

Liuaao Pei

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EDUCATION BACKGROUND

Zhejiang University

FAST Lab, College of Control Science and Engineering
MEng of Control Science and Engineering

Sep. 2022 — now

Postgraduate Recommendation (Ranking: 3/84)

Supervisor: [Prof. Fei Gao](#)

Harbin Institute of Technology

BEng of Control Science and Engineering

Sep. 2018 — Jun. 2022

Comprehensive Score: 94.03/100 (Rank: 1/25)

PUBLICATIONS

- **Learning to Plan Maneuverable and Agile Flight Trajectory with Optimization Embedded Networks**

Zhichao Han*, Long Xu*, **Liuaao Pei**, Fei Gao.

Under Review, 2024.

- Introduced an optimization-embedded neural network based on a compact trajectory library, integrating the strengths of both conventional methods and neural networks
- Introduced a regularized trajectory library enables the method to efficiently capture the spatial distribution of optimal trajectories with minimal storage cost.
- Conducted real-world flight experiments with a small onboard computer showcase the quadrotor's ability to navigate swiftly through dense forests.

- **Collaborative Planning for Catching and Transporting Objects in Unstructured Environments**

Liuaao Pei, Junxiao Lin, Zhichao Han, Lun Quan, Yanjun Cao, Chao Xu, Fei Gao.

[IEEE Robotics and Automation Letters \(RA-L\)](#), 2023.

- Proposed an efficient collaborative car-like robot team planning method that enables the generation of safe trajectories in unstructured environments.
- Modeled multiple essential collaboration relationships for real-time collaborative catching and transporting planning, we and implement them based on the above framework.
- Conducted real-world collaborate catching and transporting tasks by implementing our algorithm on a car-like robotic team.

- **An Efficient Spatial-Temporal Trajectory Planner for Autonomous Vehicles in Unstructured Environments**

Zhichao Han, et al., **Liuaao Pei**, Long Xu, Chengyang Li, Changjia Ma, Chao Xu, Shaojie Shen, Fei Gao

[IEEE Transactions on Intelligent Transportation Systems \(TITS\)](#), 2023.

- Introduced a unified and efficient trajectory planning formulation tailored for car-like robots, incorporating four essential attributes: spatial-temporal joint optimization, convex-approximation-based static and dynamic obstacle avoidance, analytical constraint expression in flat space, and efficient trajectory representation.
- Analyzed the characteristics of the constraints in the trajectory planning problem and reformulate the original optimization as an unconstrained one that can be effectively solved.
- Deployed our algorithm on a commercial manned platform and conduct real-world experiments in complex environments to validate the practicality of our algorithm.

- **A Linear and Exact Algorithm for Whole-Body Collision Evaluation via Scale Optimization**

Qianhao Wang*, Zhepei Wang*, **Liuaao Pei**, Chao Xu and Fei Gao

[2023 IEEE International Conference on Robotics and Automation \(ICRA\)](#), London, 2023.

COMPETITION EXPERIENCES

DJI UAV Intellisense Technology Competition

National Champion

Planning and Control

Jul. 2022 — May. 2022

- Achieving high-mobility racing flight using only onboard vision and IMU in complex and dynamic environments.
- Won the championship with a time of 22.0 seconds, less than half of the second-place time.

Robomaster AI Challenge of National University Robotics Competition
National Runner-up

Team Leader
Jan. 2022 — May. 2022

- Came early to the FAST lab at Zhejiang University to lead the team of 8 people, which is the first year of participation;
- Based on the official mechanical foundation of the infantry robot, we choose our own sensors and computing platforms, design and develop the robot's localization, planning, visual servoing, decision-making and perception algorithms;
- Enable the robot to full-automatically complete the 2v2 shooting confrontation match on the field of play, and ultimately obtain the national runner-up achievement.

National University Robotics Competition Robomaster Championship 2021
National Runner-up

Team Leader
Sep. 2020 — Aug. 2021

- For one year, led 50+ person team training, R&D, competitions, outreach, and was mainly responsible for coordinating the R&D of 7 different types robots;
- Implementing a robot-versus-robot match similar to the Honor of Kings/League of Legends mechanism, with 4 robot iteration cycles during the preparation period;
- The final result was to complete the preparation of 12 sets of 7 types of robots for the national competition, robot performance is stable, the team members are united, and the ability to deal with emergency problems is strong, and to achieve the result of National Runner-up.

National University Robotics Competition Robomaster Championship 2020
National First Prize

Team Member
Sep. 2019 — Aug. 2020

- The competition lasted nearly a year and achieved National 6th. During this period, mainly responsible for The debugging of the Sentinel robot, control algorithm design work;
- Mainly familiar with the application of control algorithms such as PID and sliding mode control, communication protocols such as CAN, USART and SPI, and the use of the UCOS operating system;
- Multi-task fully automated function realization of dual gimbal launching mechanism automatic targeting, chassis movement, power control, communication and decision making of the sentinel robot is realized.

Harbin Institute of Technology Annual Program - Musical Fountains
First Prize

Team Member
Sep. 2018 — Jun. 2019

- Participated in a research project for the first time during his undergraduate studies, during which he mastered the skills of microcontroller-based C programming and hardware design, applying A/D sampling, digital logic implementation, and PWM output;
- Implemented the function of controlling water pumps and colored lights based on the input audio, and was awarded school-level first prize in the closing defense.

HONOR AND AWARDS

- Sep. 2022, National Champion - Unmanned Aerial Vehicle Intelligent Sensing Technology Competition
- May. 2022, National Runner-up - Robomaster AI Challenge of National University Robotics Competition
- Oct. 2021, Qiming Space Scholarship (3/180) - Harbin Institute of Technology
- Aug. 2021, National Runner-up - National University Robotics Competition Robomaster Mecha Match
- Aug. 2021, Outstanding Team Leader (3/273) - National University Robotics Competition Robomaster Mecha Match
- May. 2021, Northern Quarter - National University Robotics Competition Robomaster Mecha Match
- Aug. 2020, National First Prize - National University Robotics Competition Robomaster Mecha Match
- Aug. 2020, National First Prize - National University Robotics Competition Embedded Technology Category

SKILLS

- C ++ / C / Python / Matlab
- Linux, ROS, PyTorch, OpenCV, Carla, AirSim, MDK5, Solidworks
- ARM Cortex-M embedded development, ROS-based robotics system development
- Hobbies: Table Tennis, Photography, Driving