Rui'Xin WU

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Education

ZheJiang University (ZJU) Hangzhou, China
Master of Mechanical Engineering Sep. 2023 – Present

- **Graduate students exempted from admission.**

Harbin Institute of Technology (HIT) Harbin, China
Bachelor of Robotics Engineering Sep. 2019 – Jun. 2023

- ***GPA*: 93.58 / 100, *Rank*: 2nd / 43**
- **National Scholarship**
- **Outstanding Graduate of Heilongjiang Province**

Publication

- Diffusion-Based mmWave Radar Point Cloud Enhancement Driven by Range Images.
  IEEE RAL, 2026 [Accepted] [Paper] [Video]
  R. Wu†, Z. Li†, J. Wang*, Z. Zheng, Z. Li, K. Huang, G. Lu.
- Tailless Flapping-Wing Robot With Bio-Inspired Elastic Passive Legs for Multi-Modal Locomotion.
  IEEE RAL, 2025 [Accepted] [Paper] [Video]
  Z. Zheng†, X. Xu†, J. Wang*, Y. Chen, J. Huang, **R. Wu**, H. Yu, G. Lu.
- Multi-Quadrotor Cooperative Encirclement and Capture Approach in Obstacle Environments.
  IEEE ICM, 2025 [Accepted] [Paper]
  Z. Li†, **R. Wu**†, J. Wang*, C. Hu, Z. Zheng, J. Meng, G. Lu.

Internship

Meituan UAV Path Planning & Scheduling Algorithm Group May. 2025 – Jul. 2025
Algorithm Strategy Intern (BeiDou Program) BeiJing, China

- Conducted research and development of autonomous site-selection algorithms to enable onboard UAVs to perform emergency landing and precision payload lowering operations.
- Responsible for researching escape algorithms for entrapped UAVs by integrating Control Barrier Functions (CBFs) with the MINCO trajectory framework, enabling escape-vector-guided planning with adaptive aggressiveness.

Field Autonomous Systems & compuTing Lab Dec. 2024 – Feb. 2025
Research Assistant HuZhou, China

- Responsible for developing cooperative formation flight algorithms for UAV swarms in complex unknown environments, following a Hybrid A*–based front-end and MINCO spatiotemporal trajectory optimization framework.
- Conducted algorithm validation in Unity-based simulations and successfully completed mid-term evaluation with real-world flight experiments.

Projects

Real-World Evaluation of Manipulation Skills from Generative Simulation Mar. 2026 - Present

- Built multiple dual-arm task scenarios based on the EmbodiChain platform, and established a closed-loop data generation framework, covering generative simulation, large-scale data expansion, and Sim2Real generalization.
- Tested the SOTA world-action model and VLA based on this data generation framework to evaluate inference time, action steps, and success rate.

Two-Stage Target Interception Algorithm with Intermittent Observations Jul. 2024 - Present

- Proposed a novel UAV interception algorithms with intermittent observations, alleviating the continuous coupling between perception and planning in existing approaches.
- Proposed a two-stage "fast-approach and precise-capture" interception strategy to trade off speed and accuracy.
- Explored multi-sensor fusion target tracking methods integrating camera and LiDAR measurements.

RL for Autonomous UAV Interception in Complex Environments Jul. 2025 - Present

- Built a reinforcement learning framework for UAVs based on IsaacLab, supporting domain randomization, observation noise, and curriculum learning.
- Generalizable interception is achieved based on dual-stream information of optical flow and semantics. Optical flow provides obstacle information, while semantics identify interception intentions.
- Maintaining the target states using a recurrent neural network to cope with brief occlusions of the target in complex environments.

Dense Point Cloud Generation from Single-Chip mmWave Radar Sep. 2024 - Feb. 2025

- Combined range images with pre-trained image diffusion models to tackle dense mmWave radar point cloud generation, and achieved high-quality results through cross-modal fine-tuning with LiDAR data supervision.
- Designed and built a handheld multi-sensor data acquisition platform capable of collecting depth, RGB, grayscale images, LiDAR, mmWave radar, and IMU data.

Cooperative Encirclement and Capture Method of Multiple Drones Mar. 2024 - Aug. 2024

- Proposed a distributed cooperative decision-making method in Complex environments based on Safe Priority Reachable Regions (SPRR).
- Generated continuous and smooth trajectories that are dynamically feasible, target-trackable, and collision-safe using SPRR and the decisions.

Honors & Awards

Competition Prize

- *Finalist*, Meituan Low-altitude Economy Intelligent Flight Management Challenge Dec. 2024
- *3rd Prize*, National Undergranduate Mechanical Innovational Competition Aug. 2022
- *1st Prize*, Northeast Region, National University Students' Optoelectronic Design Competition Aug. 2022
- *Honorable Mention*, COMAP's Interdisciplinary Contest in Modeling (ICM) May. 2022
- *1st Prize*, Mathematical modeling of the three northeastern provinces League Aug. 2021

Scholarship

- **National Scholarship** Oct. 2022
- First-Class Academic Scholarship in ZJU Oct. 2024
- Jiefang Linghang Scholarship, established by FAW Jiefang Automobile Co., Ltd. Apr. 2022
- SMC Scholarship, established by Beijing SMC Education Foundation May. 2021
- Academic Scholarship in HIT, 7 times Sep. 2019 – Jun. 2023

Distintion

- **Outstanding Graduate of Heilongjiang Province** Jun. 2023
- Outstanding Student of HIT Dec. 2020
- Outstanding Student Cadre of HIT Dec. 2021
- Outstanding League Member of HIT May. 2021
- Outstanding League Cadres of HIT May. 2022
- Outstanding Graduate Student of ZJU Dec. 2024
- Comprehensive Excellence Award for Graduate Students of ZJU Dec. 2024

Skills

- **Modeling & Simulation**: 3D modeling (SolidWorks, Inventor) and simulation platforms (IsaacLab, Gazebo, EmbodiChain).
- **Software & Development**: Proficient in Ubuntu platform and Docker, ROS, C++ > C > Python.
- **Path Planning & Trajectory Optimization**: Graph-search and sampling-based path planning, polynomial trajectory generation, and spatiotemporal joint optimization.
- **Optimization Tools**: L-BFGS, OSQP, and OSQP-Eigen.
- **Deep Learning & AI**: PyTorch; experience with MHA, Transformer, Diffusion models, CLIP, BERT, and ViT, etc.

- **Radar & Perception**: 4D mmWave radar raw data acquisition and signal processing (CFAR, DOA estimation); high-quality radar point cloud generation (RPDNet, RadarHD).
- **SLAM & Geometry**: Fast-LIO2, VINS deployment and debugging; stereo geometry (epipolar geometry, PnP, ICP).