space Telerobotics*, Pasadena, February 1989.
- Matthew T. Mason and Yu Wang, On the inconsistency of rigid-body frictional planar mechanics. *Proceedings, 1988 IEEE International Conference on Robotics and Automation*, pp. 524-528. April 24-29, 1988, Philadelphia PA.
- Matthew T. Mason, Kenneth Y. Goldberg, and Russell H. Taylor, Planning sequences of squeeze-grasps to orient and grasp polygonal objects. *Seventh CISM-IFTOMM Symposium on Theory and Practice of Robots and Manipulators*, Udine, Italy, 1988.
- Yu Wang and Matthew T. Mason, Modeling Impact Dynamics for Robotic Operations. *4th IEEE International Conference on Robotics and Automation*, IEEE Computer Society, Raleigh, NC, 1987.
- Michael A. Erdmann and Matthew T. Mason, An Exploration of Sensorless Manipulation. *3rd IEEE International Conference on Robotics and Automation*, IEEE Computer Society, San Francisco, CA, 1986.
- Matthew T. Mason and Randall C. Brost, Automatic Grasp Planning: an Operation Space Approach. *6th CISM/IFTOMM Symposium on Theory and Practice of Robots and Manipulators*, Cracow, Poland, 1986.
- Matthew T. Mason, Mechanics of Manipulation. *IEEE International Conference on Robotics and Automation*, IEEE Computer Society, St. Louis, MO, 1985.

Matthew T. Mason, Automatic Planning of Fine Motions: Correctness and Completeness. *IEEE International Conference on Robotics*, IEEE Computer Society, Atlanta, GA, 1984.

Matthew T. Mason, Adaptable Manipulation without Sensors. *Robotics Research and Advanced Applications*, ASME Winter Annual Meeting, Phoenix, Arizona, November 1982.

#### Papers at Unrefereed Conferences

Paritosh A. Kavathekar, Devin J. Balkcom and Matthew T. Mason. The geometry of time-optimal trajectories for an omnidirectional robot. *Proceedings of the Qualitative Reasoning Workshop*, pp. 1–5, 2006.

Devin J. Balkcom and Matthew T. Mason. Progress in Desktop Robotics. Eleventh Yale Workshop on Adaptive and Learning Systems, New Haven, CT, June 2001.

Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason. Sensorless Parts Feeding with a One Joint Robot. *Algorithms for Robotic Motion and Manipulation*, (1996 Workshop on the Algorithmic Foundations of Robotics), pp. 229–237, J.-P. Laumond and M. Overmars (editors), A. K. Peters, Wellesley, Massachusetts, July 1997.

Srinivas Akella, Wesley H. Huang, Kevin M. Lynch, and Matthew T. Mason, From Robotic Juggling to Robotic Parts Feeding. *Ninth Yale Workshop on Adaptive and Learning Systems*. New Haven CT, 1996.

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

Kevin M. Lynch and Matthew T. Mason. Stable pushing: Mechanics, controllability, and planning. *First Workshop on the Algorithmic Foundations of Robotics*, A. K. Peters, Boston, 1995.

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.

Matthew T. Mason and Kevin M. Lynch. Throwing a club: early results. *Robotics Research: The Sixth International Symposium*, Takeo Kanade and Richard Paul, editors. International Foundation for Robotics Research: Cambridge MA. 1994.

Matthew T. Mason, Srinivas Akella, and Kevin M. Lynch. Recent results in pushing. *Proceedings of NSF Design and Manufacturing Systems Conference*, University of North Carolina at Charlotte, January 6–8, 1993.

Matthew T. Mason, Randall C. Brost, and Kenneth Y. Goldberg. Progress in robotic manipulation. *Proceedings of NSF Design and Manufacturing Systems Conference*. January 8–12, 1990, Tempe, AZ.

Randall C. Brost and Matthew T. Mason, Graphical analysis of planar rigid-body dynamics with multiple frictional contacts. *5th International Symposium on Robotics Research*, August, 1989.

Matthew T. Mason, Compliant sliding of a block along a wall. *First International Symposium on Experimental Robotics*, Montreal, June 19-21, 1989.

Matthew T. Mason, Kenneth Y. Goldberg, and Yu Wang. Progress in Robotic Manipulation. *Advances in Manufacturing Systems Integration and Processes: 15th Conference on Production Research and Technology*. National Science Foundation, January 1989.

Thomas M. Mitchell, Matthew T. Mason, and Alan D. Christiansen. Toward a learning robot. *Proceedings of the Workshop on Representation and Learning in an Autonomous Agent*, Portugal, November 1988.

Russell H. Taylor, Matthew T. Mason, and Kenneth Y. Goldberg. Sensor-based manipulation planning as a game with nature. *Robotics Research: The Fourth International Symposium*, R. C. Bolles and B. Roth, editors. MIT Press, Cambridge, MA. 1988.

- Matthew T. Mason, On the Scope of Quasi-Static Pushing. *Robotics Research: the Third International Symposium*, Olivier Faugeras and George Giralt, editors, MIT Press, 1986.
- Matthew T. Mason, Mechanics of Pushing. *Robotics Research: the Second International Symposium*, Hideo Hanafusa and Hirochika Inoue, editors, MIT Press, 1985.
- Tomas Lozano-Perez, Matthew T. Mason, and Russell H. Taylor, Automatic Synthesis of Fine-Motion Strategies for Robots. *Robotics Research: The First International Symposium*, Michael Brady and Richard P. Paul, editors. MIT Press, 1984.

### Other publications

- Yu Wang and Matthew T. Mason. Two-dimensional rigid-body collisions with friction: authors' closure. *Trans ASME; J Applied Mechanics* v60, p 566, June 1993.
- Matthew T. Mason, Kicking the Sensing Habit. *AI Magazine*, 14:1, pp. 58–59, Spring 1993.
- Michael A. Erdmann and Matthew T. Mason. Planar sliding with dry friction: a review. *The Robotics Review* 2. MIT Press. 1992.
- Matthew T. Mason. 1989. Robotic Manipulation: Mechanics and Planning. *Robotics Science*, Michael Brady, editor. MIT Press.
- Matthew T. Mason. 1989. Numerical Simulation of Time-Dependent Contact and Friction Problems in Rigid Body Mechanics: A Review. *The Robotics Review* 1. MIT Press.
- Kenneth Y. Goldberg and Matthew T. Mason. 1990. A Programmable Parts Feeder. *Annual Research Review*, The Robotics Institute, Carnegie Mellon University.

### Invited Lectures

Generality and Simple Hands.

- Carnegie Mellon, Center for the Foundation of Robotics. Pittsburgh PA. November 3, 2009.
- Technion Autonomous Systems Program. Haifa, Israel. 29 June 2009.
- Jet Propulsion Laboratory. Pasadena CA. May 26, 2009.
- Willow Garage. May 28, 2009.

Simplicity, Generality, Robotics. Schloss Dagstuhl Seminar on Cognition, Control and Learning for Robot Manipulation in Human Environments. Wadern, Germany. August 20, 2009.

Robotics and Manipulation. Global Conference on Educational Robotics. Leesburg, VA. July 5, 2009.

Exploring Robotic Manipulation. Hanyang University, Ansan Campus. June 5, 2009.

Human centered research at the Robotics Institute. International Distinguished Scholars Symposia on Seven Future Technologies: Current and Future Vision of Human-Centered Robot Fusion Technology. Hanyang University, Korea. June 4, 2009.

Sampling path space for mobile robot local planning. Institute for Infocomm Research (I2R), Singapore. September 9, 2008.

Exploring robotic manipulation. National University of Singapore. September 11, 2008.

Current topics in robotics and computer vision. GRASP Symposium. University of Pennsylvania. April 16, 2008.

Exploring manipulation. The XXV Alexander Graham Christie Lecture. Johns Hopkins University. March 27, 2008.

Elements of caging. Center for the Foundations of Robotics Seminar. Carnegie Mellon. January 31, 2007.

Some background on uncertainty in robotic manipulation. DARPA STOMP kickoff meeting. Boulder CO. September 26, 2006.

Robotics: Past, Present and Future. Keynote speaker, 25th anniversary of the Naval Center for Applied Research in Artificial Intelligence. September 19, 2006.

Very fast and very slow motions of mobile robots. Workshop on Topology and Robotics. July 14, 2006. ETH, Zurich.

The subjective nature of straight lines: shortest paths for mobile robots.

- Georgia Tech Robotics and Intelligent Machines Seminar Series. November 1, 2006.
- MITRE Corporation. September 15, 2005.
- NASA Ames Research Center. October 4, 2005.
- MIT CSAIL Colloquium. November 8, 2005.

Robotics: Machines and Ideas. Keynote Address, RoboNexus 2005.

Research at the Robotics Institute.

- DARPA Business Conference, April 23, 2008.
- Intel Distinguished Lecture, October 12, 2005.

Invitation to Robotics.

- The Ellis School. October 17, 2005.
- Oklahoma School of Science and Mathematics. February 23, 2005.

Robotics Programs: Lessons Learned. Keynote presentation, Georgia Institute of Technology Robotics Initiative. November 7, 2003.

Robotic Manipulation. Distinguished lecture, Computer Science Department, Iowa State University. January 2003.

Robotics: Machines and Ideas.

- SAC Museum and Peter Kiewit Institute, University of Nebraska. April 2002.
- Academy for Lifelong Learning. Carnegie Mellon. May 2002.
- Elderhostel. Carnegie Mellon. June 2001; June 2002; June 2003.

Manipulation Sampler. Entertainment Technology Center. Carnegie Mellon University. March 28, 2002.

Desktop Robotics. EECS Departmental Seminar. Case Western Reserve University. December 6, 2001.

Robotics in Self-Assembly. DSRC/DARPA Workshop on Self-Assembly in Manufacturing. December 6, 2000.

Automated Manufacturing and Robotic Juggling.

- Keynote address, International Conference on Industrial Technology. Bangkok, Thailand. December 12, 2002.
- University of Oklahoma (Computer Science Department). March 29, 2001.
- Purdue University. September 25, 2001.

- University of Pennsylvania (GRASP Lab). November 10, 2000.
- University of Michigan (Mechanical Engineering Department). October 13, 2000.
- Arthur Schoffstall Lectures in Computer Science and Engineering, Rensselaer Polytechnic Institute (Computer Science Department). March 23, 2000.
- Pennsylvania State University (Computer Science Department). September 1998.

A Mobile Manipulator. IEEE ICRA Workshop on Mobile Micro-Robots. April 2000.

Education with and about robots. Seminar on Robot Education. Carnegie Mellon University (Robotics Institute). June 2000.

Robotics Education. Mechatronics at the Crossroads of Education and Industry : The Research Center Experience. Panel session at IEEE Int Conf Robotics and Automation. April 2000.

Manipulation and Mobility.

- Arthur Schoffstall Lectures in Computer Science and Engineering. Rensselaer Polytechnic Institute (Computer Science Department). March 24, 2000.
- University of Michigan (Computer Science Department). August 1999.

How to Be Smart. Carnegie Mellon University, Associate Provost for Academic Projects. September 1999, September 2000.

Mobile Manipulation. Australia National University. March 1999.

Manipulation and Intelligence. VUB Brussels AI Lab. May 1998.

Manipulation without sensing, grasping, or understanding. Mechanical Engineering Department Seminar. April 1997.

Robotic Manipulation: Parts feeding and juggling. Dartmouth Computer Science Department Seminar. May 1995.

Dynamic manipulation applied to parts orienting. Presented at IEEE ICRA Workshop on Geometric Algorithms for Manufacturing. May 2, 1993.

Dynamic manipulation. Invited talk. International Conference on Intelligent Autonomous Systems (IAS-3). February 18, 1993. Pittsburgh PA.

Juggling and parts feeding.

- Robotics Seminar, Carnegie Mellon. December 4, 1992.
- Engineering Colloquium, University of California at Berkeley. October, 1992.
- EE Department Colloquium, University of Illinois at Urbana-Champaign. October 8, 1992.

Roots and Directions in Motion Planning. June 15–17, 1992. NSF Workshop on Geometric Uncertainty in Motion Planning.

Kicking the sensing habit. AAAI Fall Symposium, Sensory Aspects of Robotic Intelligence. Fall 1991.

Mechanics and manipulation: graphical methods. Invited seminar at Sandia National Labs. July 11, 1991.

Manipulation: Mechanics and Planning. NSF/LaSER Distinguished Lecture Series in Robotics and Artificial Intelligence. Louisiana State University. October 19, 1990.

Series of lectures on the mechanics of manipulation, Course on Geometric Modeling and Robotics. Fibonacci Institute for the Foundations of Computer Science. Trento, Italy. June 25 – July 20, 1990.

Robotics Seminar, CMU. February, 1990.

Robotic Manipulation. MIT Center for Information-Driven Mechanical Systems. Host: Jean-Jacques Slotine. December 7, 1989.

Sensor based motion planning

- Fujitsu Laboratories Ltd, Kawasaki, Japan, August 1989.
- Yokogawa Electric Corporation, Tokyo, Japan, August 1989.
- Mitsubishi Heavy Industries, Ltd., Advanced Technology Research Center, Yokohama, Japan, August 1989.
- Mitsubishi Electric Corporation, Kamakura Works, Japan, August 1989.
- IBM Research, Tokyo Research Laboratory, Japan, August 1989.

Sensor based motion planning with uncertainty. IEEE ICRA Workshop on Task Strategy Generation and Skill Acquisition for Advanced Manipulation. May 15, 1989.

Interactions of Autonomy and Dexterity. NASA Conference on Space Telerobotics, Pasadena. February, 1989.

Robotic manipulation: mechanics and planning.

- Jet Propulsion Laboratory. February, 1989.
- Bell Labs, Holmdel. February, 1988.
- IBM Yorktown Heights. February, 1988.
- Yale University. February, 1988.
- Harvard University. January, 1988.
- MIT Artificial Intelligence Lab. January, 1988.
- Rensselaer Polytechnic Institute. January, 1988.
- Cornell Computer Science Department. January, 1988.

Uncertainty and Planning. Workshop on Automatic Robot Programming, Cambridge, Massachusetts, April, 1987.

Task Planning. Workshop on Robotics, ACM Fall Joint Computer Conference, November, 1986.

Mechanics of Grasping. Workshop on Robot Hands, Dubrovnik, Yugoslavia, September 1986.

Grasp Planning. Geometric Reasoning - An International Workshop, Oxford University, June 1986.

Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse, France, June 1986.

Lord Corporation, May, 1986.

Manipulation and Planning. Workshop on Robotics and Automation, NASA/Johnson Space Center, Houston, January 1986.

Fine motion planning: correctness and completeness.

- University of Pennsylvania, December, 1985.
- SIAM Conference on Geometric Modeling and Robotics, Albany, NY, 1985.
- California Institute of Technology, May, 1985.
- Cornell University, September, 1984.

Mechanics of Manipulation. USA-Spain Joint Seminar on Sensors and Robotic Control, Madrid, October 1985.

Procedures for Fine Motion Planning and Control. SIAM Conference on Geometric Modeling and Robotics, Albany, NY, 1985.

Manipulation and Planning. Workshop on Intelligent Robots: Achievements and Issues, SRI International, November 1984.

Robotic Manipulation. Canadian Society for the Computational Study of Intelligence, London, Ontario, May, 1984.

A Formal Framework for Fine Motion Planning. Mini Symposium on Robot Motion Algorithms, IBM Thomas J. Watson Research Center, Yorktown Heights, New York, June 1983.

Pushing and grasping. “The Design and Control of Dexterous Hands”, sponsored by Defense Advanced Research Projects Agency, MIT Artificial Intelligence Laboratory. November 5–6, 1981.

## Professional activities

### Editorial Boards

- Advisory Board, International Journal of Robotics Research, 2005– .
- Technical editor: IEEE Journal Robotics and Automation, 1989–1992.
- Editorial Board, International Journal of Robotics Research, 1998–2005.
- Board of editors, Robotics Review, MIT Press, 1988–1992.
- North American Editor, Butterworths Series in Computer Automation, 1988–1994.

### Program and steering committees

- Advisory Board, Intel Labs Pittsburgh. 2009–.
- Steering Committee, Workshop on the Algorithmic Foundations of Robotics. 2009–.
- Carnegie Science Center Catalyst Committee. 2008, 2009.
- Steering committee, IEEE RAS Technical Committee on Algorithms for Planning and Control Newsletter. 2008—
- At large member, Technical Activities Board, IEEE Robotics and Automation Society, 2008–2010.
- Senior Steering Committee, National Robotics Engineering Center, 2008—.
- RoboBusiness Advisory Council, 2008—.
- Scientific advisory board, Georgia Tech Robotics and Intelligent Machines, 2007—
- Steering committee, Robot250. 2007 - 2008.
- Program Committee. World Premier International Research Center (WPI) Initiative; Ministry of Education, Culture, Sports, Science and Technology (MEXT); Japan. 2007—.
- Robotics and Automation Liaison Committee. IEEE Robotics and Automation Society. 2007 —
- Planning committee. Cornerstones Symposium '07: Ideal City of the 21st Century. Spring, 2007.
- Advisory board, Global Connection’s PA Tourism project. 2007.
- Advisory Board. RoboBusiness 2006.
- Program Committee. Robotics: Science and Systems. 2006.
- Senior Programm Committee. EUROS-06. 2006

- Organizing Committee, NSF Robotics and Computer Vision PI Workshop. October 2003.
- International Steering Committee, Workshop on Control Problems in Robotics and Automation. 2002.
- International Advisory Committee for the IEEE International Conference on Industrial Technology, 2002.
- International Symposium on Robotics Research, 1999.
- Workshop on the Algorithmic Foundations of Robotics, 1996, 1998, 2000, 2002.
- IEEE International Workshop on Intelligent Robots and Systems (IROS), 1991, 1992, 1994.
- AAAI Fall Symposium on “Sensory Aspects of Robotic Intelligence”, 1991.
- National Conference on Artificial Intelligence, 1986 and 1987. Robotics area chair, 1991. Robotics and vision area chair, 1994.
- International Joint Conference on Artificial Intelligence, 1987.
- IEEE International Conference on Robotics and Automation, 1987, 1988, 1989, 1990, 1991, 1993, 1999, 2002, 2003, 2004.

#### Workshops

- Schloss Dagstuhl Seminar on Cognition, Control and Learning for Robot Manipulation in Human Environments. August 16–21, 2009.
- Co-organizer. CRA/CCC workshop on Emerging Technologies and Trends in Robotics. August, 2008.
- Cyber-Physical Systems (CPS) Summit. April 25, 2008.
- IEEE ICRA Workshop on Algorithmic Automation. May 19, 2008.
- Smart Assembly Systems. NIST. October 3–4, 2006.
- Language for Intelligent Machines (LIMES) Workshop. Army Research Office. July 19–21, 2006.
- Co-organizer. Workshop on Science and Technology Challenges for Robotics. Robotics Science and Systems. August 16, 2006.
- Workshop on Mathematics and Robotics. NSF Division of Mathematical Sciences. May 15, 16, and 17, 2000.
- Co-organized Third Workshop on the Algorithmic Foundations of Robotics. March 5–7, 1998.
- NSF IRIS Manufacturing Research Planning Meeting. June 7-8, 1993.
- Co-organized IEEE ICRA Workshop on Geometric Algorithms for Manufacturing. May, 1993.
- Co-organized NSF Workshop on Geometric Uncertainty in Motion Planning. June 15–17, 1992.
- Workshop on expanding access to Japanese robotics research and development; Office of Japan Affairs; National Research Council. May 1, 1992.
- Workshop on Experimental Computer Science, organized by Barbara Liskov. October, 1991.
- AAAI Fall Symposium, Sensory Aspects of Robotic Intelligence. Fall 1991.
- Co-organizer, IEEE ICRA workshop on Task Strategy Generation and Skill Acquisition for Advanced Manipulation. May 15, 1989.
- Workshop on Automatic Robot Programming, Cambridge, Massachusetts, April, 1987.
- Workshop at ACM Fall Joint Computer Conference, November, 1986.
- Workshop on Robot Hands, Dubrovnik, Yugoslavia, September 1986.
- Geometric Reasoning - An International Workshop, Oxford University, June 1986.

- Workshop on Robotics and Automation, NASA/Johnson Space Center, Houston, January 1986.
- USA-Spain Joint Seminar on Sensors and Robotic Control, Madrid, October 1985.
- Workshop on Intelligent Robots: Achievements and Issues, SRI International, November 1984.
- Workshop on the Design and Control of Dexterous Hands, sponsored by Defense Advanced Research Projects Agency, MIT Artificial Intelligence Laboratory. November 5–6, 1981.

Other professional activities

- Co-organizer, A Roadmap for US Robotics: From Internet to Robotics. Sponsored by the Computing Community Consortium and the Computing Research Association. Delivered to the Congressional Caucus on Robotics, May 21, 2009.
- SERC Distinguished Visitor, Singapore, 2008.
- Co-director, Robot Hall of Fame, 2007– .
- Jury, Robot Hall of Fame, 2006– .
- Fellow Nomination Committee, IEEE Robotics and Automation Society, 2006, 2008.
- Founding coordinator, Association of PhD Programs in Robotics, 2005– .
- National Research Council review panel, Robotic Access and Human Planetary Landing Systems, June 3, 2005.
- Visiting member, Technology Review Board, MITRE Corporation. 2002.
- Design Review Board, Skywalker project. Carnegie Mellon University, 1999.
- Chair of IEEE Robotics and Automation Society technical committee on Manipulation, Member of Technical Activities Board. 1993.
- April, 1990. Panelist, Panel Discussion on Robotics Education, IEEE ICRA.

**University and department service**

University Research Review Committee, 2007 – .

SCS Dean Search Committee, 2003 – 2004.

Curriculum committee for Qatar campus, 2003.

SCS Undergraduate Program Curriculum Committee (chair), 2003.

CS Department’s Performance Review Committee (chair), 2003.

Dean’s Performance Review Committee, 2001.

SCS Promotions and Governance Committee (chair), 2000 – 2001.

Faculty Senate (ex officio), 2000 – 2002.

Faculty Chair for the School of Computer Science, 2000 – 2002.

RI space committee. 1999 – 2003.

SCS College Council. 1999 – .

Faculty Senate (appointed by President Cohon), 1998 – 1999.

Director, Robotics Education Lab, 1997 – 2001.

Robotics Minor committee for CIT, 1997 – .

CMU/ETL collaboration program, 1996 – .

Newell and Simon Hall building committee for SCS, 1999.

CS PPC committee, to revise PhD curriculum, 1998–1999.

SCS Microsoft Fellowship committee, 1998, 1999.

SCS Self-Assessment committee, 1998.

Ryan Award committee, 1995, 1996, 1997.

SCS Dean’s Kitchen Kabinet, 1995 – 1998.

Ad hoc university committee to review Conflict of Interest Policy, 1995.

Simon Prize committee. Chair 1994, 1995; member 1996.

University Research Council, 1993 – 1996.

Robotics Institute hiring committee, chair 1993, 1994, 1996; member 1989, 1990.

Organized first Emigration Course for Computer Science Department. Spring 1993.

Secretary, Dec5 Corporation. 1992 – 2002.

Computer Science Doctoral Review Committee. 1992 – 1994.

Robotics PhD Program Committee. 1991 – 1996. Non-voting ex officio 1996 – .

Robotics PhD Program Education Committee. 1991.

SCS Immigration Course. 1991.

University Faculty Policy Committee. 1988.

Undergraduate program sequence subcommittee, Physics Department. 1988.

Admissions committee, Computer Science Department. 1988 – 1990.

### **Courses taught**

16-597. Designing Tabletop Robots. 2003.

Robotics section of Andrew’s Leap. 1992–2003.

15-883; 16-741. Mechanics of Manipulation. 1987–2007.

15-384. Robotic Manipulation. 1986–2003.

15-212. Fundamental Structures of Computer Science II. 1985, 1986.

18-858. Robotics. 1983, 1984.

15-880C. Robotics reading and discussion seminar. 1985–1990.

November, 2009