Alberto Rodriguez

Assistant Professor
Walter Henry Gale (1929) Career Development Professor

MIT, Department of Mechanical Engineering, Room 5-207d
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EDUCATION

Carnegie Mellon University

2013 Doctor of Philosophy, Robotics (advised by Prof. Matthew Mason)

Polytechnic University of Catalonia

2006 Degree in Telecommunications Engineering
2005 Degree in Mathematics

PROFESSIONAL APPOINTMENTS

Massachusetts Institute of Technology

2016 - present Walter Henry Gale (1929) Career Development Professor
2014 - present Assistant Professor, Department of Mechanical Engineering
2013 - 2014 Postdoctoral Associate (advised by Prof. Russ Tedrake)

ABB Inc.

Summer 2009 Research Intern, US Corporate Research Center, Windsor, CT, USA

Polytechnic University of Catalonia

2004 - 2006 Research Assistant, Department of Automatic Control, ESAII, Barcelona, Spain

AWARDS AND HONORS

2018 Amazon Research Award.
2017 Amazon Robotics Challenge 2017, Stowing task, 1st place.
2016 Walter Henry Gale (1929) Career Development Professor
2016 Best Paper Award Finalist IROS 2016, "More than a Million Ways to be Pushed: A High-Fidelity Experimental Data Set of Planar Pushing"
2016 Amazon Picking Challenge 2016, 3rd and 4th place
2015 Amazon Picking Challenge 2015, 2nd place
2014 Best Video Award finalist ICRA 2014, "Regrasping Objects with Extrinsic Dexterity"
2013 Best Student Paper Award ICRA 2013, "Effector Form Design for 1DOF Planar Act."
2011 Best Student Paper Award RSS 2011, "From Caging to Grasping"

LEADERSHIP AND SERVICE ACTIVITIES

Massachusetts Institute of Technology

2017 - present Co-chair Mechanical Engineering Department Seminar, MIT
2016 - present Associate Head of House, Sydney-Pacific, MIT.
2016 Controls and Dynamics Curriculum Revision Committee, MechE, MIT
2013 - present Graduate Admissions Committee, MechE, MIT.

Workshop Organization

2018 ICRA 2018 "Advances in Robotic Warehouse Automation"
2017 RSS 2017 "Empirically Data-driven Robotic Manipulation"
2017 ICRA 2017 "Warehouse Picking Automation Workshop 2017: Solutions, Experience, Learnings and Outlook of the Amazon Picking Challenge"
2016 CASE 2016 "Automation for Warehouse Logistics"
2015 NSF "Locomotion and Manipulation: Why the Great Divide?"

2013	ICRA 2013 "Caging and its Applications in Grasping/Multi-agent Cooperation."
2013	RSS 2013 "Common Platforms in Robotic Manipulation."

Program Committee and Editorial

2018 - 2014	Program Committee RSS 2018, 2017, 2015, 2014
2016	Co-editor Robotics and Automation Magazine Special issue "Open Source and Widely-Disseminated Robot Hardware".
2016	Program Committee WAFR 2016
2014	Program Committee ISER 2014

TEACHING EXPERIENCE

Spring 2018	2.003 Dynamics and Controls I
Fall 2017	2.003 Dynamics and Controls I, (recitation instructor)
Spring 2017	2.003 Dynamics and Controls I, (recitation instructor)
Fall 2016	2.12 Introduction to Robotics
Spring 2016	2.003 Dynamics and Controls I, (recitation instructor)
Fall 2015	2.003 Dynamics and Controls I
Spring 2015	2.003 Dynamics and Controls I
Fall 2014	2.003 Dynamics and Controls I, (recitation instructor)

INTELLECTUAL PROPERTY

2017 Feb	Patent "Two-Phase Gripper to Reorient and Grasp", Publication number: US20170036354 A1
2014 Nov	Patent "Method and Apparatus for Using Post Assembly Process Interaction Signatures to Detect Assembly Failures", Publication numbers: WO2014160760 A3, CN105229548 A

PUBLICATIONS

Under Review

1. Taylor, O. and A. Rodriguez (2018). Optimal Shape and Motion Planning for Dynamic Planar Manipulation. *Autonomous Robots*, In review.

Refereed Journal Papers

1. Correll, N., K. Bekris, D. Berenson, O. Brock, A. Causo, K. Hauser, K. Okada, A. Rodriguez, J. Romano, and P. Wurman (2018). Analysis and Observations from the First Amazon Picking Challenge. *IEEE Transactions on Automation Science and Engineering (T-ASE)* 15(1), 172–188.
2. Fazeli, N., R. Kolbert, R. Tedrake, and A. Rodriguez (2017). Parameter and Contact Force Estimation of Planar Rigid-Bodies Undergooing Frictional Contact. *The International Journal of Robotics Research*.
3. Paolini, R., A. Rodriguez, S. S. Srinivasa, and M. T. Mason (2014). A Data-Driven Statistical Framework for Post-Grasp Manipulation. *The International Journal of Robotics Research* 33(4), 600–615.
4. Mason, M. T., A. Rodriguez, S. S. Srinivasa, and A. S. Vazquez (2012). Autonomous Manipulation with a General-Purpose Simple Hand. *The International Journal of Robotics Research* 31(5), 688–703.
5. Rodriguez, A. and M. T. Mason (2012). Grasp Invariance. *The International Journal of Robotics Research* 31(2), 237–249.
6. Rodriguez, A. and M. T. Mason (2012). Path-Connectivity of the Free Space. *IEEE Transactions on Robotics* 28(5), 1177–1180.
7. Rodriguez, A., M. T. Mason, and S. Ferry (2012). From Caging to Grasping. *The International Journal of Robotics Research* 31(7), 886–900.

Refereed Conference Papers

1. Chavan-Dafle, N. and A. Rodriguez (2018). Stable Prehensile Pushing: In-Hand Manipulation with Alternating Sticking Contacts. In: *IEEE International Conference on Robotics and Automation (ICRA)*.
2. Hogan, F., E. Romo, and A. Rodriguez (2018). Reactive Planar Manipulation with Convex Hybrid MPC. In: *IEEE International Conference on Robotics and Automation (ICRA)*.
3. Yu, K.-T. and A. Rodriguez (2018). Realtime State Estimation with Tactile and Visual sensing. Application to Planar Manipulation. In: *IEEE International Conference on Robotics and Automation (ICRA)*.
4. Zeng, A. et al. (2018). Robotic Pick-and-Place of Novel Objects in Clutter with Multi-Affordance Grasping and Cross-Domain Image Matching. In: *IEEE International Conference on Robotics and Automation (ICRA)*.
5. Bauza, M. and A. Rodriguez (2017). A Probabilistic Data-Driven Model for Planar Pushing. In: *IEEE International Conference on Robotics and Automation (ICRA)*. `https://arxiv.org/abs/1704.03033`.
6. Chavan-Dafle, N. and A. Rodriguez (2017). Sampling-based Planning of In-Hand Manipulation with External Pushes. In: *International Symposium on Robotics Research (ISRR)*. `http://arxiv.org/abs/1707.00318`.
7. Fazeli, N., E. Donlon, E. Drumwright, and A. Rodriguez (2017). Empirical Evaluation of Common Impact Models on a Planar Impact Task. In: *IEEE International Conference on Robotics and Automation (ICRA)*.
8. Fazeli, N., S. Zapolsky, E. Drumwright, and A. Rodriguez (2017). Fundamental Limitations in Performance and Interpretability of Common Planar Rigid-Body Contact Models. In: *International Symposium on Robotics Research (ISRR)*.
9. Fazeli, N., S. Zapolsky, E. Drumwright, and A. Rodriguez (2017). Learning Data-Efficient Rigid-Body Contact Models: Case Study of Planar Impact. In: *Conference on Robot Learning (CoRL)*.
10. Nakamura, Y., D. Troniak, A. Rodriguez, M. T. Mason, and N. Pollard (2017). The Complexities of Grasping in the Wild. In: *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*.
11. Taylor, O. and A. Rodriguez (2017). Optimal Shape and Motion Planning for Dynamic Planar Manipulation. In: *Robotics: Science and Systems (RSS)*.
12. Zeng, A., K.-T. Yu, S. Song, D. Suo, E. Walker Jr., A. Rodriguez, and J. Xiao (2017). Multi-view Self-supervised Deep Learning for 6D Pose Estimation in the Amazon Picking Challenge. In: *IEEE International Conference on Robotics and Automation (ICRA)*. `https://arxiv.org/abs/1609.09475`.
13. Hogan, F. and A. Rodriguez (2016). Feedback Control of the Pusher-Slider System: A Story of Hybrid and Underactuated Contact Dynamics. In: *Workshop on Algorithmic Foundation of Robotics (WAFR)*. `https://arxiv.org/abs/1611.08268`.
14. Kolbert, R., N. Chavan-Dafle, and A. Rodriguez (2016). Experimental Validation of Contact Dynamics for In-Hand Manipulation. In: *International Symposium on Experimental Robotics (ISER)*.
15. Yu, K.-T., M. Bauza, N. Fazeli, and A. Rodriguez (2016). More than a Million Ways to be Pushed. A High-Fidelity Experimental Data Set of Planar Pushing. In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. `https://arxiv.org/abs/1604.04038`.
16. Chavan-Dafle, N., M. T. Mason, H. Staab, G. F. Rossano, and A. Rodriguez (2015). A Two-Phase Gripper to Reorient and Grasp. In: *IEEE Conference on Automation Science and Engineering (CASE)*, pp.1249–1255. `http://dx.doi.org/10.1109/CoASE.2015.7294269`.
17. Chavan-Dafle, N. and A. Rodriguez (2015). Prehensile Pushing: In-hand Manipulation with Push-Primitives. In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp.6215–6222. `http://dx.doi.org/10.1109/IROS.2015.7354264`.
18. Fazeli, N., R. Tedrake, and A. Rodriguez (2015). Identifiability Analysis of Planar Rigid-Body Frictional Contact. In: *International Symposium on Robotics Research (ISRR)*.

19. Yu, K.-T., J. Leonard, and A. Rodriguez (2015). Shape and Pose Recovery from Planar Pushing. In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp.1208–1215. http://dx.doi.org/10.1109/IROS.2015.7353523.
20. Zhang, Z., A. Rodriguez, and M. T. Mason (2015). A Novel Nonlinear Compliant Link on Simple Grippers. In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp.2923–2928. http://dx.doi.org/10.1109/IROS.2015.7353780.
21. Chavan-Dafle, N., A. Rodriguez, R. Paolini, B. Tang, S. S. Srinivasa, M. A. Erdmann, M. T. Mason, I. Lundberg, H. Staab, and T. A. Fuhlbrigge (2014). Extrinsic Dexterity: In-Hand Manipulation with External Forces. In: *IEEE International Conference on Robotics and Automation (ICRA)*, pp.1578–1585. http://dx.doi.org/10.1109/ICRA.2014.6907062.
22. Rodriguez, A. and M. T. Mason (2013). Effector Form Design for 1DOF Planar Actuation. In: *IEEE International Conference on Robotics and Automation (ICRA)*, pp.349–356. http://dx.doi.org/10.1109/ICRA.2013.6630599.
23. Zeglin, G., A. Rodriguez, and M. T. Mason (2013). A Simple and Compliant Force Sensing Palm for the MLab Simple Hand. In: *IEEE International Conference on Robotics and Automation (ICRA)*, pp.2367–2373.
24. Paolini, R., A. Rodriguez, S. S. Srinivasa, and M. T. Mason (2012). A Data-Driven Statistical Framework for Post-Grasp Manipulation. In: *International Symposium on Experimental Robotics (ISER)*.
25. Rodriguez, A., M. T. Mason, and S. Ferry (2011). From Caging to Grasping. In: *Robotics: Science and Systems (RSS)*.
26. Rodriguez, A., M. T. Mason, S. S. Srinivasa, M. Bernstein, and A. Zirbel (2011). Abort and Retry in Grasping. In: *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*.
27. Rodriguez, A., D. Bourne, M. T. Mason, G. F. Rossano, and J. Wang (2010). Failure Detection in Assembly : Force Signature Analysis. In: *IEEE Conference on Automation Science and Engineering (CASE)*.
28. Rodriguez, A. and M. T. Mason (2010). Grasp Invariance. In: *Algorithmic Foundations of Robotics (WAFR)*.
29. Rodriguez, A., M. T. Mason, and S. S. Srinivasa (2010). Manipulation Capabilities with Simple Hands. In: *International Symposium on Experimental Robotics (ISER)*.
30. Rodriguez, A. and M. T. Mason (2008). Two Finger Caging: Squeezing and Stretching. In: *Algorithmic Foundations of Robotics (WAFR)*. Springer.
31. Hernansanz, A., X. Giralt, A. Rodriguez, and J. Amat (2007). RPQ: Robotic Proximity Queries. Development and Applications. In: *International Conference on Informatics in Control, Automation, and Robotics (ICINCO)*.

Book Chapters

1. Giralt, X., A. Hernansanz, A. Rodriguez, and J. Amat (2008). "Robotic Proximity Queries Library for Online Motion Planning Applications". In: *New Developments in Robotics, Automation and Control*. inTouch.
2. Frigola, M., A. Rodriguez, J. Amat, and A. Casals (2007). "Computer Vision Body Modeling for Gesture Based Teleoperation". In: *Advances in Telerobotics*. Springer.

Other Publications

1. Chavan-Dafle, N., A. Rodriguez, R. Paolini, B. Tang, S. S. Srinivasa, M. A. Erdmann, M. T. Mason, I. Lundberg, H. Staab, and T. A. Fuhlbrigge (2014). Regrasping Objects with Extrinsic Dexterity. In: *IEEE International Conference on Robotics and Automation (ICRA)*. http://youtu.be/WAPgjZCI1gI.
2. Rodriguez, A. (2013). "Shape for Contact". PhD Thesis. CMU-RI-TR-13-21, Carnegie Mellon University.

INVITED TALKS

"Manipulation Skills that I Wish my Robots Had"

2018 Feb Berkeley, Peoples and Robots Seminar, USA

2018 Feb Oregon State University, Oregon, USA
2018 Jan HKUST, Robotics Institute Seminar, Hong Kong
2017 Oct NERC 2017, Northeastern University, Boston, USA
2017 Sep IROS 2017, Workshop on Contact Frontiers, Vancouver, Canada

"Fundamentals of Robotic Manipulation"
2017 Jul Summer School on Soft Robotics, Lake Chiemsee, Germany
2017 Jun Summer School on Cognitive Robotics, Cambridge, USA

"Real-Time Contact-Aware State Estimation"
2017 Jul RSS 2017, Workshop Tactile Sensing for Manipulation, Cambridge, USA

"Reactive Robotic Manipulation"
2017 Jul RSS 2017, Workshop Contact - Turning a problem into a solution, Cambridge, USA
2017 May ICRA 2017, Workshop Sensor-based Object Manipulation for Assembly, Singapore
2017 May University of Washington, Robotics Colloquia, Seattle, USA
2017 May MIT, School of Engineering, Junior faculty luncheon, Cambridge, USA

"Team MIT-Princeton's Approach to the Amazon Picking Challenge"
2017 May ICRA Workshop Warehouse Picking Automation, Singapore
2016 Jul ABB Inc. US Corporate Research Center, Bloomfield, CT, USA

"Dexterous Manipulation with non-Dexterous Manipulators"
2017 Jun ICRA 2017, Workshop AI in Automation, Singapore
2016 Oct IROS 2016, Workshop Dexterity acquisition in object manipulation, Daejeon, S. Korea
2016 May ABB Inc. Corporate Research Center, Vasteras, Sweden
2016 May ICRA 2016, Workshop Contact and Dynamics in Manipulation, Stockholm, Sweden
2016 Mar Northwestern University, NxR Lab, Evanston, USA
2015 Oct TATA Consultancy Services, Noida, India.
2015 Aug MIT, LIDS, Summer Dynamics and Information Lunches, Boston, USA
2015 Jul Delta Corporation, Taipei, Taiwan
2015 Jul EPOCH Symposium - The Future of Robotics and Machine Learning, Taipei, Taiwan
2015 Jul EPOCH Foundation, Garage+, Taipei, Taiwan
2014 Apr Locomotion Group, MIT-CSAIL, Boston, USA

"Experiments with Frictional Contact"
2016 Dec SIMPAR 2016, Workshop Grand Challenges in Robot Simulation, San Francisco, USA

"The Pusher-Slider: A Story of Hybrid and Underactuated Contact Dynamics"
2016 Oct IROS 2016, Workshop Closed-loop Object Manipulation, Daejeon, S. Korea
2016 Oct MIT Robotics Seminar, Cambridge, USA
2016 Oct Mathworks, Natick, USA

"Robots in a low labor cost economy"
2015 Oct TATA Consultacy Services, Noida, India
2015 Oct MIT Alumni Club, Pune, India
2015 Oct NASSCOM Engineering Summit, Keynote, Pune, India

"Prehensile Pushing: In-hand Manipulation with External Forces"
2015 May ICRA 2015, Workshop Robotic Hands, Grasping, and Manipulation, Seattle, USA

"Primer on Manipulation"
2014 Apr MIT, Mechanical Engineering, Course 2.165 Robotics, Boston, USA

"Shape for Contact"'

2013 Sep Massachusetts Institute of Technology, CSAIL, Locomotion Group, Boston, USA
2013 Jul Carnegie Mellon University, CFR Seminar, Robotics Institute, CMU, Pittsburgh, USA

"Contacting the World with Mechanical and Data-Driven Intelligence"'

2014 Apr WPI, Computer Science, Worcester, USA
2014 Mar MIT, Mechanical Engineering, Graduate program Open House, Boston, USA
2013 Apr Georgia Tech, School of Interactive Computing, Atlanta, USA
2013 Mar MIT, Mechanical Engineering, Boston, USA
2013 Mar UMASS, Computer Science, Amherst, USA
2013 Mar Stanford, Computer Science, Stanford, USA
2013 Mar University of Maryland, Mechanical Engineering, College Park, USA
2013 Feb USC, Department of Computer Science, Los Angeles, USA

"Data-Driven Manipulation with a Simple Hand"'

2012 Nov Georgia Tech, RIM Center, Atlanta, USA

"Grasp Invariance"'

2011 Feb LAAS-CNRS, Toulouse, France
2010 Nov CMU, CFR Seminar, Pittsburgh, USA

"From Caging to Grasping"

2011 Jun RSS 2011, Full oral presentation, Los Angeles, USA
2011 May ICRA 2011 Workshop "Uncertainty in Automation", Shanghai, China
2008 May CMU, Human Sensing Laboratory, Pittsburgh, USA
2006 Dec UPC, ESAII, Barcelona, Spain