Bai Ruofei

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Education

Nanyang Technological University (NTU) **Singapore**
Ph.D. Candidate in Robotics | School of Electrical and Electronics Engineering
GPA: 4.92/5.00 08/2022 till now

Zhejiang University (ZJU) **China**
M.Eng. in Control Theory & Control Engineering | College of Electrical Engineering
GPA: Top 3/42 09/2019 - 03/2022

Zhejiang University (ZJU) **China**
B.Eng. in Automation | College of Electrical Engineering
GPA: 3.93/4.00 09/2015 - 05/2019

Research Experience

Multi-Robot Navigation under Connectivity Constraints | **ICRA 2025** 06/2024 till now

- Design planning algorithms to ensure inter-robot communication & observation for coordination and awareness.
- Formulate Line-of-Sight (LoS) constraints from real-time LiDAR point clouds using visibility analysis in computer vision, eliminating previous limitations on prior environmental model.
- Establish an MR-exploration framework in ROS & Gazebo: robots map unknown environments while keeping LoS connectivity.

Active SLAM-Aware Robot Exploration | **RA-L 2024, IROS 2024** 08/2022 - 05/2024

- Exploit prior topological-metric information for efficient exploration & reliable localization and mapping with active loop-closing.
- Achieve efficient SLAM uncertainty evaluation by relating SLAM uncertainty with predicted pose graph topology via hierarchical pose graph abstraction.
- Prove submodularity property for performance guarantee; verified in single- & multi-robot experiments.

Path & Task Planning with Temporal Logic Specifications | **RAS 22, IROS 21** 01/2020 - 03/2022

- Design a multi-robot task planning framework under both individual and global collaborative task specifications expressed in linear temporal logic (LTL).
- Establish a hierarchical method to synthesize robot plans with independent local strategy search and joint optimization of global tasks.

Work Experience

Planning and Control (PnC) Algorithm Intern | **Autowise.ai** 04/2022 - 06/2022

- Implement and evaluate path planning algorithms for autonomous vehicles, including sampling-based dynamic programming (DP); driving corridor-based quadratic programming (QP); reachability set analysis for driving corridor prediction.
- Develop a patent about merging driving corridors for improved efficiency.

Team member | **Intelligent Car Competition of ZJU** 01/2018 - 06/2018

- Design fuzzy PID control laws to drive a tricycle car following the electromagnetic line in speed race competition. Deal with challenging environments with sharp turns and uphills.
- Win first price in the University Competition (tricycle track).

Software Engineer Intern | **Shenzhen D.Y. Innovations Technology Co. Ltd.** 07/2018 - 09/2018

- Apply Bonjour mDNS protocol to automatically set up IP addresses for devices in a local area network with different operating systems, including Windows, Linux, and Android.

Publications

[1] Realm: Real-Time Line-of-Sight Maintenance in Multi-Robot Navigation with Unknown Obstacles, 2025 IEEE International Conference on Robotics and Automation (ICRA) 2025
Ruofei Bai, S Yuan, K Li, H Guo, WY Yau, L Xie.

[2] Swept Volume-Aware Trajectory Planning and MPC Tracking for Multi-Axle Swerve-Drive AMRs, 2025 IEEE International Conference on Robotics and Automation (ICRA) 2025
T Hu, S Yuan, **Ruofei Bai**, X Xu, Y Liao, F Liu,L Xie.

[3] Graph-based Slam-Aware Exploration with Prior Topo-Metric Information, IEEE Robotics and Automation Letters (RAL) 2024
Ruofei Bai, H Guo, WY Yau, L Xie.

[4] Multi-Robot Active Graph Exploration with Reduced Pose-SLAM Uncertainty via Submodular Optimization, 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024
Ruofei Bai, S Yuan, H Guo, P Yin, WY Yau, L Xie.

[5] Hierarchical Multi-Robot Strategies Synthesis and Optimization under Individual and Collaborative Temporal Logic Specifications, Robotics and Autonomous Systems (RAS) 2022
Ruofei Bai, R Zheng, M Liu, S Zhang.

[6] Multi-Robot Task Planning under Individual and Collaborative Temporal Logic Specifications, 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021
Ruofei Bai, R Zheng, M Liu, S Zhang.

Selected Awards

Singapore International Graduate Award (SINGA) **2022 - 2026**

Outstanding Graduate of Zhejiang Province & ZJU (M. Eng.) | Top 5% **2022**

Outstanding Graduate of Zhejiang Province & ZJU (B. Eng.) | Top 5% **2019**

National Encouragement Scholarship (**all three times**) **2016, 2017, 2018**

Honorable Mention Award for 2016 MCM/ICM **2016**

Skills

Languages: CET-4; CET-6; IELTS 7.0; GRE 153(V)$+169$(Q)$+3.5$(AW)

Programming Languages: Python, C/C++, Matlab, Git

Engineering Software: ROS, Gazebo, Gurobi, G2O, GTSAM

Robot Platforms: TurtleBot3, Pioneer3AT