

jake welder

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EDUCATION

Candidate for PhD in Mechanical Engineering

University of Pennsylvania, GRASP Laboratory

Advised by Dr. Vijay Kumar

2019 – present

Philadelphia, PA

Master of Science in Engineering, Robotics

University of Pennsylvania

2020

Philadelphia, PA

Bachelor of Science in Engineering, Mechanical Engineering

University of Pennsylvania

2019

Philadelphia, PA

Minor in French and Francophone Studies

EXPERIENCE

Research in Aerial Robotics

GRASP Lab, University of Pennsylvania

2015 – present

Philadelphia, PA

Collaborative research in planning and control for high speed 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

Exyn Technologies

Summer 2018

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 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.

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

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, Int. Conference on Intelligent Robots and Systems

2017

First Place, Robockey Championship, Design of Mechatronic Systems

2016

OUTREACH

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

SKILLS

Computational C++, ROS, MATLAB, Python, Java, git, Linux, Embedded Programming
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.