

Teng Guo

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Education

University of Science and Technology of China

Bachelor of Physics;

Rutgers, The State University of New Jersey

Ph.D. of Computer Science;

Aug. 2015 – July. 2019

Hefei, Anhui

Sep. 2019 – 2024

New Brunswick, NJ USA

Technical Skills

- Proficiency in programming: Python, C++, Parallel computing, ROS, Unity, Pytorch, Gurobi, Git, Pandas
- Expertise in heuristic search, planning, optimization, control, and machine learning techniques tailored for applications in multi-agent and multi-robot systems.

Experience

The League of Robot Runners, sponsored by Amazon Robotics

Dec. 2022 - Sep. 2023

Software development

remote

- developed the C++ Start-kit, simulators, Pybind module for machine-learning users, and visualization tools for the multi-robot simulation in warehouses
- developed the website page and event pages with React, Node.js, PostgreSQL.
- reviewed and evaluated the state-of-the-art MAPF algorithms

2020 Agile Robotics for Industrial Automation Competition

Jun. 2020-Aug. 2020

Code development

- developed and executed **task planning** and **motion planning** code to control a dual-armed robot equipped with vacuum grippers, making it work smoothly in a constantly changing environment.
- won the third-place position and 2500\$ award in the competition. The highlight video can be found in [ARIAC HIGHLIGHT](#)

Projects

Polynomial-time multi-robot path planning and UAV coordination

Jan. 2022 - Mar. 2022

- Proposed a novel polynomial time multi-robot planning algorithm based on **graph matching** theory and Integer Linear Programming, ensuring constant factor optimality guarantees for 3D scenarios.
- The algorithm is designed to scale efficiently to thousands of robots, achieving an optimality ratio close to $1..x$
- Conduct simulations in Unity and experiments using **Crazyswarm**

Parallel Acceleration of Search-based Algorithms

Jan. 2021 - Jan. 2024

- Proposed **parallel** computational frameworks based on **multi-threading** (MPI and OpenMP) to enhance **Integer Linear Programming**, Conflict-Based Search solvers for multi-robot planning, achieved remarkable speed improvements of 10x-50x

Path planning for multiple autonomous vehicles

July. 2023-Sep. 2023

- Proposed enhanced conflict-based **hybrid state A* search** algorithm and decentralized prioritized inheritance backtracking planners.
- Developed experiential learning-based heuristics aimed at significantly improving success rates by more than 50%

Quadrotor flip maneuver

May. 2020-Sep. 2020

- Engineered a SO(3) **PID** controller in the firmware level specifically tailored to execute precise flips on a physical **Crazyflie**, integrating seamlessly with an onboard flowdeck sensor and Optitrack system in ROS [\[video\]](#)

Bin Picking

May. 2023-Dec. 2023

- Fine-tuned and used Mask-RCNN, SegmentAnything, DepthAnything, Grounded-SAM on custom mix-object datasets for instance segmentation. Applied suction-net to predict suction pose.

Publications

1. **Guo, Teng**, Shuai D. Han, and Jingjin Yu. "Spatial and temporal splitting heuristics for multi-robot motion planning." 2021 IEEE International Conference on Robotics and Automation (ICRA). IEEE, 2021. [\[paper\]](#)
2. **Guo, T.**, and Yu, J. (2023). Toward Efficient Physical and Algorithmic Design of Automated Garages. 2023 IEEE International Conference on Robotics and Automation (ICRA), 1364-1370. [\[paper\]](#), [\[video\]](#)
3. **T. Guo** and J. Yu, "Sub-1.5 Time-Optimal Multi-Robot Path Planning on Grids in Polynomial Time," in Proceedings of Robotics: Science and Systems, New York City, NY, USA, June 2022. [\[paper\]](#), [\[video\]](#)
4. **Guo, Teng**, Si Wei Feng, and Jingjin Yu. "Polynomial time near-time-optimal multi-robot path planning in three dimensions with applications to large-scale uav coordination." 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2022. [\[paper\]](#), [\[video\]](#)
5. **Guo, T.**, Feng, S.W., Szegedy, M., and Yu, J. (2022). Rubik Tables, Stack Rearrangement, and Multi-Robot Path Planning. 2022 58th Annual Allerton Conference on Communication, Control, and Computing (Allerton), 1-4. [\[paper\]](#)
6. **Guo, Teng**, and Jingjin Yu. ". "Efficient Heuristics for Multi-Robot Path Planning in Crowded Environments." 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). [\[paper\]](#) [\[video\]](#)
7. **Guo, T.**, and Yu, J. "Well-Connected Set and Its Application to Multi-Robot Path Planning." 2024 IEEE International Conference on Robotics and Automation (ICRA)
8. **Guo, T.**, and Yu, J. "Decentralized Lifelong Path Planning for Multiple Ackerman Car-Like Robots" 2024 IEEE International Conference on Robotics and Automation (ICRA)
9. Huang, B., **Guo, T.**, Boularias, A., and Yu, J. (2022, May). Interleaving monte carlo tree search and self-supervised learning for object retrieval in clutter. In 2022 International Conference on Robotics and Automation (ICRA) (pp. 625-632). IEEE. [\[paper\]](#) [\[video\]](#)
10. Feng, S.W., **Guo, T.**, Bekris, K.E., Yu, J. (2021). Team RuBot's experiences and lessons from the ARIAC. Robotics Comput. Integr. Manuf., 70, 102126. [\[paper\]](#) [\[video\]](#)
11. Feng, S.W., **Guo, T.**, and Yu, J. (2023). Optimal Allocation of Many Robot Guards for Sweep-Line Coverage. 2023 IEEE International Conference on Robotics and Automation (ICRA), 3614-3620. [\[paper\]](#) [\[video\]](#)