Juncheng Li

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EDUCATION

Nanyang Technological University — **Singapore**
Ph.D. in Electrical & Electronic Engineering, NTU — Jul. 2017 - Now
GPA: 5.0/5.0; NTU Research Scholarship — Supervisor: Prof. Lihua Xie

Tsinghua University — **Beijing, China**
Bachelor in Mechanical Engineering, THU — Aug. 2013 - Jun. 2017
GPA: 87.97/100

RESEARCH

Motion Planning and Control for Automated Guided Vehicles

- Developed a hierarchical trajectory planning and control framework for real-time autonomous navigation of AGVs in warehouse environments without landmarks.
- It can provide accurate tracking performance and handle large uncertainties of the robot dynamics.

Multi-Robot Motion Coordination

- Proposed an efficient motion planning method to generate safe, dynamically feasible, and near-optimal trajectories for multiple non-holonomic robots in a shared workspace.
- The computation time is considerably reduced with a small impact on the optimality of the plans.

Map-less Navigation via Deep Reinforcement Learning

- Developed a DRL-based autonomous navigation method that directly maps raw sensor data and goal information to control commands.
- Proposed a behavior-fusion framework to reduce the learning complexity and enable risk-aware navigation of robots in unknown environments.

SELECTED PUBLICATIONS

Journal Papers

1. **Juncheng Li**, Maopeng Ran, and Lihua Xie, "Efficient Trajectory Planning for Multiple Non-Holonomic Mobile Robots via Prioritized Trajectory Optimization", in *IEEE Robotics and Automation Letters (RA-L)*, 2021. [Paper] [Code] [Video]
2. **Juncheng Li***, Maopeng Ran*, and Lihua Xie, "Design and Experimental Evaluation of a Hierarchical Controller for an Autonomous Ground Vehicle with Large Uncertainties", in *IEEE Transactions on Control Systems Technology*, 2021. [Paper] [Video] (* equal contribution)
3. **Juncheng Li**, Maopeng Ran, and Lihua Xie, "A Behavior-Based Mobile Robot Navigation Method with Deep Reinforcement Learning", in *Unmanned Systems*, 2021. [Paper] [Video]
4. Maopeng Ran, **Juncheng Li** and Lihua Xie, "Reinforcement-Learning-Based Disturbance Rejection Control for Uncertain Nonlinear Systems", in *IEEE Transactions on Cybernetics*, 2021. [Paper]
5. Maopeng Ran, **Juncheng Li** and Lihua Xie, "A New Extended State Observer for Uncertain Nonlinear Systems", in *Automatica*, 2021. [Paper]

Conference Papers

6. **Juncheng Li**, Maopeng Ran, and Lihua Xie, "MPC-Based Unified Trajectory Planning and Tracking Control Approach for Automated Guided Vehicles", in *IEEE International Conference on Control and Automation (ICCA)*, 2019. [Paper] [Video]
7. Han Wang, **Juncheng Li**, Maopeng Ran, and Lihua Xie "Fast Loop Closure Detection via Binary Content", in *IEEE International Conference on Control and Automation (ICCA)*, 2019. [Paper] [Video]
8. Maopeng Ran, **Juncheng Li**, and Lihua Xie, "Active Disturbance Rejection Time-Varying Formation Tracking for Unmanned Aerial Vehicles", in *IEEE International Conference on Control, Automation, Robotics and Vision (ICARCV)*, 2020. [Paper]

PROJECT EXPERIENCE

Development of Dynamic Reconfigurable Material Handling System

Delta-NTU Corporate Laboratory for Cyber Physical Systems Aug. 2017 - Jun. 2021

- The project aims to develop a universal navigation solution adaptable to all types of industrial AGVs.
- The technologies used in this project include simultaneous localization and mapping (SLAM), path and trajectory planning, collision avoidance, robust and accurate tracking control, etc. [Demo1] [Demo2]
- It provides a cost-efficient solution to upgrade conventional AGVs into smart ones.

Efficient and Precision Docking for AGVs in Dynamic Environments

Delta-NTU Corporate Laboratory for Cyber Physical Systems Jul. 2020 - Now

- The project aims to develop a precision and efficient docking solution for AGVs in warehouses.
- Developed a flexible multi-sensory system and fusion algorithms for accurate relative localization. Designed an advanced motion planning and control algorithm for fast precision docking of AGVs with mobile racks, charging stations, and conveyors. [Demo]

SKILLS & PROFICIENCY

Research	**Mobile Robot Motion Planning** **Robust Nonlinear Control** **Deep Reinforcement Learning (DRL)**
Engineering	**Robotics Operating System (ROS)** **Automated Guided Vehicle (AGV)** **Simultaneous localization and mapping (SLAM)** **Programming Ability in C/C++ and Python**