Parker C. **Lusk**

Perception · Estimation · Controls

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Education

Massachusetts Institute of Technology — *Cambridge, MA*

Ph.D. Candidate, Aeronautical and Astronautical Engineering — *Aug. 2018 - current*

- 5.00/5.00 GPA
- Advisor: Jonathan P. How

Brigham Young University — *Provo, UT*

M.S. Electrical and Computer Engineering — *Aug. 2016 - Aug. 2018*

- 4.00/4.00 GPA
- Thesis: Vision-Based Emergency Landing of Small Unmanned Aircraft Systems
- Advisor: Randal W. Beard

Brigham Young University — *Provo, UT*

B.S. Electrical Engineering — *Jan. 2013 - Aug. 2016*

- 3.78/4.00 GPA

Work Experience

MIT Aerospace Controls Laboratory — *Cambridge, MA*

Graduate Research Assistant — *Aug. 2018 - current*

- Manage flight software of research vehicles using Qualcomm Snapdragon Flight/Pro
- Control implementation of non-standard vehicles (canted hexrotor, tri-tiltrotor VTOL)
- Removing VICON dependency with vision-based navigation techniques

BYU MAGICC Lab / Center for Unmanned Aircraft Systems — *Provo, UT*

Graduate Research Assistant — *Aug. 2016 - Aug. 2018*

- Safe2Ditch: Joint NASA Langley project for autonomous emergency landing of drones
- Visual multiple target tracking using monocular camera on autonomous aerial vehicles

LGS Innovations — *Westminster, CO*

Embedded Developer / PCB Designer — *Summer 2015*

- Worked with the Intel Edison embedded Linux Platform; designed and assembled PCB add-ons with Cadsoft EAGLE
- Wrote NodeJS app to control embedded hardware

Verisage and Coding Campus — *Provo, UT*

Software Developer / Course Instructor — *Mar. 2013 - Apr. 2015*

- Managed Verisage projects and worked with clients to add value to their products
- Taught students and developed curriculum at Coding Campus

Relevant Advanced Coursework

Signals & Systems	Digial Comms Theory, Math of Signals & Systems, Stochastic Processes, Statistical DSP
Control Theory	Feedback Control, Flight Dynamics and Control, Linear System Theory, Nonlinear System Theory
Robotics and AI	Bayesian Methods, Deep Learning, Robotic Vision, Autonomous Systems, Visual Nav., Underactuated Robotics

Skills

Research	Multiple target tracking, Recursive Bayesian filtering, VIO/SLAM, autopilot implementation, optimal control
Programming	C/C++, Python, MATLAB/Simulink, ROS/Gazebo, OpenCV, TensorFlow, Git
Embedded	STM32, Snapdragon Flight/Pro, NVIDIA TX2, ODROID, Naze32, Pixhawk, Arduino

Extracurricular Activity

Teaching Assistant, EE Senior Project - Robot Soccer — *Winter 2017* — *Brigham Young University*
Founder, President, BYU Mechatronics Club — *Fall 2014 - Winter 2016* — *Brigham Young University*
Technical Advisor, KVM Foundation — *2014* — *Visakhapatnam, India*
Student, Pembroke-King's Programme — *Summer 2013* — *Cambridge University, UK*

Selected Projects

Anticipated VINS-Mono
Mass. Institute of Technology

Visual Navigation for Autonomous Vehicles — *2018*

- Uses techniques from: L. Carlone and S. Karaman, Attention and Anticipation in Fast Visual-Inertial Navigation, ICRA'17
- Based on HKUST VINS-Mono, implemented in C++ and available as open source on GitHub

The DesktopQuad
Provo, UT

Personal Research Project — *2017*

- A custom built tethered micro quad with an upward facing camera
- Particle filter based localization using IMU and ArUco fiducial markers
- Implemented in hardware by extending ROSflight, a custom autopilot project built in the BYU MAGICC Lab
- ROS/C++ implementation with corresponding simulation in Gazebo

Stereo Camera Baseball Catcher
Brigham Young University

Graduate Class Project: Robotic Vision — *March 2017*

- In a team of two, used a stereo rig to estimate depth of incoming baseballs
- Used a online least squares optimization to command an X-Y actuated net to consistently catch baseballs

Robot Soccer
Brigham Young University

ECEn Senior Project — *Winter 2016*

- Worked with a team of four to design, build, and program two ODROID based mobile robots to play soccer
- Used ROS/Python to implement motion control, state estimation, computer vision, and AI algorithms
- Won first place in a ten team competition at BYU

iOS Bluetooth Shooter
Provo, UT

Personal Project — *Dec. 2015*

- Wrote iOS app to communicate via Bluetooth with a custom made toy missle shooter.

Honors & Awards

Fellowship, Utah NASA Space Grant Consortium — *Aug. 2017 - Apr. 2018* — *Brigham Young University*
Invited, Phi Kappa Phi — *2017* — *Brigham Young University*
Invited, IEEE-Eta Kappa Nu — *2016* — *Brigham Young University*
Recipient, Heritage Scholarship — *Jan. 2013 – Aug. 2016* — *Brigham Young University*

Publications

[1] **P. C. Lusk**, S. Wadhwania, X. Cai, A. Paris, K. Fathian, and J. P. How, "A Distributed Pipeline for Visual-Inertial Formation Flying of Unmanned Aerial Vehicles," (in preparation), 2019.

[2] K. Fathian, K. Khosoussi, Y. Tian, **P. C. Lusk**, and J. P. How, "CLEAR: A Consistent Lifting, Embedding, and Alignment Rectification Algorithm for Multi-View Data Association," (in review), 2019.

[3] **P. C. Lusk**, P. C. Glaab, L. J. Glaab and R. W. Beard, "Safe2Ditch: Emergency Landing for Small Unmanned Aircraft Systems," *AIAA Journal of Aerospace Information Systems*, 16(8), pp. 327-339, 2019.

[4] J. H. Lee, J. D. Millard, **P. C. Lusk** and R. W. Beard, "Autonomous target following with monocular camera on UAS using Recursive-RANSAC tracker," *International Conference on Unmanned Aircraft Systems (ICUAS)*, Dallas, TX, pp. 1070-1074, 2018.

[5] **P. C. Lusk** and R. W. Beard, "Visual Multiple Target Tracking from a Descending Aerial Platform," *American Control Conference (ACC)*, Milwaukee, WI, pp. 5088–5093, 2018.