KYLE HARLOW

(+1) 719-429-0156 ⋄ kyle.harlow@colorado.edu
430 UCB, 1111 Engineering Dr. ⋄ Boulder, CO 80309
1420 Renaissance Dr. APT R305 ⋄ Longmont, CO 80503

EDUCATION

University of Colorado Boulder *2013 - 2017*
B.S., Applied Math GPA: 3.82
Markov Processes, Fourier Series/B.V. Problems, Complex Var. and Applications
Magna Cum Laude

University of Colorado Boulder *2013 - 2019*
B.S./M.S., Electrical Engineering GPA: 3.82/3.95
Control Systems Analysis, Advanced Robotics, Principles of Embedded Software,
Embedded Sensors and Actuators, Linear Control Systems,
Sampled Data and Digital Control Systems, Optimal Design,
Statistical Estimation of Dynamical Systems, Hybrid Dynamic Systems
Magna Cum Laude

RESEARCH EXPERIENCE

Millimeter-Wave Radar Based Perception, University of Colorado - Boulder *2020 - Present*
Researching millimeter-wave (mmWave) based odometry methods using learned front-end processing for accurate localization in visually degraded environments.

DARPA SubT Challenge, University of Colorado - Boulder *2019 - 2021*
Acting perception engineer for the DARPA SubT Challenge where robots are tasked with accurately localizing objects and mapping subterranean environments.

Masters Thesis, University of Colorado - Boulder *2018 - 2019*
Harlow, K, Algorithms and 3D Extension for Online Probabilistic Change Detection in Feature Based Maps. Defended successfully Summer 2019

CONFERENCE PAPERS

Bateman S, **Harlow K**, Heckman CR. Better Together: Online Probabilistic Clique Change Detection in 3D Landmark-Based Maps. *International Conference on Intelligent Robots and Systems*; 2020 Oct 25-29.

Mopidevi AN, **Harlow K**, Heckman CR. RMap: Millimeter-Wave Radar Mapping Through Volumetric Upsampling. *International Conference on Robotics and Automation*; (Submission Pending Review) 2024.

JOURNAL PUBLICATIONS

Ebadi K, Bernreiter L, Biggie H, Catt G, Chang Y, Chatterjee A, Denniston CE, Deschnes SP, **Harlow K**, Khattak S, Nogueira L. Present and future of slam in extreme underground environments. *IEEE Transactions on Robotics*; (Pending Resubmission) 2023.

Harlow K, Jang H, Barfoot TD, Kim A, Heckman CR. A New Wave in Robotics: Survey on Recent mmWave Radar Applications in Robotics. *IEEE Transactions on Robotics*; (Submission Pending Review) 2023.

Biggie H, Rush E, Riley D, Ahmad S, Ohradzansky M, **Harlow K**, Miles M, Torres D, McGuire S, Frew E, Heckman C, and Humbert J. Flexible Supervised Autonomy for Exploration in Subterranean Environments. *Journal of Field Robotics*; 2023. Field Robotics, 3, 125-189.

Kramer A, **Harlow K**, Willams C, Heckman CR. ColoRadar: The Direct 3D MillimeterWave Radar Dataset. *The International Journal of Robotics Research*; 2022. 41(4), 351-360.

Ohradzansky M, Rush E, Riley D, Mills A, Ahmad S, McGuire S, Biggie H, **Harlow K**, Miles M, Frew E, Heckman CR, Humbert J S. Multi-Agent Autonomy: Advancements and Challenges in Subterranean Exploration *Journal of Field Robotics*; 2022. Field Robotics, 2, 1068-1104.

TEACHING EXPERIENCE

CSEN 7000: Autonomous Vehicle Perception, University of Colorado - Boulder *Fall 2020*

- Proctored discussions about state-of-the-art robotic perception research papers
- Assisted students debugging Formula 1/10th autonomous vehicle hardware and software

ECEE 4610/4620: Senior Design, University of Colorado - Boulder *2017 - 2019*

- Helped student project teams navigate engineering design and testing processes
- Instructed students in practical printed circuit board (PCB) design practices
- Reviewed and graded industry-standard engineering documentation
- Tutored students in debugging embedded sensor and actuator interfaces
- Graded major engineering design presentations providing live feedback on student engineering plans
- Instructed and graded students on proper multistage testing practices

ENGINEERING EXPERIENCE

DARPA SubT Challenge Team MARBLE Member, University of Colorado - Boulder *2020 - 2022*

- Designed a precision global alignment system integrating a Leica Total Station, ROS, and several heterogeneous robotic platforms
- Programmed and tested an object filtering algorithm to merge multiple single-shot detections of visual and area-of-affect artifacts into a single report with accurate positioning
- Assisted in tuning lidar-inertial SLAM algorithms for long term localization
- Published three papers which included the above methods and experiments validating each system design

RoboSub Electronics Captain and Co-Founder, University of Colorado - Boulder *2014 - 2018*

- Designed layout and schematics of core high power PCBs for power and signal distributions between computers, motors, and sensors in Altium Designer
- Mentored new recruits in PCB and circuit design as well as project management
- Programmed sampled data digital controls algorithms for vehicle stability and maneuverability in ROS
- Secured Engineering Excellence Fund grants in excess of $80,000 between 2015 and 2019
- Managed sponsorship acquisition, securing donations and discounts of various critical sensors and software

Mechatronics Intern, SSL Robotics LLC. *Summers 2017 - 2018*

- Programmed lighting array for Dragonfly Tipping Point End Effector
- Designed an initial combination motor controller and inertial measurement unit PCB for 1:5 Scale FriendArm
- Designed and manufactured an IO breakout board for a National Instruments sbRio-9651
- Programmed a LabView module that takes in SPI data from an inertial measurement unit, and injects it onto an EtherCAT bus via a Copley ME3 Controller
- Programmed an internal positioning system and inventory tracker integrating a Posyx ultra-wideband positioning system, touch screen GUI, and bar-code scanner

SKILLS

Programming Frameworks and Libraries
ROS, Pytorch, Pytorch Lightning, Einops, PCL, Eigen, GTSAM

Languages
Python, Matlab, Embedded C, C++, ARM Assembly

Certifications
Radio Operators General License