

jake welde

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EDUCATION

- Candidate for PhD in Mechanical Engineering** 2019 – present
University of Pennsylvania, GRASP Laboratory Philadelphia, PA
Advised by Dr. Vijay Kumar
- Master of Science in Engineering, Robotics** 2020
University of Pennsylvania Philadelphia, PA
- Bachelor of Science in Engineering, Mechanical Engineering** 2019
University of Pennsylvania Philadelphia, PA
Minor in French and Francophone Studies

EXPERIENCE

- Research in Aerial Robotics, Dynamics and Control** 2015 – present
GRASP Lab, University of Pennsylvania Philadelphia, PA
Collaborative research in planning and control for dynamic aerial robots
- Demonstrated differential flatness of underactuated aerial manipulators, enabling convenient planning of dynamically feasible trajectories, applicable for many manipulation tasks
 - Developed a new any-time algorithm to plan dynamically feasible system trajectories which will produce a desired trajectory for the end effector of an underactuated aerial manipulator
 - Contributed to onboard sensing, estimation, and motion planning pipeline to enable a quadrotor to dynamically track moving targets while respecting the vehicle's field of view, sensor, control effort, and underactuation constraints
- Intern, Robotics: Software and Algorithms** Summer 2018
Exyn Technologies Philadelphia, PA
Software engineering and algorithms internship at fast-moving aerial robotics startup, focused on delivering robust, trustworthy, and safe autonomy solutions for challenging real-world problems
- Evaluated and integrated a variety of sensing modalities for barcode decoding and localization for autonomous robotic warehouse inventory and inspection applications
 - Developed system-critical software to integrate low-level sensors with high-level software stack
 - Evaluated prior art on extrinsic calibration for multimodal sensor payloads
 - Developed and implemented novel algorithm for globally optimal extrinsic calibration of any number of rigidly connected accelerometers, cameras, and LIDARs, using only a single physical calibration target for all modalities, enabling rapid and accurate recalibration in challenging field environments.

TEACHING

MEAM 520: Introduction to Robotics Fall 2021
Teaching assistant for Professor M. Ani Hsieh *University of Pennsylvania*

- Worked with students in office hours and hands-on lab sessions. Led the development of a completely new optimization inverse kinematics lab for this iteration of the course, among other lab development.

MEAM 211: Engineering Mechanics, Dynamics Spring 2021
Teaching assistant for Professor Michael Posa *University of Pennsylvania*

- Led interactive problem-solving recitations. Helped create a new computational aspect of the course, where students implement a multibody dynamics simulator via step-by-step weekly assignments. Nominated for Outstanding Teaching Assistant in Mechanical Engineering on the basis of this course.

CIT 520: Introduction to Robotics Spring 2021
Teaching assistant for Professor Vijay Kumar *University of Pennsylvania*

- Led interactive problem-solving recitations and provided guidance to students completing virtual labs.

MEAM 520: Introduction to Robotics Fall 2020
Teaching assistant for Professor Cynthia Sung *University of Pennsylvania*

- Helped create a rich simulated setting for labs due to remote teaching during COVID-19. Culminated in a livestreamed final competition where teams' autonomous robots competed head-to-head.

PennX: Robotics, Dynamics and Control Summer 2017
Teaching assistant for Professors M. Ani Hsieh and Vijay Kumar *University of Pennsylvania*

- Developed engaging assignments for a massive open online course with learners from around the world

PUBLICATIONS

J. Welde, J. Paulos and V. Kumar, "Dynamically Feasible Task Space Planning for Underactuated Aerial Manipulators," in IEEE Robotics and Automation Letters, vol. 6, no. 2, pp. 3232-3239, April 2021, doi: 10.1109/LRA.2021.3051572.

J. Welde and V. Kumar, "Coordinate-Free Dynamics and Differential Flatness of a Class of 6DOF Aerial Manipulators," 2020 IEEE International Conference on Robotics and Automation (ICRA), Paris, France, 2020, pp. 4307-4313, doi: 10.1109/ICRA40945.2020.9196705.

J. Thomas, J. Welde, G. Loianno, K. Daniilidis and V. Kumar, "Autonomous Flight for Detection, Localization, and Tracking of Moving Targets With a Small Quadrotor," in IEEE Robotics and Automation Letters, vol. 2, no. 3, pp. 1762-1769, July 2017, doi: 10.1109/LRA.2017.2702198.

MEDIA

Penn Engineering Today: ["Virtual Robots: Taking Risks in an Online Classroom"](#) 2021

National Geographic's Breakthrough: ["Game of Drones"](#) 2017

34th Street Magazine: ["Penn Students Create Gingerbread Replica of Fisher Fine Arts Library"](#) 2017

LA Times: ["They did it for the graham: Six gingerbread architectural masterpieces"](#) 2017

HONORS AND AWARDS

Finalist for Best Paper in Unmanned Aerial Vehicles, ICRA 2021	2021
National Science Foundation Graduate Research Fellowship	2019
Couloucoundis Prize for Best Senior Design Presentation in Mechanical Engineering	2019
Second Place, School of Engineering Senior Design Competition	2019
Student Travel Grant Award, International Conference on Intelligent Robots and Systems	2017
First Place, Robockey Championship, Design of Mechatronic Systems	2016

OUTREACH

Mentoring Undergraduate Researchers

Nicole Luna, "Aerial Manipulator Mechanical Design"	Summer 2021
Natasha Dilamani, "Dynamic Modeling of the Sphero, a Highly Nonholonomic System"	Summer 2020

Science Olympiad at the University of Pennsylvania

2017-present

Volunteering as Event Supervisor, coordinating a team of volunteers to run competition for high school students to explore STEM through hands on engineering challenges and theoretical knowledge contests.

REVIEW ACTIVITIES

- IEEE Transactions on Automatic Control
- IEEE Transactions on Robotics
- IEEE Robotics and Automation Letters
- IEEE International Conference on Robotics and Automation
- IEEE International Conference on Intelligent Robots and Systems

SKILLS

Computational	C++, Python, ROS, Drake, MATLAB, git, Linux, Embedded Systems
Fabrication	SOLIDWORKS, Manual Lathe, Manual/CNC Mill, PCB Design, Soldering
Production	LaTeX, Microsoft Office, Digital Photography, Adobe Photoshop
Language	English (native), French (conversational)

PERSONAL INTERESTS

My personal interests include conservation, hiking, cooking, photography, music, and theatre.