

Chengkai Wu

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Education

The Hong Kong University of Science and Technology (Guangzhou)

Ph.D Student in Robotics and Autonomous Systems

2025/02 --

Guangzhou, China

Harbin Institute of Technology, Shenzhen

M.Eng in Control Engineering

2022/09 -- 2024/12

Shenzhen, China

- Outstanding Graduate

- Optimization Method(A+), Nonlinear and Adaptive Control(A+), Optimal Estimation(A+), Machine Learning(A), etc

Xidian University

B.Eng in Electronic Information Engineering

2018/09 -- 2022/06

Xi'an, China

- GPA: 3.8/4.0, Rank: Top 1%

- Advanced Mathematics(99), Linear Algebra(96), Intelligent Robot(96), Signals and Systems(100), etc.

Research Interests

My research interests center on robotics motion planning and control, utilizing both optimization and learning-based methods to generate safe and smooth locomotions.

Publications

Real-time Whole-body Motion Planning for Mobile Manipulators Using Environment-adaptive Search and Spatial-temporal Optimization

Yokohama, Japan

Chengkai Wu*, Ruilin Wang*, Mianzhi Song, Fei Gao, Jie Mei, Boyu Zhou[†].

2024 *IEEE International Conference on Robotics and Automation (ICRA 2024)*. [[Paper](#)] [[Video](#)] [[Code](#)] - **Oral Presentation**

FERMI: Flexible Radio Mapping with a Hybrid Propagation Model and Scalable Autonomous Data Collection

Yiming Luo, Yunfei Wang, Hongming Chen, **Chengkai Wu**, Ximin Lyu, Jinni Zhou, Jun Ma, Fu Zhang, Boyu Zhou[†].

Robotics: Science and Systems 2025 (RSS 2025). [[Paper](#)] [[Code](#)]

ApexNav: An Adaptive Exploration Strategy for Zero-Shot Object Navigation with Target-centric Semantic Fusion

Mingjie Zhang, Yuheng Du, **Chengkai Wu**, Jinni Zhou, Zhenchao Qi, Jun Ma, Boyu Zhou[†].

In Submission - *IEEE Robotics and Automation Letters 2025 (RAL 2025)*. [[Paper](#)] [[Video](#)] [[Code](#)]

Projects

A Robust and Efficient Mobile Manipulation Architecture for Pick-and-Placing Task

2024/01 -- Now

Visiting Student, advised by Prof. Boyu Zhou

Zhuhai, China

- Designed a real-time path planning method for manipulation-on-the-move tasks using reachability maps and progress heuristics.

- Developed an optimization-based trajectory generation method for efficient pick-and-place task execution.

Air-Ground Coordinated Patrol and Tracking

2024/01 -- 2024/08

Algorithm Engineer, advised by Prof. Boyu Zhou

Zhuhai, China

- Developed a drone trajectory planner with yaw angle planning, successfully applied to exploration and patrol tasks.

- Proposed a novel method for enabling ground robots to identify traversable areas in 3D environments based on their current location.

DJI RoboMaster 2022-2023,2023-2024 University AI Challenge Competition - Team MAS

2022/09 -- 2024/04

Team Leader, advised by Prof. Jie Mei

Shenzhen, China

- Developed a Kinodynamic A*-based path planning algorithm for real-time drone gate-traversal paths.

- Designed an optimization-based trajectory generation method for gate traversal, avoiding static and dynamic obstacles.

- Implemented a drone SE(3) controller, achieving an average gate traversal speed exceeding 8m/s in simulation.

- Devised a prior-based landing zone localization correction scheme.

- Constructed a drone platform; in competition, successfully traversed all ten target gates in 39 seconds.

- Won **Second Place** in the National Competition and **Third Place** in the Classic Competition.

Real-time Whole-body Motion Planning for Mobile Manipulators Using Environment-adaptive Search and Spatial-temporal Optimization

2023/01 -- 2023/09

Visiting Student, advised by Prof. Boyu Zhou

Zhuhai, China

- Designed an environment-adaptive path searching method for mobile manipulators, achieving a higher quality path with reduced computation time compared to *RRT*-Connect*.
- Developed a spatial-temporal optimization method to generate smooth, agile, safe, and dynamically feasible trajectories for mobile manipulators, outperforming CHOMP by a factor of approximately 10 in computation time efficiency.
- Established a physical platform for mobile manipulators, achieving real-time whole-body trajectory planning within 500ms in indoor scenes containing various obstacles using onboard computer.
- Published one paper to **ICRA 2024**.

Numerical Optimization in Robotics

2022/07 -- 2022/09

Excellent Student, advised by Dr. Zhepei Wang

China

- Implemented collision-free polynomial trajectory generation in environments with convex obstacles based on the LBFGS algorithm.
- Achieved efficient computation of minimum collision distance using the Low-Dimensional QP algorithm.
- Implemented Ackerman model predictive control (MPC) trajectory tracking based on the PHR-ALM algorithm.
- Solved the time-optimal path parameterization (TOPP) problem using the Conic ALM algorithm.

Field Autonomous System & Computing Lab - Zhejiang University

2021/07 -- 2021/09

Research Assistant, advised by Prof. Yanjun Cao and Fei Gao

Huzhou, China

- Designed and developed a finite-state machine-based drone task switching module, ensuring reliable and stable task transitions.
- Developed drone path planning functionalities, such as approach path generation, target detection path generation, and safe return-to-home.
- Developed a ROS Qt-based drone operation interface for real-time visualization of flight data.
- Successfully deployed functionalities to a physical drone and participated in a competition, achieving **Second Place**.

Open-Source Projects

🔗 Smart Autonomous Robotics Group

2023/01 - Present

- **Contributor of 🔗 REMANI-Planner (★167)**. A motion planning method capable of generating high-quality, safe, agile and feasible trajectories for mobile manipulators in real time.

Technical Skills

- **Programming Languages:** C/C++(ROS), Python, MATLAB
- **Tools:** Gazebo, Isaac Sim, Unity, SolidWorks, PX4, Git, LBFGS, ACADOS, Pytorch, LaTeX
- **Theoretical Knowledge:** Motion Planning, Numerical Optimization, Forward/Inverse Kinematics, Model Predictive Control (MPC), Reinforcement Learning
- **Languages:** Chinese (Native), English (IELTS: 7)

Services

- **Reviewer:** T-ASE
- **Teaching Assistant:** RBCC-Phase 3 (HKUST-GZ 2025 Summer)

Honors and Awards

Outstanding Graduate - Harbin Institute of Technology	2025
Third Place - DJI RoboMaster 2023-2024 University AI Challenge - Classic	Apr. 2024
Second Place - DJI RoboMaster 2022-2023 University AI Challenge	Nov. 2022
Honorable Mention - Mathematical Contest in Modeling	Dec. 2021
Provincial First Prize - Contemporary Undergraduate Mathematical Contest in Modeling	Dec. 2020
School First-Class Academic Scholarship	Oct. 2023
School First-Class Academic Scholarship	Sep. 2020
First-class Senior Scholarship (2/495)	Dec. 2020

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