

Ting-Hao Wang

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wtyngh.github.io

Robotics engineer and Ph.D. candidate in Mechanical Engineering at UC Berkeley with 9+ years of hands-on experience across the full robotics stack, from mechanism design and mechatronics to motion planning and autonomous system deployment. Proven track record of building and validating real-world robotic platforms including UAVs and legged-wheeled robots. Passionate about hardware-aware software solutions that bridge research and practical engineering.

Technical Skills

Hardware & Mechanical: Mechanism design, mechatronics, PCB design (Altium), SolidWorks, AutoCAD

Software & Programming: C/C++, Python, MATLAB, LabVIEW

Robotics Frameworks & Tools: ROS, Gazebo, PX4, Linux, Git, Qt

Robotics Expertise: Motion planning, state estimation, dynamics modeling and control, computer vision

Research Experience

High Performance Robotics Laboratory, UC Berkeley (*advisor: Prof. Mark W. Mueller*)

Graduate Student Researcher:

Jan. 2021 – Present

- **Morphing Quadrotor with Passive Arm Actuation:** Designed a quadrotor with rotating arms that extend and retract passively via yaw control, enabling $2\times$ arm-length variation and $3\times$ inertia modulation for agile compact flight. Achieved $2\times$ reduced angular response under torque impulses, advancing co-design of quadcopter configuration and flight dynamics.
- **Plane-Based Local Trajectory Planner for UAVs:** Developed a plane-based spatial partitioning local planner using depth sensors for computationally efficient trajectory planning in cluttered environments. Achieved $4\times$ faster collision checking optimized for resource-constrained onboard hardware. Validated in Gazebo and real-world autonomous flights.
- **Fault-Tolerant RL Controller for Quadcopters:** Integrated an RL-based low-level quadcopter controller capable of real-time adaptation to motor failures, payload variations, and structural damage, handling disturbances $8\times$ beyond the training set without explicit fault detection. Implemented in ROS; validated through extensive real-world flight tests.

Bio-inspired Robotics Laboratory, NTU (*advisor: Prof. Pei-Chun Lin*)

Graduate Student Researcher & Research Assistant:

July 2016 – Dec. 2020

- **TurboQuad: Leg-Wheel Transformable Quadruped:** Designed and built *TurboQuad*, a leg-wheel transformable quadruped covering mechanism, mechatronics, embedded systems, and software, featuring a unique leg-wheel module enabling agile transitions between wheeled and legged locomotion. Top-three finalist at the 2017 NI Global Student Design Showcase.
- **Terrain-Aware Behavior Selection for TurboQuad:** Built a real-time RGBD vision system using a pre-trained CNN for terrain classification and an elevation-map-based path planner for autonomous gait selection and obstacle avoidance; developed a reduced-order dynamic model incorporating slip effects and complex contact geometry to determine optimal gait transition references under varying terrain conditions.

Undergraduate Researcher:

Feb. 2015 – Jun. 2016

- **Autonomous Wheeled Robot with 7-DOF Arm:** Built a fully autonomous wheeled robot with a 7-DOF arm using forward/inverse kinematics for trajectory planning and sensor-fused localization. Completed multi-modal tasks (writing, color classification, basketball shooting). Won 3rd place at the 2015 TDK Robocon Contest.

Education

University of California, Berkeley

Jan. 2021 – Present

Ph.D. candidate, Mechanical Engineering - GPA: 3.94/4.0

- Taiwan–UC Berkeley Fellowship (Fall 2021 – Spring 2025)

National Taiwan University (NTU), Taipei, Taiwan

Sep. 2016 – Jun. 2018

M.S., Mechanical Engineering, System and Control Division - GPA: 3.93/4.0, ranking 6/39

National Taiwan University (NTU), Taipei, Taiwan

Sep. 2012 – Jun. 2016

B.S., Mechanical Engineering - GPA: 3.93/4.0, ranking 7/159

Publications

- **T. H. Wang** and M. W. Mueller, “Plane-Based Spatial Partitioning using Depth Sensors: Computationally Efficient Local Trajectory Planning for Multicopters over Obstacles,” *International Conference on Unmanned Aircraft Systems (ICUAS)*, 2026
- D. Zhang, A. Loquercio, J. Tang, **T. H. Wang**, J. Malik, and M. W. Mueller, “A Learning-based Quadcopter Controller with Extreme Adaptation,” *IEEE Transactions on Robotics (T-RO)*, 2025
- L. R. Rubi, J. Kam, R. Luo, J. Yang, X. Zheng, E. Zou, **T. H. Wang**, and M. W. Mueller, “UCAirLink: A VTOL-Based Air Transportation System,” *Vertical Flight Society Forum Proceedings*, 2025
- **T. H. Wang** and P. C. Lin, “A Reduced-Order-Model-Based Motion Selection Strategy in a Leg-Wheel Transformable Robot,” *IEEE/ASME Transactions on Mechatronics (T-MECH)*, 2021
- H. Y. Chen, **T. H. Wang**, K. C. Ho, C. Y. Ko, P. C. Lin, and P. C. Lin, “Development of a Novel Leg-Wheel Module,” *Mechanism and Machine Theory*, 2021
- C. Liu, **T. H. Wang**, P. C. Lin, “Development of an Innovative 2-DOF Continuous-Rotatable Mechanism,” *International Symposium on Robotics and Mechatronics (ISRM)*, 2019
- S. L. Hsu, K. W. Liu, C. H. Hsiung, S. Y. Chen, **T. H. Wang**, and P. C. Lin, “Flip-and-Leap in a Hexapod Robot,” *iRobotics*, 2019
- **T. H. Wang**, D. G. Sung, and P. C. Lin, “Terrain Classification, Navigation, and Gait Selection in a Leg-Wheel Transformable Robot,” *CACS*, 2018

Patent

- P. C. Lin, H. Y. Chen, **T. H. Wang**, “Wheel-Leg Hybrid Module with Rapid Transformation Capability,” R.O.C. Patent I764563, 2022.

Teaching & Awards

- Led a team of seven to win the Joby Aviation Award and Best Overall Design at the 2024 CITRIS Aviation Prize. Published the paper at the 2025 Vertical Flight Society Annual Forum.
- Graduate Student Instructor, “Introduction to UAV” course (2021–2024); taught over 400 students through hands-on hardware and simulation labs. Awarded the 2024 Outstanding GSI Award.
- GSI of Aerospace Capstone (2025–2026), leading student projects for aerial exploration and localization.