

Mark Cutler | markjcutler.com

284 Vassar St. Apt G5 – Cambridge, MA 02139

✉ markjcutler@gmail.com

Education

Massachusetts Institute of Technology

PhD, GPA – 4.7/5.0

Robotics and Autonomous Systems

Cambridge MA

2012–2015

Massachusetts Institute of Technology

MS, GPA – 4.7/5.0

Aeronautical and Astronautical Engineering

Cambridge MA

2010–2012

Brigham Young University

BS, GPA – 3.99/4.0

Mechanical Engineering

Provo UT

2004–2005, 2007–2010

Dissertation

Title: *Practical Robot Reinforcement Learning through Efficient Simulator Sampling*

Committee: 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 the 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

Research.....

Aerospace Controls Lab, MIT

Research Assistant

Cambridge MA

2010–2015

- Designed and wrote all of the lab infrastructure code used for autonomous vehicle communication, control, estimation, planning, and visualization
- Designed, built, and soldered custom autopilots that currently operate all the lab vehicles
- Implemented lightweight, vision-based estimation code for relative navigation of quadrotors
- Implemented a robust multi-vehicle path planning algorithm used for multi-vehicle missions

MAGICC Lab, BYU**Provo UT***Undergraduate Research Assistant**2008–2010*

- 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

Industry.....**SpotterRF****Orem UT***Mechanical Design Engineer**2010–2010*

- 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

L-3 Communications**Salt Lake City UT***Mechanical Design Engineer**2009–2009*

- Designed demo platform for new modem integration into mobile communication ground station
- Performed thermal, structural, weight, and power analyses to optimize data link and modem case designs

Corning Inc.**Corning NY***Advanced Machine Design Engineer**2008–2008*

- 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.....**Research Mentor****Cambridge MA***Aerospace Controls Lab**2010–2014*

- Mentored several undergraduate researchers and senior projects

The Church of Jesus Christ of Latter-day Saints**Rostov, Russia***Volunteer Representative**2005–2007*

- 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 , some 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

- International Journal of Robotics Research
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Control Systems Technology
- ASME Journal of Dynamic Systems, Measurement and Control
- IEEE Control Systems Magazine
- 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
- IFAC Symposium on Automatic Control in Aerospace

Publications

Journal Papers.....

Cutler, M., Walsh, T. J., and How, J. P. Real-world reinforcement learning via multi-fidelity simulators. *IEEE Transactions on Robotics*, 2014 (submitted).

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

Barrett, W., Bowcutt, R., **Cutler**, M., Gibelyou, S., and Owens, K. Minimum rank of edge subdivisions of graphs. *Electronic Journal of Linear Algebra*, 18:530–563, 2009.

Peer-reviewed Conference Papers.....

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.

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.....

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.

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 | - Robots |
| - Electronics | - Racquet Sports |
| - Skiing | - Ultimate Frisbee |