

Wanhao Liu

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Education

Guangdong University Of Technology

B.S. IN ELECTRONIC SCIENCE AND TECHNOLOGY

Average Score: 86.60/100

Guangzhou, China

Sep. 2023 - Present

Honors: First Prize Scholarship (Top 1%), Advanced Individual, Outstanding Student Leader Scholarship

Key courses: Probability Theory (98), Analog Electronics (91), University Physics (91), Electromagnetic Fields and Waves (90)

Research Interest

Embodied AI & Autonomous Robotics: My core interest is Embodied AI, focusing on developing autonomous robots that can intelligently perceive, reason, and act in complex, unstructured environments.

Multimodal Perception for Robotics: I am interested in how fusing sensor modalities like vision, language, and touch can enable a deep semantic understanding of the world, particularly through Vision-Language Models.

Learning-based Control: My focus includes data-efficient Reinforcement Learning and Imitation Learning to teach robots robust and generalizable manipulation and navigation skills.

Human-Robot Interaction: I am also keen on exploring shared autonomy and learning from human feedback to create robots that can safely and effectively collaborate with people.

Publications & Patents

Journals

[J1] Prescribed-time fault-tolerant attitude control for tiltrotor UAV with input saturation and mismatched disturbances.

Liwei Luo, Wanhao Liu, Li Yuan, Qianqian Cai, Panshuo Li
Control Engineering Practice, 2025 [Paper]

CONFERENCE PROCEEDINGS

[C3] AC-MASAC: An Attentive Curriculum Learning Framework for Heterogeneous UAV Swarm Coordination.

Wanhao Liu, Junhong Dai, Yixuan Zhang, Shengyun Yin, Panshuo Li
Under Review, 2025 [Paper]

[C2] SConflict Prioritized-based Experience Replay Soft Actor-Critic Algorithm for Unsignalized Intersections Coordination.

Junhong Dai, YUe cai, Wanhao Liu, Panshuo Li
CVCI, 2025 [Paper]

[C1] Improved Heuristic JPS Algorithm for Path Planning in Intelligent Warehouse Robot.

Yixuan Zhang, Wanhao Liu, Libin Liu
ICEMCE, 2024 [Paper]

CONFERENCE PROCEEDINGS

[P1] A Multi-Algorithm Shopping Mall Recommendation Method and System Combining Multiple Metrics.

Yixuan Zhang, Libin Liu, Wanhao Liu
CN202411661572.4, 2024, Authorized [Paper]

Research Experience

Attentive Curriculum Learning Framework for Heterogeneous UAV Swarm Coordination

Guangzhou, China

ADVISED BY PROF. LI PANSHUO, PROFESSOR OF SCHOOL OF AUTOMATION, GDUT

Mar. 2025 - Oct. 2025

- Addressed key limitations in Multi-Agent Reinforcement Learning (MARL) for heterogeneous UAV swarm coordination, focusing on the challenges of modeling asymmetric agent dependencies and ensuring stable policy convergence.
- Designed and implemented AC-MASAC, a novel MARL framework featuring two core contributions: a role-aware heterogeneous attention mechanism to explicitly model Leader-Follower dynamics, and a structured curriculum learning strategy to overcome sparse rewards and catastrophic forgetting.
- Validated the proposed framework in a custom simulation environment, demonstrating significant performance gains over baseline algorithms in Success Rate (SR), Formation Keeping Rate (FKR), and Success-weighted Mission Time (SMT).

Prescribed-Time Fault-Tolerant Control for Tiltrotor UAVs

ADVISED BY PROF. LI PANSUO, PROFESSOR OF SCHOOL OF AUTOMATION, GDUT

Guangzhou, China

Nov. 2024 - Jun. 2025

- Investigated attitude control for tiltrotor UAVs (TRUAVs) under composite mismatched disturbances, actuator faults, and input saturation.
- Developed OPAFAC, a novel control strategy integrating a disturbance observer, an adaptive sliding mode controller, and an anti-saturation system to guarantee error convergence within a prescribed time.
- Validated the strategy via hardware-in-the-loop (HIL) experiments, achieving prescribed-time convergence and demonstrating superior fault tolerance and robustness over existing methods..

Improved Heuristic JPS Algorithm for Warehouse Robot Path Planning

ADVISED BY LIU LIBIN, LECTURER OF GUANGDONG UNIVERSITY OF TECHNOLOGY, GDUT

Guangzhou, China

Oct. 2024 - Mar. 2025

- Investigated the inefficiency of the Jump Point Search (JPS) algorithm in warehouse environments, specifically its excessive search range and interruptions.
- Developed an improved heuristic JPS by integrating angle and dynamic heuristic functions to optimize search direction and a B-spline module for path smoothing.
- Validated the algorithm via simulation, achieving a 35% reduction in planning time and a 34% reduction in searched nodes while generating safer, smoother paths.

Scientific Competition

National University Smart Car Competition

LEADER, NATIONAL SECOND PRIZE

Hangzhou, China

Jun. 2025 - Sep. 2025

- This solution employs a data-centric approach, deeply integrating deep learning with multi-sensor information. The system utilizes a CNN regression network for high-precision lane line recognition and the PP-YOLOE model to detect various task targets, providing the vehicle with environmental perception capabilities.
- Coordinated multi-task operations are enabled by integrating dual infrared sensors with a high-precision robotic arm. This design ensures that the vehicle can quickly and accurately perform physical operations after identifying task targets, demonstrating close collaboration between the decision-making and control execution layers.
- The system is deployed on a Jetson Orin Nano platform, achieving low-latency real-time inference. Final tests demonstrated excellent performance in task completion rate, cruising trajectory deviation, and system stability, validating the effectiveness of the solution.

Skills

Programming Python, C++, \LaTeX , MATLAB, Linux, Docker

Frameworks PyTorch, Tensorflow, NumPy, Git, Anaconda, ROS1, ROS2