

Aaron M. Johnson

Curriculum Vitae

Contact Carnegie Mellon University
Robotics Institute
Newell-Simon Hall 4519
5000 Forbes Avenue
Pittsburgh, PA 15213

Phone: (301) 509-6951
E-Mail: aaronjohnson@alumni.cmu.edu
Alternate E-Mail: amj1@andrew.cmu.edu
<http://kodlab.seas.upenn.edu/Aaron/Home>

Education **Ph.D., Electrical & Systems Engineering**, May 2014
University of Pennsylvania, Philadelphia, PA
Thesis: *Self-Manipulation and Dynamic Transitions for a Legged Robot*
Advisor: Daniel E. Koditschek

B.S., Electrical & Computer Engineering, May 2008
Carnegie Mellon University, Pittsburgh, PA
Minors: *Robotics* and *Philosophy*
Advisors: Howie Choset, Tsuhan Chen

Work Experience

Academia

2015– **Postdoctoral Fellow, Personal Robotics Lab**
Carnegie Mellon University, Pittsburgh, PA
Research, grant management, student advising

May–Dec. 2014 **Postdoctoral Fellow, Kod*Lab**
University of Pennsylvania, Philadelphia, PA
Research, grant management, student advising

2008–2014 **Graduate Student Researcher, Kod*Lab**
University of Pennsylvania, Philadelphia, PA
Research, robot design & fabrication, grant management, student advising

Fall 2009,
Spring 2012 **Teaching Assistant, Engineering Probability**
University of Pennsylvania, Philadelphia, PA
Recitation, homework & test preparation

2006–2008 **Instructor, Fun with Robots Class**
Carnegie Mellon University, Pittsburgh, PA
Instructor, course development

2005–2008 **Undergraduate Student Researcher, Biorobotics Lab**
Carnegie Mellon University, Pittsburgh, PA
Research, robot design & fabrication

Industry

- 2010–2012 **Visiting Graduate Student Researcher**
Boston Dynamics, Waltham, MA
- Summer 2007 **Electrical Engineering Intern**
iRobot Corporation, Burlington, MA

Awards/Honors

- Best Student Paper Finalist**, ICRA Conference, May 2013
- Best Student Paper Finalist**, CLAWAR Conference, July 2012
- David Tuma Laboratory Project Award**, Carnegie Mellon University, ECE Dept, May, 2008
- Computing Research Associations Outstanding Undergraduate**, Honorable Mention, 2008
- Tau Beta Pi** and **Eta Kappa Nu** Honors societies, 2006-2008
- Undergraduate project awards: **IBM Innovation that Matters Award**, **‘Thought’ Prize for Excellence in Research**, and **Lockheed Martin Undergraduate Project Judges Choice Awards**, Carnegie Mellon University, Meeting of the Minds, May 2005–2008

Publications

Some publications available online: <http://kodlab.seas.upenn.edu/Aaron/Publications>

Journal Papers

- Thomas Libby, Aaron M. Johnson, Evan Chang-Siu, Robert J. Full, and D. E. Koditschek. *Design and Scaling of Inertial Appendages for Aerial Reorientation*. In prep. 2015
- Aaron M. Johnson, Samuel E. Burden, and D E Koditschek. “A Hybrid Systems Model for Simple Manipulation and Self-Manipulation Systems”. In: *arXiv preprint arXiv:1502.01538 [cs.RO]*, Submitted for publication (2015)
- Aaron M. Johnson and Sidney Axinn. “The Morality of Autonomous Robots”. In: *Journal of Military Ethics* 12.2 (2013), pp. 129–141
- Aaron M. Johnson and D. E. Koditschek. “Legged Self-Manipulation”. In: *IEEE Access* 1 (2013), pp. 310–334

Conference Papers

- Anna L. Brill, Avik De, Aaron M. Johnson, and D. E. Koditschek. “Tail-Assisted Rigid and Compliant Legged Leaping”. In: *Proceedings of the IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*. Submitted. 2015
- Garrett J. Wenger, Aaron M. Johnson, Camillo J. Taylor, and Daniel E. Koditschek. “Semi-autonomous exploration of multi-floor buildings with a legged robot”. In: *Unmanned Systems Technology XVII*. vol. 9468. Baltimore, MD: SPIE, 2015, 94680B–8
- Aaron M. Johnson and Sidney Axinn. “Acting vs. Being Moral: The Limits of Technological Moral Actors”. In: *Proceedings of the IEEE Intl. Symposium on Ethics in Engineering, Science, and Technology*. Chicago, IL, 2014
- Aaron M. Johnson and D. E. Koditschek. “Toward a Vocabulary of Legged Leaping”. In: *Proceedings of the IEEE Intl. Conference on Robotics and Automation*. Karlsruhe, Germany, 2013, pp. 2553–2560
- Best Student Paper Finalist**

Camilo Ordonez, Jacob Shill, Aaron M. Johnson, Jonathan Clark, and Emmanuel Collins. “Terrain Identification for RHex-type Robots”. In: *Unmanned Systems Technology XV*. vol. 8741. 1. Baltimore, MD: SPIE, 2013, 87410Q

Aaron M. Johnson, G. Clark Haynes, and D. E. Koditschek. “Standing Self-Manipulation for a Legged Robot”. In: *Proceedings of the IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*. Algarve, Portugal, 2012, pp. 272–279

Aaron M. Johnson, Thomas Libby, Evan Chang-Siu, Masayoshi Tomizuka, Robert J. Full, and D. E. Koditschek. “Tail Assisted Dynamic Self Righting”. In: *Proceedings of the Fifteenth Intl. Conference on Climbing and Walking Robots*. Baltimore, MD, 2012, pp. 611–620

Best Student Paper Finalist

Camilo Ordonez, N. Gupta, E. G. Collins, J. Clark, and Aaron M. Johnson. “Power Modeling of the XRL Hexapedal Robot and its Application to Energy Efficient Motion Planning”. In: *Proceedings of the Fifteenth Intl. Conference on Climbing and Walking Robots*. Baltimore, MD, 2012, pp. 689–696

G. Clark Haynes, Jason Pusey, Ryan Knopf, Aaron M. Johnson, and D. E. Koditschek. “Laboratory on legs: an architecture for adjustable morphology with legged robots”. In: *Unmanned Systems Technology XIV*. vol. 8387. 1. Baltimore, MD: SPIE, 2012, 83870W

Aaron M. Johnson, Matthew T. Hale, G. C. Haynes, and D. E. Koditschek. “Autonomous Legged Hill and Stairwell Ascent”. In: *Proceedings of the IEEE Intl. Workshop on Safety, Security, & Rescue Robotics*. Kyoto, Japan, 2011, pp. 134–142

Avik De, Goran Lynch, Aaron M. Johnson, and D. E. Koditschek. “Motor Sizing for Legged Robots Using Dynamic Task Specification”. In: *Proceedings of the IEEE Intl. Conference on Technologies for Practical Robot Applications*. Boston, MA, 2011, pp. 64–69

Aaron M. Johnson, G. Clark Haynes, and D. E. Koditschek. “Disturbance Detection, Identification, and Recovery by Gait Transition in Legged Robots”. In: *Proceedings of the IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*. Taipei, Taiwan, 2010, pp. 5347–5353

Cornell G. Wright, Aaron M. Johnson, Aaron Peck, Zachary McCord, et al. “Design of a Modular Snake Robot”. In: *Proceedings of the IEEE/RSJ Intl. Conference on Intelligent Robots and Systems*. San Diego, CA, 2007, pp. 2609–2614

Chris Atwood, Felix Duvall, Aaron M. Johnson, Richard Juchniewicz, et al. “Relative Localization in Colony Robots”. In: *Proceedings of the Natl. Conference on Undergraduate Research*. Lexington, VA, 2005

Thesis and Technical Reports

Sonia Roberts, Jeff Duperret, Aaron M. Johnson, Scott van Pelt, et al. *Desert RHex Technical Report: Jornada and White Sands Trip*. Tech. rep. Philadelphia, PA: University of Pennsylvania, 2014

Aaron M. Johnson. “Self-Manipulation and Dynamic Transitions for a Legged Robot”. PhD thesis. Philadelphia, PA: Electrical & Systems Engineering, University of Pennsylvania, 2014

Aaron M. Johnson and D. E. Koditschek. *Parametric jumping dataset on the RHex Robot*. Tech. rep. Philadelphia, PA: University of Pennsylvania, 2012

Aaron M. Johnson, Cornell Wright III, Matthew Tesch, Kevin Lipkin, and Howie Choset. *A Novel Architecture for Modular Snake Robots*. Tech. rep. CMU-RI-TR-11-29. Pittsburgh, PA: Robotics Institute, 2011

Kevin C. Galloway, G. C. Haynes, B. Deniz Ilhan, Aaron M. Johnson, et al. *X-RHex: A Highly Mobile Hexapedal Robot for Sensorimotor Tasks*. Tech. rep. Philadelphia, PA: University of Pennsylvania, 2010

Posters and Abstracts

Thomas Libby, Aaron M. Johnson, and Robert J. Full. “Scaling of Effectiveness for Inertial Reorientation”. In: *Society for Integrative and Comparative Biology Annual Meeting*. West Palm Beach, FL, 2015

Aaron M. Johnson and D. E. Koditschek. “Cellular Decomposition and Classification of a Hybrid System”. In: *Northeast Robotics Colloquium*. Providence, RI, 2014

Aaron M Johnson. “Gait Design Using Self-Manipulation”. In: *Robotics: Science and Systems Workshop on “Dynamic Locomotion”*. Berkeley, CA, 2014

Avik De, Aaron M. Johnson, and D. E. Koditschek. “Planar Hopping with a Leg and a Tail”. In: *Dynamic Walking*. Zurich, Switzerland, 2014

Aaron M. Johnson and D. E. Koditschek. “Robot Parkour: The Ground Reaction Complex & Dynamic Transitions”. In: *Dynamic Walking*. Pittsburgh, PA, 2013

Aaron M. Johnson and Sidney Axinn. “The Morality of Autonomous Robots”. In: *Florida Philosophy Association Annual Meeting*. Ft. Lauderdale, FL, 2011

Kevin Woo, Eugene Marinelli, James Kong, Aaron M. Johnson, et al. “Investigating Power Management in a Robot Colony”. In: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2008
IBM Innovation that Matters Awards and ‘Thought’ Prize for Excellence in Research

Aaron M. Johnson and Tsuhan Chen. “Vision-Based Relative SLAM”. in: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2008

Felix Duvall, Kevin Woo, James Kong, Aaron M. Johnson, et al. “Control of a Robot Colony”. In: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2007
Lockheed Martin Undergraduate Project Judges Choice Award

Aaron M. Johnson. “A friendly VoIP box”. In: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2007

Felix Duvall, Aaron M. Johnson, Ryan Kellogg, James Kong, et al. “A Robotic Platform for Exploring Emergent Behavior”. In: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2006

Allison Naaktgeboren, Jessica Kang, Steven Shamlan, Aaron M. Johnson, et al. “Relative Localization in Colony Robots”. In: *Meeting of the Minds*. Carnegie Mellon University, Pittsburgh, PA, 2005
Lockheed Martin Undergraduate Project Judges Choice Award

Invited Talks

- 4/8/2015 **Toyota Motor Engineering & Manufacturing North America**, San Jose, CA
- 4/2/2015 **Locomotion and Manipulation: Why the great divide?** NSF Workshop, Arlington, VA
- 3/12/2015 **University of Maryland**, Department of Mechanical Engineering Seminar, College Park, NJ
- 2/4/2015 **Princeton University**, Princeton, NJ
- 9/10/2014 **Carnegie Mellon University**, Bio-inspired Robotics Class 24–676, Pittsburgh, PA
- 6/26/2014 **Carnegie Mellon University**, Center for Foundations of Robotics Seminar, Pittsburgh, PA
- 5/21/2014 **ARL Robotics Collaborative Technology Alliance**, PI Meeting Poster, Aberdeen, MD
- 4/25/2014 **NSF CABiR Consortium**, Berkeley, CA
- 3/4/2014 **Massachusetts Institute of Technology**, CSAIL Center for Robotics Seminar, Cambridge, MA
- 5/1/2013 **George Washington University**, Department of Computer Science Talk, Washington, DC
- 11/9/2012 **Stanford University**, Stanford, CA

11/8/2012 **University of California**, Berkeley, CA
 11/2/2012 **NSF CABI_R Consortium**, Online Presentation
 11/2/2012 **Northwestern University**, Evanston, IL
 6/4/2012 **Carnegie Mellon University**, Pittsburgh, PA
 4/27/2012 **Royal Veterinary College**, London, UK
 12/16/2011 **NSF CABI_R Consortium**, Philadelphia, PA
 2/3/2011 **Boston University**, Boston, MA

Selected Media Appearances

5/27/2015 **Make: Rockstar Robots: Boston Dynamics Crazy-Legged RHex** – Article
 7/18/2014 **IEEE Spectrum – Automation: Video Friday: RHex Pronking ...** – Article
 8/15/2013 **CNN.com Whats Next: Met RHex – the curvy-legged, leaping robot** – Article
 8/13/2013 **Wall Street Journal News Hub: All-terrain robot, or overexcited puppy?** – Live video interview
 8/13/2013 **The Associated Press: Penn researchers strive for a more athletic robot** – Syndicated article and video including interview
 7/29/2013 **Computerworld: Researchers build jumping, flipping, handstanding robot** – Article and interview
 7/26/2013 **Fast Company – Co.EXIST Blog: This versatile robot can climb just about anywhere** – Article
 7/25/2013 **Slate: “Parkour robot” jumps around, other robots roll eyes** – Article
 7/24/2013 **The Atlantic: Hardcore parkour (with robots)** – Article
 7/23/2013 **IEEE Spectrum – Automation: RHex does parkour all over UPenn** – Article and interview
 7/23/2013 **University of Pennsylvania: A robot that jumps, flips, and does pullups** – Press release
 5/8/2013 **IEEE Spectrum – Automaton: This robots acrobatic leaps are the coolest thing youll see today** – Article
 8/5/2012 **The Naked Scientist: [RHex] the robot gets a tail** – Radio interview
 7/31/2012 **Wired – Danger Room: Robot uses its tail to land on its feet, just like a cat** – Article
 7/30/2012 **IEEE Spectrum – Automaton: XRL hexapod robot gets a tail, learns to use it** – Article

Professional and Other

International Program Committee, Climbing and Walking Robots Conference (CLAWAR), 2013–
 Workshop Organizer, “AAAI-RSS Celebrating the 50th Anniversary of Shakey: The Role of AI to Harmonize Robots and Humans,” Robotics: Science and Systems Conf., 2015,
<http://rll.berkeley.edu/RSS2015-BlueSky-Shakey>
 Workshop Organizer, “Robotic Uses for Tails,” Robotics: Science and Systems Conf., 2015,
<http://kodlab.seas.upenn.edu/TailsRSS2015>
 Special Session Organizer, “Throwing Your Weight Around: Using Appendage Inertia,” CLAWAR Conf., 2012, <http://kodlab.seas.upenn.edu/Aaron/UsingAppendageInertia>

Session Chair, “Legged Robots I”, IROS 2012

NSF Panelist, 2015

Reviewer for numerous journals and conferences including: ASME Journal of Dynamic Systems, Measurement, and Control, Bioinspiration & Biomimetics, Biology Letters, IEEE/ASME Transactions on Mechatronics, IEEE Transactions on Robotics, International Journal of Robotics Research, Robotics and Autonomous Systems, and SIAM Journal on Applied Dynamical Systems

Professional memberships: American Society of Mechanical Engineers (ASME), Association for Computing Machinery (ACM), Institute of Electrical and Electronics Engineers (IEEE), and Society for Industrial and Applied Mathematics (SIAM)

Judge, Sigma Xi Poster Competition, Carnegie Mellon University Meeting of the Minds, 2015

Community presentations, demos, and tours including invited talks at a local elementary/middle school and senior living center

President of the Carnegie Mellon University Robotics Club, 2007–2008

Robot inspector, website evaluator, and mentor for FIRST Robotics Competition, 2003–

Director and instructor for “Career Exploration and Mentoring Program,” an afterschool robotics program for students at nine elementary and middle schools throughout Maryland, 2000–2004

References

Daniel E. Koditschek

Alfred Fitler Moore Professor of
Electrical & Systems Engineering
University of Pennsylvania
200 S. 33rd St., Levine Bldg 358
Philadelphia, PA 19104
kod@seas.upenn.edu
(215) 898-9241

George Pappas

Joseph Moore Professor and Chair of
Electrical & Systems Engineering
University of Pennsylvania
200 S. 33rd St., Moore Bldg 202
Philadelphia, PA 19104
pappasg@seas.upenn.edu
(215) 898-9780

Vijay Kumar

UPS Foundation Professor of
Mechanical Engineering
University of Pennsylvania
220 S. 33rd St., Towne Bldg 229
Philadelphia, PA 19104
kumar@seas.upenn.edu
(215) 898-3630

Siddhartha Srinivasa

Finmeccanica Associate Professor of
Robotics
Carnegie Mellon University
5000 Forbes Ave., NSH 4533
Pittsburgh, PA 15213
ss5@andrew.cmu.edu
(412) 268-5529

Matthew T. Mason

Professor of
Robotics
Carnegie Mellon University
5000 Forbes Ave., NSH A521
Pittsburgh, PA 15213
matt.mason@cs.cmu.edu
(412) 268-8804

Robert J. Full

Chancellor’s Professor of
Integrative Biology
University of California, Berkeley
3040 Valley Life Sciences Bldg, Room 3140
Berkeley, CA 94720
rjfull@berkeley.edu
(510) 642-9896

Last updated: June 4, 2015