Guofei CHEN

guofei@cmu.edu Personal Website
5000 Forbes Ave., Pittsburgh, PA, USA, 15213

EDUCATION

Carnegie Mellon University, Robotics Institute *Aug 2023 - May 2025 (expected)*
GPA: 4.0/4.0 — M.S. in Robotics
Advisor: Dr. Ji Zhang and Dr. Wenshan Wang
Research: Mapping and Planning, Navigation Systems

Zhejiang University, Chukochen Honors College *Sep 2019 - Jul 2023*
GPA: 3.95/4.0 — B.E. in Automation
Advisor: Prof. Fei Gao
Research: Multi-robot Localization, Optimization

RESEARCH EXPERIENCE

Interactive Navigation Aug 2023 - Present
Advisor: Dr. Ji Zhang and Prof. Yiannis Aloimonos

- Proposed a new mapping and planning framework, which **considers manipulating objects** while navigating in large-scale complex environments. Searched for the manipulation policy by enforcing stable push, then adopted a visibility graph to model object shapes and encoded the manipulation policy as topological edges to the graph for global planning. The robot could attempt to push objects to shorten the path to the goal while performing global path searches in real-time. (Paper **[1]** accepted by IROS 2024)
- Built open-source full-stack navigation systems, which integrates SLAM, local control, and global planning, on three different hardware platforms: a) Quadruped (Unitree Go2); b) Wheel-legged (Diablo); c) Quadrotor. The corresponding simulations using Unity are also released. The systems emphasize low cost, robustness, and usability, with support for semantic navigation. [website]
- Collaborated on mapping and planning using a visibility graph in 3-dimensional space for quadrotors. The proposed method could build a sparse dynamic visibility graph for global path planning from depth input in real time. It is up to **1000x** faster than SOTA grid-map-based path search methods, e.g. BRRT*, in large-scale or complex environments. (Paper [2] submitted to ICRA 2025)

Relative Localization in Quadrotor Swarm using Range Measurements Nov 2022 - June 2023
Advisor: Prof. Fei Gao

- Proposed a **certifiable** relative pose solver for quadrotor swarm with range measurements using UWB. The solver doesn't need an initial guess for the highly nonlinear problem and outputs the upper bound for the error between the solution and the global optimum. Solver pipeline: 1) Reformulating and convex relaxing the original problem by carefully exploiting the problem structure. 2) Solving the convex but huge problem efficiently with Riemannian staircase and Riemannian elevator algorithms. 3) Recovering the solution to primal. In practice, it usually finds the global optimum when the relative error is smaller than 50% and can run 1Hz to 10Hz when the robot number is smaller than 100, satisfying real-world requirements. [thesis(Chinese)]

RoboCup Robot Soccer Small Size League Team - ZJUNlict June 2020 - July 2022
Advisor: Prof. Rong Xiong, Dr. Zheyuan Huang

- Responsible for: a)planning and motion control module; b) multi-robot coordinate defense module. Reviewed more than 30k lines of code. We were awarded the **champion title** among teams across the nation at *2020* and *2021 RoboCup China Open*. [video] [news]
- Proposed using visibility graph for mapping and planning, which accelerated the planning module by **6 times**. This reduced the planning module time consumption from more than 60% to 10% per execution cycle, which solved the time bottleneck in the high-level decision module caused by planning efficiency. [post]

PUBLICATIONS AND MANUSCRIPTS

1. B. He*, **G. Chen***, W. Wang, J. Zhang, C. Fermuller, Y. Aloimonos.(*: equal contribution) Interactive-FAR: Interactive, Fast and Adaptable Routing for Navigation Among Movable Obstacles in Complex Unknown Environments. 2024 International Conference on Intelligent Robots and Systems (IROS 2024). [paper][video][website]
2. B. He, **G. Chen**, C. Fermuller, Y. Aloimonos, J. Zhang. Air-FAR: Fast and Adaptable Routing for Aerial Navigation in Large-scale Complex Unknown Environments. *Submitted to* 2025 International Conference on Robotics and Automation (*Submitted to* ICRA 2025) [paper][website]
3. Z. Ren, B. Suvonov, **G. Chen**, B. He, Y. Liao, C. Fermuller, J. Zhang. Search-Based Path Planning among Movable Obstacles. *Submitted to* 2025 International Conference on Robotics and Automation (*Submitted to* ICRA 2025)
4. Z. Chen, H. Wang, **G. Chen**, Y. Ma, L. Yao, Z. Ge, Z. Song. Analyzing and Improving Supervised Nonlinear Dynamical Probabilistic Latent Variable Model for Inferential Sensors. *IEEE Transaction on Industrial Informatics*. 2023. [paper]

PROJECTS

Robust Navigation Systems for Interaction, Language, and Beyond Apr 2024 - Present
Advisor: Prof. Ji Zhang, Carnegie Mellon University

- Open-sourced full-stack navigation systems on three robot platforms. Developed, Calibrated, and maintained the SLAM and locomotion of these systems. The system could reliably localize itself, analyze traversability, and move between different locations. Developed the corresponding robot and sensor simulation with Unity, with 20+ realistic simulation environments.
- Created the data collection, labeling, training/fine tuning pipeline for 2D and 3D segmentation and scene understanding using onboard sensors.
- System highlights: a) Unitree Go2 [code]: used only the original onboard lidar, no extra sensors. b) Diablo [code]: a wheel-legged robot with good durability c) Quadrotor [code]: rich simulation environments.

TinySQL - A Relational Database Management System Mar 2022 - Jun 2022
Adivisor: Prof. Yunjun Gao, Zhejiang University

- Built a relational database from scratch using only STL C/C++. Architect of the project, team leader, code reviewer (20k+ lines). Designed the memory model of files for table and index. Implemented the index manager, record manager, and buffer manager. [doc] [code][post]

HONORS AND AWARDS

- 2023 Chiang Chen Overseas Graduate Scholarship (**1 in Zhejiang University, 9 in China**) [Website]
- 2020, 2021 RoboCup (ChinaOpen) Champion of Small Size League [highlights]
- 2020, 2021, 2022 Excellence Award in Academics, Zhejiang University

SKILLS

Programming: C/C++, Python, Lua, MATLAB
Robotics and ML: ROS, Unity, Isaac Sim, Jax
Language: English (TOEFL: 111, S: 25), Mandarin Chinese