Sequoyah Walters

610-350-7543 | snwalters2@wisc.edu | linkedin.com/in/sequoyah-walters | seqwalt.github.io

Education

University of Wisconsin–Madison Aug. 2023
M.S. Mechanical Engineering
Thesis: "Vision-based Autonomous Landing of a Quadcopter with Field-of-View Constraints"

West Chester University of Pennsylvania (Honors College) Dec. 2019
B.S. Physics, Minors in Computer Science and Math

Projects

Autonomous Landing: Visual Inertial Odometry Quadcopter

- Designed and built a quadcopter with a front-facing stereo camera, a down-facing monocular camera, and a NVIDIA Jetson Xavier companion computer (PX4, Linux, ROS, UART, CAD)
- Implemented visual-inertial odometry for quadcopter state estimation (specifically ROVIO)
- Wrote an open-source software library to generate a minimum-snap trajectory and track it using model predictive control (MPC) for real-time on-board autonomous landing (C++, ACADO, AprilTag)

IMU Orientation Estimation: Self Balancing Robot

- Constructed a custom two-wheel inverted pendulum self-balancing robot (PID, Arduino, CAD)
- Wrote an IMU library to compute 3-DOF robot orientation without gimbal lock (RK4, Madgwick, C++)
- Calibrated the IMU with least-squares method to compensate for axis misalignment, scale offset and bias

Extended Kalman Filter: Monocular Robot Pose Estimation

- Fabricated a differential-drive robot that uses a monocular camera for pose estimation with a custom AprilTag extended Kalman filter (Python, Raspberry Pi, I2C, CAD)
- Visualized live data over WiFi to speed up EKF tuning and debugging by $\sim 4\times$ (Flask, Plotly.js)

Lunar Lander Optimal Control

- Employed direct collocation to solve the optimal control problem of a simulated 2D lunar lander, minimizing flight time and fuel usage (Python, Pyomo)
- Performed Monte Carlo simulations to compare open and closed loop control (NumPy, RK4)

Experience

Robotics Software Engineer I Jan. 2024 – Present
Applied Research Associates, Integrated Products Division

Robotics Research Assistant June 2020 – Sept. 2023
UW Autonomous and Resilient Controls Lab

- Built and tested a quadcopter platform for field-of-view constrained landing (see project section)
- Designed a control algorithm to provide safety guarantees for sampled-data systems (Matlab)
- Replicated the results of numerous research papers implementing advanced control techniques (Matlab)

Teaching Assistant Aug. 2021 – May 2022
UW–Madison

- Led lab sessions for *Intro to Mechanical Engineering* and lectured *Dynamics* discussion sections

Bio-mechanics Research Assistant May 2019 – Aug. 2019
UW BADGER Lab

- Competitive summer undergraduate research experience (SURE) held at UW–Madison
- Calculated knee moment data for trans-tibial amputees testing a robotic foot prosthesis (Matlab)

Skills

Software/Programming: C++, Python, Matlab, PX4, ROS, Eigen, SLAM/VIO algorithms, OpenCV, PyTorch, Linux (Ubuntu), communication protocols, Git, Bash, CMake, Gazebo Simulator, OpenGL, C# (Unity 2D), OnShape, SolidWorks

Hardware: NVIDIA Jetson devices, Raspberry Pi, Arduino, OptiTrack Motion Capture, 3D printing, soldering

Coursework: Computer Vision (*optical flow, object tracking etc.*), Artificial Neural Networks (*CNNs, SVMs etc.*), Nonlinear Optimization, Probability in Machine Learning, Matrix Methods for Machine Learning, Advanced Robotics, Data Structures and Algorithms, Linear Systems

Publications & Posters

UW Autonomous and Resilient Controls Lab

- "Control barrier function meets interval analysis: Safety-critical control with measurement and actuation uncertainties," Y Zhang, **S Walters**, X Xu 2022 American Control Conference

UW BADGER Lab

- "Slopes and Stairs: Knee Moments with the Variable-Stiffness Foot," **S Walters** UW-Madison SURE program 2019 (poster)

WCU Aptowicz Research Group

- "Characterizing the size and absorption of single nonspherical aerosol particles from angularly-resolved elastic light scattering," **S Walters**, J Zallie, G Seymour, Y Pan, G Videen, K Aptowicz Journal of Quantitative Spectroscopy and Radiative Transfer. 2019
- "Measuring single-particle absorption from elastic light scattering patterns of complex aggregates," **S Walters** 17th Electromagnetic and Light Scattering Conference. 2018 (poster)

Leadership & Community Service

Robotics Group Mentor May 2019 – Aug. 2019
UW BADGER Lab

- Led a robotics team of 3 high-school students in building and testing multiple robotics projects, including two mobile robots and a robotic arm

New Directions After School Tutoring Program Oct. 2016 – Mar. 2017
Charles A. Melton Arts and Education Center (West Chester)

- Tutored elementary students on all school subjects and helped with homework

Judo Club Founder & President Jan. 2016 – Feb. 2018
West Chester University

- Oversaw all judo club functions including fundraisers, practices and home tournaments

Awards & Achievements

Graduate Engineering Research Scholars (GERS) Fellowship Sept. 2022
UW–Madison

- Fellowship of $120K awarded to the top 15 underrepresented minorities in the College of Engineering

College of the Sciences and Mathematics Outstanding Student Award Dec. 2019
West Chester University

- Recognizes one senior student who has shown exceptional intellectual or creative achievement and involvement in extracurricular and service activities

Student Commencement Speaker College of the Sciences and Mathematics Dec. 2019
West Chester University