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The Robotics Institute
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EDUCATION:

Degree	Year	University	Department
Ph.D.	1994	Massachusetts Institute of Technology	Computer Science (AI Lab)
M.S.	1989	Massachusetts Institute of Technology	Computer Science (AI Lab)
B.S.	1986	University of Houston	Electrical Engineering

Ph.D. Thesis:

Title: *Parallel Methods for Synthesizing Whole-Hand Grasps from Generalized Prototypes.*

Thesis Advisor: Professor Tomás Lozano-Pérez.

PROFESSIONAL EXPERIENCE:

Position	Organization	Years
Assistant Professor	School of Computer Science Carnegie Mellon University	2003 - Present
Assistant Professor	Computer Science Department Brown University	1998 - 2003
Postdoctoral Researcher	College of Computing Georgia Institute of Technology	1996 - 1998
Engineer / Consultant	Decision Architects Monitor Company, Cambridge, MA	1994 - 1996

PUBLICATION LIST:

Chapters in Books:

1. Nancy S. Pollard and Alon Wolf, "Grasp Synthesis from Example: Tuning the Example to a Task or Object," In Federico Barbagli, Domenico Prattichizzo, and Kenneth Salisbury (eds.) *Multi-point Interaction with Real and Virtual Objects*. Springer Tracts in Advanced Robotics, pages 77-90, 2005.
2. Jessica K. Hodgins, James F. O'Brien, Nancy S. Pollard, Robert Sumner, Wayne L. Wooten, Gary Yngve, and Victor Zordan, "Creating Realistic Motion." In Joseph Anderson and Barbara Fisher Anderson (eds.) *Motion Image Theory: Ecological Considerations*. Carbondale: Southern Illinois

University Press, pages 52-60, 2005.

Refereed Journal Papers - Published:

3. Alla Safonova, Jessica K. Hodgins, and Nancy S. Pollard, "Synthesizing Physically Realistic Human Motion in Low-Dimensional, Behavior-Specific Spaces," *ACM Transactions on Graphics (SIGGRAPH)*, 23, 3, 512-519, 2004.
4. Nancy S. Pollard, "Closure and Quality Equivalence for Efficient Synthesis of Grasps from Examples," *International Journal of Robotics Research*, 23, 6, 595-613, June 2004.
5. Anthony C. Fang and Nancy S. Pollard, "Efficient Synthesis of Physically Valid Human Motion," *ACM Transactions on Graphics (SIGGRAPH)*, 22, 3, 417-426, 2003. (Revised version later appeared as: Anthony C. Fang and Nancy S. Pollard, "Efficient Computation of Optimal, Physically Valid Motion," *Journal of Robotics Society of Japan*, 22, 2, Special issue on Motor Learning of Robots, March 2004.)
6. Paul S. A. Reitsma and Nancy S. Pollard, "Perceptual Metrics for Character Animation: Sensitivity to Errors in Ballistic Motion," *ACM Transactions on Graphics (SIGGRAPH)*, 22, 3, 537-542, 2003.
7. Jehee Lee, Jinxiang Chai, Paul S. A. Reitsma, Jessica K. Hodgins, and Nancy S. Pollard, "Interactive Control of Avatars Animated with Human Motion Data," *ACM Transactions on Graphics (SIGGRAPH)*, 21, 3, 491-500, 2002.

Refereed Conference/Workshop Papers:

8. Nancy S. Pollard and Victor B. Zordan, "Physically Based Grasping Control from Example," *ACM SIGGRAPH / Eurographics Symposium on Computer Animation*, Los Angeles, CA, 2005.
9. Paul S. A. Reitsma and Nancy S. Pollard, "Evaluating Motion Graphs for Character Navigation," *ACM SIGGRAPH / Eurographics Symposium on Computer Animation*, Grenoble, France, 2004.
10. Jernej Barbic, Alla Safonova, Jia-Yu Pan, Christos Faloutsos, Jessica K. Hodgins, and Nancy S. Pollard, "Segmenting Motion Capture Data into Distinct Behaviors", *Proceedings of Graphics Interface*, May 2004.
11. Nancy S. Pollard and Jessica K. Hodgins, "Generalizing Demonstrated Manipulation Tasks," *Proceedings of the Workshop on the Algorithmic Foundations of Robotics (WAFR)*, Nice, France, 2002.
12. Nancy S. Pollard and Richards C. Gilbert, "Tendon Arrangement and Muscle Force Requirements for Humanlike Force Capabilities in a Robotic Finger," *Proceedings of the IEEE International Conference on Robotics and Automation*, Washington, D.C. 2002.
13. Nancy S. Pollard, Jessica K. Hodgins, Marcia J. Riley, and Chris G. Atkeson, "Adapting Human Motion for the Control of a Humanoid Robot," *Proceedings of the IEEE International Conference on Robotics and Automation*, Washington, D.C., 2002.
14. Nancy S. Pollard and Fared Behmaram-Mosavat, "Force-Based Motion Editing for Locomotion Tasks," *IEEE International Conference on Robotics and Automation*, San Francisco, CA, May, 2000.
15. Nancy S. Pollard, "Simple Machines for Scaling Human Motion," *Computer Animation and Simulation '99*, N. Magnenat-Thalmann and D. Thalmann (eds), Springer-Verlag/Wein, 1999.
16. William A. Wolovich, Mustafa Unel, Nancy Pollard, and E. Zattoni, "The Shape of Multi-Body Motion," *2nd International Conference on Recent Advances in Mechatronics*, Istanbul, Turkey, May 24-26, 1999.
17. Jessica K. Hodgins and Nancy S. Pollard, "Adapting Simulated Behaviors For New Characters," *ACM SIGGRAPH '97 Proceedings*, Los Angeles, CA, 1997.

18. Nancy S. Pollard, "Parallel Algorithms for Synthesis of Whole-Hand Grasps," Proceedings of the IEEE International Conference on Robotics and Automation, Albuquerque, NM, 1997.
19. Nancy S. Pollard, "Synthesizing Grasps from Generalized Prototypes," Proceedings of the IEEE International Conference on Robotics and Automation, Minneapolis, MN, 1996.
20. Nancy S. Pollard, "Planning Grasps for a Robot Hand in the Presence of Obstacles," Proceedings of the IEEE International Conference on Robotics and Automation, Atlanta, GA, 1993.
21. David M. Siegel and Nancy S. Pollard, "Extracting the Orientation of a Grasped Object from Contact Information: An approach for overcoming prohibitive calibration requirements," Proceedings of the IEEE International Symposium on Intelligent Control, Arlington, VA, 1991.
22. Raymond K. Lam, Nancy S. Pollard, and Rajiv S. Desai, "Studies in Knowledge-Based Diagnosis of Failures in Robotic Assembly," Proceedings of the IEEE International Conference on Systems Engineering, Pittsburgh, PA, 1990.
23. Nancy S. Pollard and Tomás Lozano-Pérez, "Grasp Stability and Feasibility for an Arm with an Articulated Hand," Proceedings of the IEEE International Conference on Robotics and Automation, Cincinnati, OH, 1990.

Unrefereed Conference/Workshop Papers:

24. Nancy S. Pollard and Alon Wolf. "Grasp synthesis from example: tuning the example to a task or object", Workshop on Multi-point Interaction in Robotics and Virtual Reality, IEEE International Conference on Robotics and Automation, 2004. Invited paper.
25. Alla Safonova, Nancy S. Pollard, and Jessica K. Hodgins, "Optimizing Human Motion for the Control of a Humanoid Robot," 2nd International Symposium on Adaptive Motion of Animals and Machines (AMAM2003), Kyoto, Japan, March 2003. Invited paper.
26. Nancy S. Pollard and Paul S. A. Reitsma, "Animation of Humanlike Characters: Dynamic Motion Filtering with a Physically Plausible Contact Model," The Eleventh Yale Workshop on Adaptive and Learning Systems, Yale University, New Haven, CT, June, 2001. Invited paper.
27. Nancy S. Pollard and Jessica K. Hodgins, "Adapting Behaviors to New Environments, Characters, and Tasks," The Tenth Yale Workshop on Adaptive and Learning Systems, Yale University, New Haven, CT, June, 1998. Invited paper.

Technical Reports:

28. Nancy S. Pollard, "Parallel Methods for Synthesizing Whole-Hand Grasps from Generalized Prototypes," Massachusetts Institute of Technology Artificial Intelligence Laboratory Technical Report, January 1994.
29. Nancy S. Pollard, "The Grasping Problem: Toward Task-Level Programming for an Articulated Hand," Massachusetts Institute of Technology Artificial Intelligence Laboratory Technical Report, May 1990.
30. Nancy S. Pollard, "Inversion of Induction Logs Using the Powell Least-Square-Error Algorithm," University of Houston Well Logging Laboratory Technical Report No. 8, Houston, TX, Oct. 1986.
31. Nancy S. Pollard, Liang C. Shen, "Computer Codes for Induction Logs in Multiple Layer Formations," University of Houston Well Logging Laboratory Technical Report No. 7, Houston, TX, Oct. 1985.

EVIDENCE OF EXTERNAL REPUTATION

Citations and Awards:

1. CAREER Award, National Science Foundation, 2001-2006.
2. Graduate Fellow, Office of Naval Research, 1986-1989.
3. Outstanding Engineering Senior of the Year, University of Houston, 1986.

Invited Papers and Talks at Professional Meetings:

1. Nancy S. Pollard and Alon Wolf. "Grasp synthesis from example: tuning the example to a task or object", Workshop on Multi-point Interaction in Robotics and Virtual Reality, IEEE International Conference on Robotics and Automation, 2004. Invited paper.
2. Nancy S. Pollard. Physics-based control of Dynamic Characters, Conference on Computer Animation and Social Agents, Rutgers, New Jersey, May 2003. Invited tutorial seminar.
3. Alla Safonova, Nancy S. Pollard, and Jessica K. Hodgins, "Optimizing Human Motion for the Control of a Humanoid Robot," 2nd International Symposium on Adaptive Motion of Animals and Machines (AMAM2003), Kyoto, Japan, March 2003. Invited paper.
4. Nancy S. Pollard. "Animating Manipulation Tasks from Human Motion Data," Workshop on the Mathematics of Computer Animation, Fields Institute for Research in the Mathematical Sciences, University of Toronto, November 8, 2002. Invited seminar.
5. Nancy S. Pollard and Paul S. A. Reitsma, "Animation of Humanlike Characters: Dynamic Motion Filtering with a Physically Plausible Contact Model," The Eleventh Yale Workshop on Adaptive and Learning Systems, Yale University, New Haven, CT, June, 2001. Invited paper.
6. Nancy S. Pollard, "Animating Humans by Combining Simulation and Motion Capture," SIGGRAPH '00, July 2000. Invited SIGGRAPH Course presentation.
7. Nancy S. Pollard and Jessica K. Hodgins, "Adapting Behaviors to New Environments, Characters, and Tasks," The Tenth Yale Workshop on Adaptive and Learning Systems, Yale University, New Haven, CT, June, 1998. Invited paper.

Invited Seminar Presentations:

1. Brown University, Department of Ecology and Evolutionary Biology, "Characterizing human motion for animation and robotics," February 14, 2005 (hosts Steve Gatesy and Sharon Swartz).
2. MIT, Computer Science Department, "Dynamic Locomotion and Quasistatic Manipulation: Natural Physical Interaction for Graphical Characters and Humanoid Robots," May 20, 2003 (host Jovan Popović).
3. Princeton University, Computer Science Department, "Dynamic Locomotion and Quasistatic Manipulation: Natural Physical Interaction for Graphical Characters and Humanoid Robots," May 5, 2003 (host Adam Finkelstein).
4. Rensselaer Polytechnic Institute, Department of Computer Science, "Dynamic Locomotion and Quasistatic Manipulation: Natural Physical Interaction for Graphical Characters and Humanoid Robots," April 29, 2003 (host Jeff Trinkle).
5. Carnegie Mellon University, Robotics Institute Seminar, "Dynamic Locomotion and Quasistatic

- Manipulation: Natural Physical Interaction for Graphical Characters and Humanoid Robots,” April 18, 2003 (host Jessica Hodgins).
6. Washington University in St. Louis, Department of Computer Science, “Dynamic Locomotion and Quasistatic Manipulation: Natural Physical Interaction for Graphical Characters and Humanoid Robots,” March 31, 2003 (host Cindy Grimm).
 7. AIST Digital Human Laboratory, Tokyo, Japan, ‘Synthesis of Natural Looking Motion: On the Role of External Forces,” March 12, 2003 (host Satoshi Kagami).
 8. Advanced Telecommunications Research Institute (ATR), Human Information Sciences Division, “Efficient Planning of Natural-Looking Motion for Graphical Characters and Humanoid Robots,” March 6, 2003 (host Mitsuo Kawato).
 9. Advanced Telecommunications Research Institute (ATR), Human Information Sciences Division, “Human Models for Robot Manipulation,” Kyoto, Japan, July 13, 2002 (host Mitsuo Kawato).
 10. Advanced Telecommunications Research Institute (ATR), Human Information Sciences Division, Kyoto, Japan, “Human vs. Robot Hands: The Effect of Tendon Layout,” July 2001 (host Mitsuo Kawato).
 11. Advanced Technologies Research Institute, New Frontiers in Intelligent Robotics Program, Tokyo, Japan, “Human vs. Robot Hands: The Effect of Tendon Layout,” July 2001 (host Hirochika Inoue, University of Tokyo).
 12. New York University, Computer Vision Seminar, “Robust Behaviors for Animated Characters,” April 17, 1998 (host Davi Geiger).
 13. Yale University, Computer Science Department, “Robust Behaviors for Animated Characters,” April 7, 1998.
 14. Brown University, Computer Science Department, “Robust Behaviors for Animated Characters,” March 31, 1998.
 15. University of Southern California, Computer Science Department, “Robust Behaviors for Animated Characters,” March 26, 1998.
 16. Boston University, Computer Science Department, “Robust Behaviors for Animated Characters,” March 4, 1998.
 17. State University of New York, Stony Brook, Computer Science Department, “Robust Behaviors for Animated Characters,” February 23, 1998.
 18. University of Massachusetts at Amherst, Laboratory for Perceptual Robotics, “Physically Realistic Morphing,” February 7, 1997 (host Rod Grunen).
 19. University of Pennsylvania, GRASP Laboratory, “Synthesizing Whole-Hand Grasps Using Generalized Prototypes,” June 24, 1996 (host Ruzena Bajcsy).

Invited Participant:

1. Japan Society for the Promotion of Science and Association of International Education Workshop on “New Frontiers of Intelligent Robotics,” Advanced Science Institute, Tokyo, Japan, July 2001 (host Hirochika Inoue, University of Tokyo). Invited and awarded funding to attend the 10 day workshop as part of a group of promising young American scientists.
2. NASA / NSF Workshop on Autonomous Mobile Manipulation (AMM), Houston, TX, March 10-11, 2005 (host Rod Grunen, University of Massachusetts, Amherst). Invited as area expert in Grasping and Manipulation.

EXTERNAL PROFESSIONAL ACTIVITIES:

- Video Chair, IEEE International Conference on Robotics and Automation, 2008.
- Program Co-Chair of the First ACM SIGGRAPH / Eurographics Symposium on Computer Animation (with Michael Cohen, Microsoft Research), 2002.
- Papers Program Committee, ACM SIGGRAPH 2004, 2005.
- Co-Chair of Symposium on Dynamic Simulation of Humanoid Motion (with Jessica Hodgins, Carnegie Mellon University), IEEE International Conference on Robotics and Automation, San Francisco, CA, May 2000.
- Program Committee for ACM SIGGRAPH courses 2005; ACM SIGGRAPH posters 2004; ACM SIGGRAPH / Eurographics Symposium on Computer Animation 2003, 2004, 2005; Workshop on the Algorithmic Foundations of Robotics (WAFR) 2004; IEEE International Conference on Robotics and Automation 2000, 2001, 2002. Humanoids 2004, 2005; Pacific Graphics 2002, 2004; Web3D Symposium 2002; Interactive 3D Graphics (I3D) 2003; Computer Animation and Social Agents (CASA) 2003, 2004.
- Reviewer. SIGGRAPH; ACM Transactions on Graphics; International Journal of Robotics Research; IEEE Computer Graphics and Applications; IEEE Transactions on Robotics and Automation; IEEE Transactions on Systems, Man, and Cybernetics; IEEE Transactions on Visualization and Computer Graphics; International Journal of Humanoid Robotics; Journal of Autonomous Robots; Journal of Machine Learning Research; Journal of Robotic Systems; Communications of the ACM; Graphics Interface; IEEE International Conference on Robotics and Automation; Interactive 3D Graphics; Pacific Graphics; Web 3D Symposium
- Member IEEE, ACM, ACM SIGGRAPH.

CONTRACT AND GRANT SUPPORT:

Research Grants, CURRENT:

1. Advanced Telecommunications Research Institute International (ATR) Department of Humanoid Robotics and Computational Neuroscience, unrestricted funding for research on precision manipulation. Amount funded: \$9,500 (1M yen). Feb 2005.
2. CISE Research Resources National Science Foundation. RR: Collaborative Research Resources: Learning from Human Hands to Control Dexterous Robot Hands. Principal Investigator: Nancy Pollard. With Yoky Matsuoka at CMU. Amount funded: \$206,249. Sept 2004- Aug 2006.
3. CNS - Major Research Instrumentation National Science Foundation. Acquisition of a high-performance laser scanner for research and education in civil engineering, architecture, robotics and computer graphics. Principal Investigator: Burcu Akinci (CEE). With Omer Akin, Martial Hebert, and Jessica Hodgins. Amount funded: \$195,413. Sept 2004- Aug 2007.
4. Research Experience for Undergraduates (REU) National Science Foundation. Amount funded: \$12,000. Apr 2004- Mar 2006.

5. Medium ITR National Science Foundation. ITR Collaborative Research: Indexing, Retrieval, and Use of Large Motion Databases. Principal Investigator at lead institution: Christos Faloutsos. With Jessica Hodgins and Randy Pausch at CMU, Amy Bruckman at Georgia Tech. Amount funded: \$1.4M. Mar 2004- Feb 2008.
6. Medium ITR National Science Foundation. ITR Collaborative Research: Using Humanoids to Understand Humans. Principal Investigator at lead institution: Chris Atkeson. With Jessica Hodgins and James Kuffner at CMU, Stefan Schaal at USC. Amount funded: \$1,466,666. Oct 2003- Sept 2008.
7. CISE Research Resources National Science Foundation. An Experimental Platform for Humanoid Robotics Research. Principal Investigator: Jessica Hodgins. With Chris Atkeson, Martial Hebert, Scott Hudson, Sara Kiesler, James Kuffner, Randy Pausch, and Al Rizzi at CMU. Amount funded: \$1M. Sept 2002-Aug 2005.
8. CAREER Award National Science Foundation. Title: Quantifying Humanlike Enveloping Grasps. Principal Investigator: Nancy Pollard. Amount funded: \$325K. Apr 2001-Mar 2006.

Research Grants, EXPIRED:

1. Medium ITR National Science Foundation. Providing Intuitive Access to Human Motion Databases. Principal Investigator: Jessica Hodgins. With Christos Faloutsos and Randy Pausch at CMU and Amy Bruckman at Georgia Tech. Amount funded: \$510K. Sept 2002-Aug 2005.
2. Course, Curriculum, and Laboratory Improvement National Science Foundation. Title: Context Rich Interactive Science Teaching and Learning System. Principal Investigator: Thompson Webb III. With David Cutts, David Targan, and Sharon Swartz. Amount funded: \$74K. May 2002-May 2003.
3. Microsoft Research funding for collaborative projects. With Andy van Dam, John Hughes, and David Laidlaw. Total amount funded: \$150K. Oct 1999-Oct 2000.
4. Postdoctoral Research Associates in Computational Science and Engineering, National Science Foundation. Title: Parallel Search Algorithms For Automating the Animation of Human Motion. Principal Investigator: Jessica Hodgins. Amount funded: \$46K. Jun 1997-Jun 1999.

UNIVERSITY SERVICE:

<i>2004 - Present</i>	CMU Department Committees: Doctoral Review Committee (CSD).
<i>1998 – 2003</i>	Brown University Department Committees: Junior Faculty Search, Graduate Admissions, Faculty Teaching Liason, ACM Faculty Advisor, WiSE/WiCS Faculty Advisor.

TEACHING:

<i>Spring, 2004 & Fall, 2004</i>	Computer Graphics 15-462, CMU http://graphics.cs.cmu.edu/nsp/course/15-462/Fall04/index.html
<i>Fall, 2004</i>	Physically Based Character Animation 15-869, CMU. http://graphics.cs.cmu.edu/nsp/course/15-869/index.html
<i>Fall, 1999-2000</i>	Topics in Algorithmic Animation: CS229, Brown University. http://www.cs.brown.edu/courses/cs229/gallery.html
<i>Spring, 1999-2001</i>	Introduction to Scientific Computing: CS4, Brown University.
<i>Fall, 1998</i>	Computer Graphics Seminar: CS295-1, Animation and Scientific Visualization, Brown University.
<i>Fall, 1998</i>	Object-Oriented Programming Practice: CS5, Brown University.
<i>Summer, 1997</i>	Introduction to Computer Graphics, Georgia Institute of Technology

ADVISING:

Graduate Advising:

Current	Paul Reitsma. Current CSD PhD student. Transferred Fall, 2004 from Brown University. Completed Proposal Spring 2005, "Evaluating Expected Character Performance in Data Driven Animation."
Current	Jiaxin Fu. Current RI PhD student. Entered Fall, 2003.
Current	Ting Ting Wu. CRA-Distributed Mentoring Program, summer 2005. 5th year M.S. student academic year 2005-2006.
May 2003	Anthony C. Fang, PhD. "Efficient Synthesis of Physically Valid Human Motion," (now Assistant Professor at National University of Singapore).
May 2001	Sanjukta Roy, M.S. "A Comparative Study of Techniques to Map Motion from Simple to Highly Articulated Bodies," (Digital Media on Demand).
May 2001	Pramod Paranthaman, M.S. "Simulation of Balance in Animated Characters."
May 2001	Richards Gilbert, M.S. "A Program for Quantifying Humanlike Finger Forces Using an Anatomic Hand Tendon Model," (U. Penn Wharton School).
Jan 2001	Jaehoon Lee, M.S. "Shoulder Girdle Simulation."
Nov 2000	Carolyn Uy, M.S. "Robust Control Systems for Motion Playback," (Sony Imageworks).
Oct 2000	Jonathan Cummings, M.S. "Motion Blending and Editing," (Dreamworks).
May 2000	Remco Chang, M.S. "Volume Deformation Techniques," (Preston Aviation).
Aug 1999	Audrey Wong, M.S. "Image-Based Rendering Techniques Applied to Animation," (Pixar).
May 1999	Jeffrey Pickering, M.S. "COACH," (SoundsBig).

Undergraduate Advising:

- Fall, 2004 -Spring 2005 Jacqueline Kirchhoff, Megan Monroe, and Ting Ting Wu, CRA-W Collaborative Research Experience for Undergraduates in Computer Science and Engineering (CREU), "Realistic Animation of the Human Hand."
- Sum 2001 Taylor Shaw, Undergraduate Research Opportunities (UROP) Program, "Spacetime Constraints Attempted."
- Sum 2001 Rachel Weinstein, UROP Program and RI Space Grant Project, "Creating Motion in Micro-gravity from Motion Capture Data," (graduate student at Stanford, Honorable Mention CRA Outstanding Undergraduate, NSF Graduate Fellowship).
- 2000-2001 Adam Leventhal, Senior Honors Project, "Optimizing Radial Basis Functions for Applications in Computer Graphics," (Senior prize in the CS Dept, now at Sun Microsystems)
- 2000-2001 Leor Thomas, Senior Honors Project, "Animating Mud, A Multi-Layer Approach," (Monitor Company).
- Spring 2000 Alex Abramov, Nick Sagal, Zach Schubert, Taisuke Tanimura, Group Independent Study Project, "Adding Physics to Networked Real-Time Video Games."
- Sum 1999 Moira Burke, CRA Distributed Mentoring Program, visiting student from the University of Oregon, "Vizualizing Physical Parameters," (freelance web designer).
- Sum 1999 Fareed Behmaram-Mosavat, UROP Program, "Using 'Simple Machines' to Model Human Motion Data ," (Pixar).