Sutardja Dai Hall
University of California Berkeley, CA 94720
☎ *(919) 272-8548*
✉ *sachinpatil@berkeley.edu*
rll.berkeley.edu/~sachin

Sachin Patil

Current Position

Jan 2013 - Present	**Postdoctoral Researcher**, *University of California, Berkeley, CA*. Advisors: Pieter Abbeel and Ken Goldberg

Education

Dec 2012	**Ph.D., Computer Science**, *University of North Carolina*, Chapel Hill, NC. Dissertation Title: Motion Planning under Uncertainty in Deformable Environments Advisor: Ron Alterovitz Committee: Dinesh Manocha, Ming Lin, Jur van den Berg, Marc Neithammer
Aug 2011	**M.S., Computer Science**, *University of North Carolina*, Chapel Hill, NC.
May 2006	**B.Tech., Computer Science**, *IIT Bombay*, Bombay, India.

Experience

Research/Academic

2009–2012	**Research Assistant**, *Computational Robotics Group*, UNC Chapel Hill, NC. Advisor: Ron Alterovitz
2007–2009	**Research Assistant**, *GAMMA Group*, UNC Chapel Hill, NC. Advisors: Dinesh Manocha and Ming Lin
2005–2006	**Undergraduate Research**, IIT Bombay, Bombay, India. Advisor: Sharat Chandran
Summer 2004	**Undergraduate Research Intern**, *National University of Singapore*, Singapore. Advisor: Anthony Tung

Teaching

Fall 2013	**Guest Lecturer**, *Advanced Robotics*, University of California, Berkeley.
Fall 2012	**Instructor**, *Robotics*, UNC Chapel Hill.
Fall 2011	**Guest Lecturer**, *Motion Planning in Real and Virtual Worlds*, UNC Chapel Hill.
Fall 2010	**Guest Lecturer**, *Robotics*, UNC Chapel Hill.
Spring 2010	**Guest Lecturer**, *Motion Planning*, UNC Chapel Hill.

Professional

Summer 2008	**Graduate Research Intern**, *Microsoft Many-Core Incubation Group*, Redmond, WA.
2006–2007	**Software Developer**, *Lehman Brothers India Ltd.*, Bombay, India.

Publications (Google Scholar: http://scholar.google.com/citations?user=zhUgtnAAAAAJ)

Journal Publications

[1] Momen Abayazid, Pedro Moreira, Navid Shahriari, Sachin Patil, Ron Alterovitz, and Sarthak Misra. Ultrasound-Guided Three-Dimensional Needle Steering in Biological Tissue with Curved Surfaces. *Journal of Medical Engineering & Physics*, 37(1):145–150, 2015.

[2] Ben Kehoe, Sachin Patil, Pieter Abbeel, and Ken Goldberg. A Survey of Research on Cloud Robotics and Automation. *IEEE Transactions on Automation Science and Engineering (T-ASE)*, [to appear] 2015.

[3] Ben Kehoe, Deepak Warrier, Sachin Patil, and Ken Goldberg. Cloud-Based Grasp Analysis and Planning for Toleranced Parts Using Parallelized Monte Carlo Sampling. *IEEE Transactions on Automation Science and Engineering (T-ASE)*, [to appear] 2015.

[4] Sachin Patil, Jia Pan, Pieter Abbeel, and Ken Goldberg. Planning Curvature and Torsion Constrained Ribbons in 3D with Application to Intracavitary Brachytherapy. *IEEE Transactions on Automation Science and Engineering (T-ASE)*, [to appear] 2015.

[5] Wen Sun, Sachin Patil, and Ron Alterovitz. High-Frequency Replanning Under Uncertainty Using Parallel Sampling-Based Motion Planning. *IEEE Transactions on Robotics (T-RO)*, 31(1):104–116, 2015.

[6] Momen Abayazid, Gustaaf Vrooijink, Sachin Patil, Ron Alterovitz, and Sarthak Misra. Experimental Evaluation of Ultrasound-Guided 3D Needle Steering in Biological Tissue. *International Journal of Computer Assisted Radiology and Surgery (IJCARS)*, 9(6):931–939, 2014.

[7] Sachin Patil, Jessica Burgner, Robert J. Webster III, and Ron Alterovitz. Needle Steering in 3D via Rapid Replanning. *IEEE Transactions on Robotics (TRO)*, 30(4):853–864, 2014.

[8] John Schulman, Yan Duan, Jonathan Ho, Alex Lee, Ibrahim Awwal, Henry Bradlow, Jia Pan, Sachin Patil, Ken Goldberg, and Pieter Abbeel. Motion Planning with Sequential Convex Optimization and Convex Collision Checking. *International Journal of Robotics Research (IJRR)*, 33(9):1251–1270, 2014.

[9] Gustaaf Vrooijink, Momen Abayazid, Sachin Patil, Ron Alterovitz, and Sarthak Misra. Needle Path Planning and Steering in a Three-Dimensional Non-Static Environment using Two-Dimensional Ultrasound Images. *International Journal of Robotics Research (IJRR)*, 33(10):1361–1374, 2014.

[10] Jur van den Berg, Sachin Patil, and Ron Alterovitz. Motion Planning under Uncertainty using Iterative Local Optimization in Belief Space. *International Journal of Robotics Research (IJRR)*, 31(11):1263–1278, 2012.

[11] Sachin Patil, Jur van den Berg, Sean Curtis, Ming C. Lin, and Dinesh Manocha. Directing Crowd Simulations Using Navigation Fields. *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, 17(2):244–254, 2011.

International Conference Proceedings

[1] Gregory Kahn, Peter Sujan, Sachin Patil, Shaunak D. Bopardikar, Julian Ryde, Ken Goldberg, and Pieter Abbeel. Active Exploration using Trajectory Optimization for Robotic Grasping in the Presence of Occlusions. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

[2] Nikita Kitaev, Igor Mordatch, Sachin Patil, and Pieter Abbeel. Physics-Based Trajectory Optimization for Grasping in Cluttered Environments. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

[3] Jeffrey Mahler, Sachin Patil, Ben Kehoe, Jur van den Berg, Matei Ciocarlie, Pieter Abbeel, and Ken Goldberg. GP-GPIS-OPT: Grasp Planning Under Shape Uncertainty Using Gaussian Process Implicit Surfaces and Sequential Convex Programming. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

[4] Adithyavairavan Murali, Siddarth Sen, Ben Kehoe, Animesh Garg, Seth McFarland, Sachin Patil, W. Douglas Boyd, Susan Lim, Pieter Abbeel, and Ken Goldberg. Learning by Observation for Surgical Subtasks: Multilateral Cutting of 3D Viscoelastic and 2D Orthotropic Tissue Phantoms. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

[5] Christopher Xie, Jur van den Berg, Sachin Patil, and Pieter Abbeel. Toward Asymptotically Optimal Motion Planning for Kinodynamic Systems using a Two-Point Boundary Value Problem Solver. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2015.

[6] Yan Duan, Sachin Patil, John Schulman, Ken Goldberg, and Pieter Abbeel. Planning Locally

Optimal, Curvature-Constrained Trajectories in 3D using Sequential Convex Optimization. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2014.

[7] Animesh Garg, Timmy Siauw, Guang Yang, Sachin Patil, J. Adam M. Cunha, I-Chow Hsu, Jean Pouliot, Alper Atamturk, and Ken Goldberg. Exact Reachability Analysis for Planning Skew-Line Needle Arrangements for Automated Brachytherapy. In *IEEE International Conference on Automation Science and Engineering (CASE)*, 2014.

[8] Ben Kehoe, Gregory Kahn, Jeffrey Mahler, Jonathan Kim, Alex Lee, Anna Lee, Keisuke Nakagawa, Sachin Patil, Walter Boyd, Pieter Abbeel, and Ken Goldberg. Autonomous Multilateral Surgical Debridement with the Raven Surgical Robot . In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2014.

[9] Jeffrey Mahler, Sanjay Krishnan, Michael Laskey, Siddarth Sen, Adithyavairavan Murali, Ben Kehoe, Sachin Patil, Jiannan Wang, Mike Franklin, Pieter Abbeel, and Ken Goldberg. Learning Accurate Kinematic Control of Cable-Driven Surgical Robots Using Data Cleaning and Gaussian Process Regression. In *IEEE International Conference on Automation Science and Engineering (CASE)*, 2014.

[10] Pedro Moreira, Sachin Patil, Ron Alterovitz, and Sarthak Misra. Needle Steering in Biological Tissue using Ultrasound-based Online Curvature Estimation . In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2014.

[11] Sachin Patil, Yan Duan, John Schulman, Ken Goldberg, and Pieter Abbeel. Gaussian Belief Space Planning with Discontinuities in Sensing Domains. In *IEEE International Conference on Robotics and Automation (ICRA)*, May 2014.

[12] Sachin Patil, Gregory Kahn, Michael Laskey, John Schulman, Ken Goldberg, and Pieter Abbeel. Scaling up Gaussian Belief Space Planning through Covariance-Free Trajectory Optimization and Automatic Differentiation. In *International Workshop on Algorithmic Foundations of Robotics (WAFR)*, Aug 2014.

[13] Sachin Patil, Jia Pan, Pieter Abbeel, and Ken Goldberg. Planning Curvature and Torsion Constrained Ribbons in 3D with Application to Intracavitary Brachytherapy. In *International Workshop on Algorithmic Foundations of Robotics (WAFR)*, Aug 2014.

[14] Animesh Garg, Sachin Patil, Timmy Siauw, Adam M. Cunha, I-Chow Hsu, Pieter Abbeel, Jean Pouliot, and Ken Goldberg. An Algorithm for Computing Customized 3D Printed Implants with Curvature Constrained Channels for Enhancing Intracavitary Brachytherapy Radiation Delivery . In *IEEE International Conference on Automation Science and Engineering (CASE)*, pages 466–473, Aug 2013.

[15] Alex Lee, Yan Duan, Sachin Patil, John Schulman, Zoe McCarthy, Jur van den Berg, Ken Goldberg, and Pieter Abbeel. Sigma Hulls for Gaussian Belief Space Planning for Imprecise Articulated Robots amid Obstacles . In *IEEE International Conference on Intelligent Robots and Systems (IROS)*, pages 5660–5667, Nov 2013.

[16] Sachin Patil, Jur van den Berg, and Ron Alterovitz. Estimating Probability of Collision for Safe Planning under Gaussian Motion and Sensing Uncertainty. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 3238–3244, May 2012.

[17] Jur van den Berg, Sachin Patil, and Ron Alterovitz. Efficient Approximate Value Iteration for Continuous Gaussian POMDPs. In *AAAI Conference on Artificial Intelligence*, July 2012.

[18] Ron Alterovitz, Sachin Patil, and Anna Derbakova. Rapidly-Exploring Roadmaps: Weighing Exploration vs. Refinement in Optimal Motion Planning. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 3706–3712, May 2011.

[19] Edgar Lobaton, Jinghe Zhang, Sachin Patil, and Ron Alterovitz. Planning Curvature-Constrained Paths to Multiple Goals Using Circle Sampling. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 1463–1469, May 2011.

[20] Sachin Patil, Jur van den Berg, and Ron Alterovitz. Motion Planning Under Uncertainty in Highly Deformable Environments. In *Robotics: Science and Systems (RSS)*, June 2011. **Selected for oral presentation**.

[21] Jur van den Berg, Sachin Patil, and Ron Alterovitz. Motion Planning Under Uncertainty Using

Differential Dynamic Programming in Belief Space. In *International Symposium of Robotics Research (ISRR)*, Aug 2011.

[22] Jur van den Berg, Sachin Patil, Ron Alterovitz, Pieter Abbeel, and Ken Goldberg. LQG-Based Planning, Sensing, and Control of Steerable Needles. In *International Workshop on Algorithmic Foundation of Robotics (WAFR)*, Dec 2011.

[23] Sachin Patil and Ron Alterovitz. Interactive Motion Planning for Steerable Needles in 3D Environments with Obstacles. In *IEEE RAS and EMBS IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, pages 893–899, Sept 2010.

[24] Sachin Patil and Ron Alterovitz. Toward Automated Tissue Retraction in Robot-Assisted Surgery. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 2088–2094, May 2010.

[25] Jur van den Berg, Sachin Patil, Jason Sewall, Dinesh Manocha, and Ming Lin. Interactive Navigation of Individual Agents in Crowded Environments. In *Symposium on Interactive 3D Graphics and Games (I3D)*, pages 139–147, Feb 2008.

[26] Hengchin Yeh, Sean Curtis, Sachin Patil, Jur van den Berg, Dinesh Manocha, and Ming Lin. Composite Agents. In *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*, pages 39–47, July 2008.

Patent Applications

Jean Pouliot, Ken Goldberg, I-Chow Hsu, J. Adam Cunha, Animesh Garg, Sachin Patil, Pieter Abbeel, Timmu Siauw. Patient-Specific Temporary Implants For Accurately Guiding Local Means of Tumor Control Along Patient-Specific Internal Channels to Treat Cancers. U.S. Provisional Patent Application No.: 61/859,687 filed July 29, 2013.

Professional Service

Local Arrangements Chair
Robotics: Science and Systems (RSS) 2014

Organizing Committee
Workshop on Algorithmic Foundations of Robotics (WAFR) 2016

Associate Editor
IEEE International Conference on Intelligent Robots and Systems (IROS) 2014, 2015

Co-organizer
Stanford-Berkeley Robotics Symposium (SBRS) 2013

Workshop on Information-based Grasp and Manipulation Planning at Robotics: Science and Systems (RSS), 2014

Journal and Conference Article Reviewing
International Journal of Robotics Research (IJRR) ◇ IEEE Transactions on Robotics (T-RO) ◇ Robotics: Science and Systems (RSS) ◇ IEEE Robotics & Automation Magazine (RAM) ◇ IEEE International Conference on Robotics and Automation (ICRA) ◇ IEEE International Conference on Intelligent Robots and Systems (IROS) ◇ Workshop on Algorithmic Foundation of Robotics (WAFR) ◇ ACM Transactions on Graphics (TOG) ◇ IEEE Transactions on Visualization and Computer Graphics (TVCG)

References

Pieter Abbeel
EECS, UC Berkeley
pabbeel@cs.berkeley.edu
(510) 642-7034

Ken Goldberg
IEOR and EECS, UC Berkeley
goldberg@berkeley.edu
(510) 643-9565

Ron Alterovitz
CS, UNC Chapel Hill
ron@cs.unc.edu
(919) 962-1768