Mark Cutler

Curriculum Vitae

Education

2012–2015	**PhD**, *Massachusetts Institute of Technology*, Cambridge, *GPA – 4.7/5.0*. PhD in Robotics
2010–2012	**MS**, *Massachusetts Institute of Technology*, Cambridge, *GPA – 4.7/5.0*. Masters in Aeronautical and Astronautical Engineering
2004–2005,2007–2010	**BS**, *Brigham Young University*, Provo, UT, *GPA – 3.99/4.0*. Bachelors in Mechanical Engineering

Dissertation

Title	*Practical Robot Reinforcement Learning through Efficient Simulator Sampling*
Committe	Jonathan P. How (chair), Leslie Kaelbling, Andrea Censi
Description	Designing efficient algorithms for decision making under uncertainty for autonomous systems. Efficiency comes by properly incorporating possibly inaccurate simulations of system to be controlled.

Masters Thesis

Title	*Design and Control of an Autonomous Variable-Pitch Quadrotor Helicopter*
Advisor	Jonathan P. How
Description	Designed, built, and programmed a novel autonomous multi-rotor helicopter capable of agile, aggressive, and aerobatic flight. Developed new flight control algorithms and autopilot hardware for the vehicle control.

Experience

Vocational

2008–2010	**Undergraduate Research Assistant**, Brigham Young University, Provo, UT.

- Wrote wind estimation algorithms for small unmanned air-vehicles (UAVs)
- Developed atmospheric energy harvesting techniques for small UAVs to enhance their flight time, range, and mission capabilities
- Designed and built a three axis robot capable of mapping insect flapping patterns

2010–2010 **Mechanical Design Engineer**, SpotterRF, Orem, UT.
- Developed new heat management techniques for small radar devices resulting in a significant high-temperature performance improvement
- Designed a new carbon-fiber case for the radar encasement

2009–2009 **Mechanical Design Engineer**, L-3 Communications, Salt Lake City, UT.
- Designed demo plnnatform for new modem integration into mobile communication ground station
- Performed thermal, structural, weight, and power analyses to optimize data link and modem case designs

2008–2008 **Advanced Machine Design Engineer**, Corning Inc., Corning, NY.
- Researched and tested method that reduced tool run-out by 55% in contouring mills
- Designed mechanism enabling the cutting of ceramic extrusions to be performed by one person instead of two

Volunteer

2005–2007 **Volunteer Representative**, *The Church of Jesus Christ of Latter-day Saints*, Rostov, Russia.
- Provided leadership, development and training for 16 volunteer representatives
- Oversaw volunteer operations in a geographical area covering over 300 miles
- Developed leadership, teaching, personal and communication skills

Awards

2010–2015 National Science Foundation Graduate Fellow

2010–2011 Aurora Flight Sciences Fellow

2004–2010 Robert C. Byrd Honors Scholarship

Technical Highlights

Languages C/C++, python, Matlab, LaTeX, basic Java, html, and css

Tools ROS, Git, svn, SolidWorks

Hardware Embedded microcontroller development (Microchip and TI), Circuit design (2- and 4-layer boards), Soldering (including SMD leadless components), Basic machining (mill, lathe, 3D printing)

Professional Activities Paper reviewer for the International Journal of Robotics Research, IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Control Systems Technology, IEEE Control Systems Magazine, ASME Journal of Dynamic Systems, Measurement and Control, Automatica, Robotics: Science and Systems, IEEE International Conference on Robotics and Automation, IEEE International Conference on Intelligent Robots and Systems, IEEE Conference on Decision and Control, American Control Conference, International Conference on Unmanned Aircraft Systems, European Control Conference, and IFAC Symposium on Automatic Control in Aerospace.

Publications

Journal Papers

[1] Wayne Barrett, Ryan Bowcutt, Mark **Cutler**, Seth Gibelyou, and Kayla Owens. Minimum rank of edge subdivisions of graphs. *Electronic Journal of Linear Algebra*, 18:530–563, 2009.

Submitted Papers

[1] Mark **Cutler** and Jonathan P. How. Analysis and control of a variable-pitch quadrotor for agile flight. *ASME Journal of Dynamic Systems, Measurement and Control*, 2014 (submitted).

[2] Mark **Cutler**, Thomas J. Walsh, and Jonathan P. How. Real-world reinforcement learning via multi-fidelity simulators. *IEEE Transactions on Robotics*, 2014 (submitted).

Peer-reviewed Conference Papers

[1] **Cutler**, M. and How, J. P. Efficient reinforcement learning for robots using informative simulated priors. In *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, WA, May 2015. IEEE.

[2] Chen, Y., **Cutler**, M., and How, J. P. Decoupled multiagent path planning via incremental sequential convex programming. In *IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, WA, May 2015. IEEE.

[3] **Cutler**, M., Walsh, T. J., and How, J. P. Reinforcement learning with multi-fidelity simulators. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 3888–3895, Hong Kong, June 2014.

[4] Ure, N. K., Chowdhary, G., Chen, Y. F., **Cutler**, M., How, J. P., and Vian, J. Decentralized learning based planning multiagent missions in presence of actuator failures. In *International Conference on Unmanned Aircraft Systems (ICUAS)*, pages 1125–1134, Atlanta GA, May 2013.

[5] **Cutler**, M., Michini, B., and How, J. P. Lightweight infrared sensing for relative navigation of quadrotors. In *International Conference on Unmanned Aircraft Systems (ICUAS)*, pages 1156–1164, Atlanta GA, May 2013.

[6] Michini, B., **Cutler**, M., and How, J. P. Scalable reward learning from demonstration. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 303–308, Karlsruhe, Germany, May 2013.

[7] Chowdhary, G., Wu, T., **Cutler**, M., and How, J. P. Rapid transfer of controllers between UAVs using learning based adaptive control. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 5409–5416, Karlsruhe, Germany, May 2013. IEEE.

[8] **Cutler**, M. and How, J. P. Actuator constrained trajectory generation and control for variable-pitch quadrotors. In *AIAA Guidance, Navigation, and Control Conference (GNC)*, pages 1–15, Minneapolis, Minnesota, August 2012.

[9] Chowdhary, G., Wu, T., **Cutler**, M., Ure, N. K., and How, J. Experimental results of concurrent learning adaptive controller. In *AIAA Guidance, Navigation, and Control Conference (GNC)*, pages 1–14, Minneapolis, MN, August 2012. AIAA. Invited.

[10] **Cutler**, M., Ure, N. K., Michini, B., and How, J. P. Comparison of fixed and variable pitch actuators for agile quadrotors. In *AIAA Guidance, Navigation, and Control Conference (GNC)*, pages 1–17, Portland, OR, August 2011.

[11] Michini, B., Redding, J., Ure, N. K., **Cutler**, M., and How, J. P. Design and flight testing of an autonomous variable-pitch quadrotor. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 2978–2979. IEEE, May 2011.

[12] **Cutler**, M., McLain, T. W., Beard, R. W., and Capozzi, B. Energy harvesting and mission effectiveness for small unmanned aircraft. In *AIAA Guidance, Navigation, and Control Conference (GNC)*, pages 1–13, Toronto, Canada, August 2010.

[13] Thomson, S. L., Mattson, C. A., Colton, M. B., Harston, S. P., Carlson, D. C., and **Cutler**, M. Experiment-based optimization of flapping wing kinematics. In *AIAA Proceedings of the 47th Aerospace Sciences Meeting*, pages 1–8, January 2009.

Other Papers

[1] **Cutler**, M., Walsh, T. J., and How, J. P. Reinforcement learning with multi-fidelity simulators (poster). In *NIPS Transfer and Multi-Task Learning Workshop*, December 2013.

[2] **Cutler**, M. Design and control of an autonomous variable-pitch quadrotor helicopter. Master's thesis, Massachusetts Institute of Technology, Department of Aeronautics and Astronautics, August 2012.

Interests

- My Kids
- Electronics
- Skiing

- Robots
- Racquet Sports
- Ultimate Frisbee

Updated March 2, 2015