

Andrew T. Miller

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Education:

COLUMBIA UNIVERSITY, NEW YORK, NY

Ph.D. in Computer Science, June 2001

Advisor: Peter K. Allen

Dissertation: GraspIt!: A Versatile Simulator for Robotic Grasping

I present an interactive simulation system that facilitates analysis and visualization of the grasps of a wide variety of robotic hands. It includes a novel contact determination system, grasp analysis methods that assess the quality of a grasp, visualization methods to show the weak points of a grasp, and a dynamics module to compute object motion over time. Experiments also demonstrate its usage in planning an executing grasps in a real robotic work cell.

M.Phil. Received February 1999

M.S. Received February 1997

HAMILTON COLLEGE, CLINTON, NY

B.A. Received May 1995 - Magna Cum Laude

Major: Computer Science Minor: Physics

Awards:

Wegbreit Best Manipulation Paper Award at IEEE Intl. Conf. on Robotics and Automation - Sep. 2003.

Columbia School of Engineering and Applied Science Teaching Assistant Award - May 2000.

Elected to Sigma Xi - May 1995.

Work Experience:

Department of Computer Science, Columbia University, New York, NY

Research Scientist, Robotics group, 9/02 – Present

Exploring applications of robotics in laparoscopic surgery in collaboration with Dr. Dennis Fowler at New York Presbyterian Hospital. Currently developing new endoscopes that can be placed entirely within the human body. Also assist in writing several grant proposals, and have begun work, in collaboration with researchers at Cornell University's Neuromuscular Biomechanics lab, on a recently funded NSF-ITR grant to create a biomechanically realistic human hand model that will be integrated into GraspIt!. Supervising three masters students working on grasp planning and other aspects of the simulator.

The Royal Institute of Technology (KTH), Stockholm, Sweden

Postdoctoral Researcher, Center for Autonomous Systems, 9/01 – 9/02

Further developed the GraspIt! system and prepared it for public release. Built a dynamic simulation system that computes the motions of all elements in the system and allows for custom manipulation control algorithms. Also generalized the system to allow the inclusion of multiple connected robots, such as a mobile base, arm, and hand. Supervised a masters student working on a heuristic-based automatic grasp planner.

Department of Computer Science, Columbia University, New York, NY

Graduate Research Assistant, Robotics group, 8/95 – 6/01

Performed independent work on research projects led by Professor Peter Allen. Areas of interest have included motion based tracking, hand eye coordination, and multisensor fusion. Primary research focused on grasp analysis and planning, as well as issues in simulation such as collision detection and dynamics.

Sandia National Laboratories, Albuquerque, NM

Intern, Intelligent Systems and Robotics Center, 9/00 - 10/00

Enhanced the grasping simulator by implementing advanced grasp force optimization techniques and improved visualization methods. Conducted research on adding dynamic simulation of object motion.

Philips Research, Briarcliff Manor, NY

Summer Intern, Consumer Information Management Group, 5/00 - 8/00

Investigated learning techniques for facial animation. Project required building and implementing a catadioptric vision system capable of tracking facial motions in stereo, and developing a method to animate a 3D texture-mapped face model based on the motions of control points.

T.J. Watson Research Center, IBM, Yorktown Heights, NY

Summer Intern, User Interfaces Group - Distributed Systems & Services Department, 5/99 - 8/99

Designed a prototype of a help desk application that provides a technician with a 3D workspace with which he or she can diagnose network problems. Each test performed by the technician is recorded and graphically summarized on a tiltable network map. Also designed a 3D scatter plot application in which a user may interactively stretch regions of the various axes to expand regions of interest without losing the overall data summary.

Argonne National Laboratory, Argonne, IL

Summer Intern, Math & Computer Science Division, 5/95 - 8/95, 5/94 - 8/94

Assisted in design and construction of CAVE Automatic Virtual Environment that was featured in SIGGRAPH '94. Developed portions of CAVE software library. Wrote two disk utilities for RAID storage system attached to the IBM - SP1 supercomputer.

Patents:

“Insertable device and system for minimal access procedure,” Dennis L. Fowler, Peter K. Allen, Andrew T. Miller, patent pending, 2003.

“System and method for audio-visual content synthesis,” Nevenka Dimitrova, Dongge Li, Andrew Miller, patent pending, 2003.

“Video playback device with real-time on-line viewer feedback capability and method of operation,” Andrew T. Miller and John Zimmerman, patent pending, 2001.

“Video playback device capable of sharing resources and method of operation,” Lalitha Agnihotri, Andrew T. Miller, and Thomas F. McGee, patent pending, 2001.

Publications:

Raphael Pelossof, Andrew Miller, Peter Allen, and Tony Jebara. “An SVM learning approach to robotic grasping.” In *Proc. of the IEEE Intl. Conf. on Robotics and Automation*, in press, 2004.

Andrew T. Miller and Peter K. Allen. “GraspIt!: A versatile simulator for robotic grasping,” To appear in *IEEE Robotics and Automation Magazine*, 2004.

Andrew Miller, Peter Allen, and Dennis Fowler. “In-vivo stereoscopic imaging system with 5 degrees-of-freedom for minimal access surgery.” In *Medicine Meets Virtual Reality 12*, pp. 234-240, January, 2004.

M. Anitescu, A. Miller, and G. D. Hart. “Constraint stabilization for time-stepping approaches for rigid multibody dynamics with joints, contact and friction.” In *Proc. of the ASME International Design Engineering Technical Conferences*, September, 2003.

Andrew T. Miller, Henrik I. Christensen. “Implementation of Multi-rigid-body Dynamics within a Robotic Grasping Simulator” In *Proc. of the IEEE Intl. Conf. on Robotics and Automation*, pp. 2262-2268, September 2003.

Andrew T. Miller, Steffen Knoop, Peter K. Allen, Henrik I. Christensen. “Automatic Grasp Planning Using Shape Primitives,” In *Proc. of the IEEE Intl. Conf. on Robotics and Automation*, pp. 1824-1829, September 2003. [Winner of the 2003 Wegbreit Best Manipulation Paper Award]

Andrew T. Miller. “GraspIt!: A versatile simulator for robotic grasping”, Ph.D. Thesis, Department of Computer Science, Columbia University, June 2001.

Danica Kragić, Andrew T. Miller, Peter K. Allen. “Real-time tracking meets online grasp planning”. In *Proc. IEEE Intl. Conf. on Robotics and Automation*, pp. 2460-2465, May 2001.

Andrew T. Miller and Peter K. Allen. "GraspIt!: A Versatile Simulator for Grasp Analysis". In *Proc. ASME Intl. Mechanical Engineering Congress & Exposition*, pp. 1251-1258, November 2000.

Andrew T. Miller and Peter K. Allen. "Examples of 3D Grasp Quality Computations". In *Proc. IEEE Intl. Conf. on Robotics and Automation*, pp. 1240-1246, May 1999.

Peter K. Allen, Andrew T. Miller, Paul Y. Oh, Brian S. Leibowitz, "Integration of Vision, Force and Tactile Sensing for Grasping," *Intl. Journal of Intelligent Machines*, Vol. 4, No. 1, pp. 129-149, Jan. 1999.

Peter K. Allen, Andrew T. Miller, Paul Y. Oh, Brian S. Leibowitz. "Using Tactile and Visual Sensing with a Robotic Hand". In *Proc. IEEE Intl. Conf. on Robotics and Automation*, pp. 676-681, April, 1997.

Peter K. Allen, Andrew T. Miller, Paul Y. Oh, Brian S. Leibowitz. "Integration of Vision and Force Sensors for Grasping". In *Proc. IEEE/SICE/RSJ Intl. Conf. on Multisensor Fusion and Integration for Intelligent Systems*, pp. 349-356, December, 1996.

Peter K. Allen, Billibon H. Yoshimi, Andrew. T. Miller, Paul Y. Oh, Brian S. Leibowitz, "Visual Control for Robotic Hand-eye Coordination", *Workshop on Robotics and Robot Vision, 4th Intl. Symposium on Signal Processing and its Applications*, pp. 20-37, August, 1996.

Teaching:

Instructor: W1001 - Introduction to Computers, Columbia University, Spring 2001.
W3131 - Data Structures in C, Columbia University, Fall 1998.

Teaching Assistant: W4733 - Computational Aspects of Robotics, Columbia University, Spring 2000.
W4165 - Computation Techniques in Pixel Processing, Columbia University,
Fall 1996, Fall 1997, Fall 1999.

Programming Skills:

C, C++, Java, Tcl/Tk, HTML/CGI, Lisp, Perl
3D Modeling: ACIS 3D modeling kernel
Graphics: OpenInventor, OpenGL
Proficient with both Microsoft Visual C++ and GNU compilers.

Professional Activities:

Reviewer for IEEE Robotics & Automation conferences, IEEE/RSJ Intelligent Robots and Systems conferences, IEEE Transactions on Systems, Man, and Cybernetics: Part C, IEEE Transactions on Industrial Engineering, International Journal of Robotics and Automation, and Software-Practice and Experience. Registration chair for ACM Multimedia 2004. Member IEEE 1998-2004.

References:

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