Jingxian Wang

Tel: (+86)13071146738 | Email: wjxway@163.com | Webpage: wjxway.github.io

WORK EXPERIENCE

System Engineer, Sharpa Robotics 08/2026 – Present

EDUCATION

Ph.D. in Mechanical Engineering, Northwestern University 09/2021 – 07/2026

- Instructor: Prof. Michael Rubenstein
- Research focus: full-stack novel robot design, minimalism in robotics, swarm robot, modular robot.

Bachelor of Science in Physics, School of Physics, Peking University (PKU) 09/2017 – 07/2021

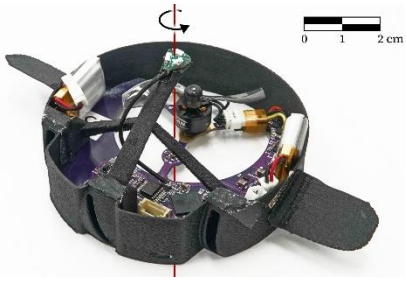
- Major courses: Theoretical Mechanics, Electrodynamics, Quantum Mechanics, Computational Physics, Modern Physics Lab I and II, Fundamentals of Electronics Circuits and Experiments, Solid Mechanics, etc.

The High School Affiliated to Renmin University of China (RDFZ), 1st EDP program. 09/2010 – 06/2017

RESEARCH EXPERIENCE

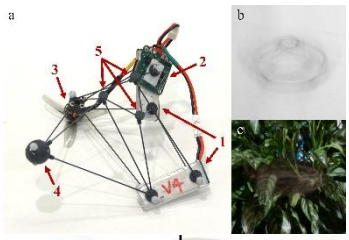
Major research projects:

Fall 2021 – present: Development of Single Motor Drone Swarm System

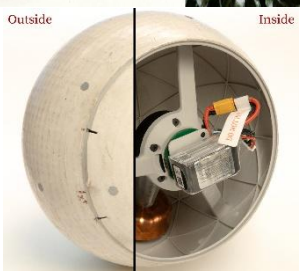


This research demonstrates the first single motor drone swarm capable of autonomous flight using peer-to-peer (P2P) communication and sensing. Each drone, weighing down to 20g and containing just one moving part, can fly independently with full control, featuring onboard P2P communication and precise positioning enabled by a novel infrared-based system. The drone is 10x lighter than all previous systems with comparable P2P positioning accuracy. I am the only student on this project and carried out:

- Kalman filter based state estimator + LQI based flight controller design.
- Sensitive (100nA), high-speed (10Mbps) free-space IR comm. circuit design.
- Relative position sensing mechanism design. (concept from Prof. Rubenstein)
- PCB and structural design.
- Custom and mission-specific communication protocol design and its implementation on Lattice FPGA.
- Embedded software development on ESP32-S3 platform.
- Swarm localization and sensing algorithm design.
- Based on this drone, developed the low-visibility drone: the Phantom Twist.



Fall 2023 – present: Development of Single Motor Spherical Robot



This research presents the first single motor spherical robot, Rollbot, and its control strategy. Rollbot minimize mechanical complexity and cost and can be used as fail-safe strategy for conventional spherical robots in the case of motor failures. My role in this project includes:

- Came up with the concept of underactuated spherical robot.
- Independently developed the analytical equation and quasi-stable approximation.
- Independently developed the hardware and feedback control algorithm.
- Collaboratively developed the RL-based control algorithm in Rollbot 2 for better agility.

Spring 2024 – present: Development of Reconfigurable Legged Metamachine



This research introduces autonomous modular legs: agile yet minimal, single-degree-of-freedom jointed links that can learn complex dynamic behaviors and may be freely attached to form legged metamachines at the meter scale. This research enables rapid repair, redesign, and recombination of highly dynamic modular agents that move quickly and acrobatically through unstructured environments. My role in this project includes:

- Lead development of the docking mechanism and mechatronics hardware.
- Helped with development of RL-based metamachine control algorithm.
- Collaboratively developing the next generation, self-reconfigurable legged metamachine

Other significant research projects:

Spring 2025 – Spring 2026: Preliminary research on single-motor femtosatellites for Saturn exploration.
Fall 2022 – Spring 2023: Research on film grain rendering and parameter estimation.
Fall 2021 – Spring 2022: Research on PCB-based minimalist robot PCBot.
Fall 2020 – Fall 2022: Development of underwater localization system based on electrostatic field.
Fall 2018 – Spring 2021: Research on light-actuated soft flying robot.
Fall 2018 – Spring 2020: Construction of an optical tweezer with trapping strength measurement system and research of phase-adjustable SPPs optical tweezer array.

Reviewer of T-RO, RSS, R-AL.

PUBLICATIONS AND PRE-PRINTS

- **Jingxian Wang***, Chen Yu*, Sam Kriegman, and Michael Rubenstein. "Rollbot 2: Agile Locomotion by a Single-Actuator Spherical Robot." *arXiv preprint* arXiv:2610.24129 (2026).
- **Jingxian Wang***, Chen Yu*, David Matthews, et.al. "Computational Design of a Low-Visibility UAV Using a Human-Aligned Perceptual Metric." RSS (2026).
- **Jingxian Wang**, and Michael Rubenstein. "Rollbot: a Spherical Robot Driven by a Single Actuator." ICRA (2026).
- Chen Yu*, **Jingxian Wang***, David Matthews*, et.al. "Reconfigurable legged metamachines that run on autonomous modular legs." *PNAS* (2026).
- **Jingxian Wang**, Andrew G. Curtis, Mark Yim, and Michael Rubenstein. "A Single Motor Nano Aerial Vehicle with Novel Peer-to-Peer Communication and Sensing Mechanism." *Robotics: Science and Systems (RSS)* (2024).
- Kaixuan Zhang*, **Jingxian Wang***, Daizong Tian, and Thrasyvoulos N. Pappas. "Film Grain Rendering and Parameter Estimation." *ACM Transactions on Graphics (ToG)* (2023).
- Kaixuan Zhang*, **Jingxian Wang***, Daizong Tian, and Thrasyvoulos N. Pappas. "Real time film grain rendering and parameter estimation." U.S. Patent Application 18/608,381, filed September 19, 2024.
- **Jingxian Wang**, and Michael Rubenstein. "PCBot: a Minimalist Robot Designed for Swarm Applications." IROS 2022. (best paper finalist, best student paper finalist, best mechanisms and design paper finalist)
- Junzheng Zheng, **Jingxian Wang**, et.al. "Biomimetic electric sense-based localization: A solution for small underwater robots in a large-scale environment." *IEEE Robotics & Automation Magazine* (2022)
- **Jingxian Wang**, Tianye Wang, Wei Wang, Xiwang Dong, and Yandong Wang. "Distributed localization without direct communication inspired by statistical mechanics." *arXiv preprint arXiv:2006.02658* (2020).
- **Jingxian Wang**, Shuneng Ran, Kun Xun; "Another Kind of High Sensitive State of DL-8 High-pressure Ionization Gauge", *Physics Experimentation* (2018).

*Note: * means co-first author.*

AWARDS AND HONORS

- Awarded NASA's Innovative Advanced Concepts (NIAC) Program 05/2026
- IROS 2022 Best Paper Award and Best Mechanisms and Design Paper Award Finalist 10/2022
- PKU Scholar in Physics, PKU 06/2021
- Outstanding Project on "Light-actuated soft flying robot", School of Engineering, PKU 01/2021
- Wenxin Zhang Scholarship, PKU 09/2020
- Award for Outstanding Research, PKU 09/2019
- Leo Koguan Scholarship (6th place out of 201 students), PKU 09/2018
- The Second Prize of Freshman Scholarship, PKU 09/2017
- Gold Medal in the 18th Asian Physics Olympiad (APhO) 05/2017

PROFESSIONAL SKILLS

Specialty: Architecting and analyzing novel robot systems, rapid prototyping of hardware and algorithms, multi-paradigm data processing.

Advantages: Rich experience in novel system design and software-hardware joint development, exposure to latest ideas in robotics, solid background in physics.

Professional Skills: Proficient in embedded systems and C/C++ (ESP32), CAD (Autodesk Fusion/Inventor), circuit design and validation (LTSpice/TINA), and PCB design (Autodesk Eagle PCB). Highly proficient in Wolfram Mathematica for programming, analytics, publication-quality visualization, data/image processing, and 3D modeling/printing. Experienced in FPGA design with Verilog, COMSOL, Ansys Fluent, LaTeX, and Python.

English Proficiency: TOEFL iBT 114 (out of 120), GRE 327 (out of 340).