Hao Luan

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Education

University of Toronto — Toronto, ON
Master of Applied Science (M.A.Sc.), Electrical & Computer Engr. — *Sep. 2022 – Nov. 2024 (expected)*

- Relevant coursework: controls, game theory, and robotics.

Harbin Institute of Technology — Shenzhen, CHN
Bachelor of Engineering (B.Eng.), Automation — *Sep. 2017 – Jun. 2021*

- CGPA: 90.1/100, 3.8/4.0
- Thesis: "Distributed Consensus of Multi-Agent Systems with State Constraints under Switching Directed Graphs." [Abstract]

Experience

Research Assistant — Aug. 2021 – Present
Robotic Perception & Intelligence Lab — Southern University of Science and Technology
Supervisor: Prof. Max Q.-H. Meng — *Dept. Electronic & Electrical Engr.*
Co-Supervisor: Dr. Jiankun Wang — *Dept. Electronic & Electrical Engr.*

- Developing an autonomous mobile manipulation platform operating in dynamic environments.
- Researching safe, efficient, and trustworthy planning algorithms for mobile robots.

Undergraduate Research Assistant — Oct. 2019 – Jun. 2021
Multi-Agent Systems Lab — Harbin Institute of Technology, Shenzhen
Supervisor: Prof. Jie Mei — *School of Mechanical Engineering and Automation*

- Proposed a framework addressing the distributed consensus problem for multi-agent systems with constraints, uncertainties, and time-varying directed topologies.
- Presented distributed consensus algorithms, theoretical proof of convergence, numerical simulations, and physical experiments for validation.

Software Development Intern — Mar. 2021 – May 2021
Peng Bo Technology (Shenzhen) Co. Ltd. — Shenzhen, CHN
Supervisor: Dr. Shixin Mao

- Developed drivers for the vehicle chassis of the company's autonoumous robotic cleaning products.

Visiting Research Student — Nov. 2015 – May 2016
Robotics Laboratory — Sun Yat-sen University
Supervisor: Prof. Hui Cheng — *School of Computer Science and Engineering*

- Optimized and implemented a centralized offline task-allocation algorithm for multi-robot systems based on the Ant Colony System.

Publications & Preprints

* indicates co-first authors.

- A. Xiao*, **H. Luan***, Z. Zhao*, Y. Hong, J. Zhao, W. Chen, J. Wang, and M. Q.-H. Meng, "Robotic autonomous trolley collection with progressive perception and nonlinear model predictive control," *International Conference on Robotics and Automation (ICRA)*, 2022. [Page] [PDF]

- **H. Luan**, J. Mei, A.-G. Wu, and G. Ma, "Distributed constrained consensus of multi-agent systems with uncertainties and disturbances under switching directed graphs," 2022. ***Under Review***. [Page] [Abstract]

Selected Academic Services

Conference Reviewing

- IEEE International Conference on Robotics and Automation (ICRA 2022)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)
- IEEE International Conference on Robotics and Biomimetics (ROBIO 20/21)

Awards & Fellowships

ECE Department M.A.Sc. Student Fellowship, University of Toronto	2022 – 2024
Outstanding Bachelor's Thesis (top 4%)	2021
Honorable Mention in the Mathematical Contest In Modeling (MCM)	2020
Undergraduate Academic Merit Scholarship, Harbin Institute of Technology	2018, 2019, 2020
Third Prize in the National Olympiad in Informatics in Provinces (NOIP)	2016
Honor Roll in the American Mathematics Contest (AMC) 12, and invited to the AIME	2016

Selected Projects

Robotic Autonomous Trolley Collection at Airports Aug. 2021 – Present
Advisors: Prof. Max Q.-H. Meng, Dr. Jiankun Wang *SUSTech*

- Developing decision-making modules for a robotic solution to the autonomous trolley collection task at airports. Working on perception-aware planning and multi-robot collaborative manipulation.
- Proposed a safety-critical motion planner prototype for obstacle avoidance and perception-aware planning. Conducted realistic tests and validated the effectiveness of the prototype.

Unmanned Palletizing Using Six-axis Robot Arm Apr. 2020 – Jul. 2020
Advisor: Prof. Yunjiang Lou, Associate Dean *HITSZ*

- Designed robot manipulator control algorithms based on the 6-DOF manipulator's forward and inverse kinematics using LFPB trajectory planning.
- Developed a user interface for managing position information of manipulated objects.
- Achieved fast palletizing and grasping motions with high accuracy.

Vision-Based Auto Parking Oct. 2019 – Dec. 2019
Advisor: Prof. Haoyao Chen *HITSZ*

- Identified a specific parking sign by adopting traditional vision techniques including filtering, color segmentation, perspective transformation, Canny edge detection, polygon envelope, etc.
- Designed an online close-loop controller for a differential-drive autonomous car, employing multiple control schemes and leveraging vision information.
- Integrated searching, detection, and motion control with ROS and realized fully automated parking.

Skills

Languages: English (*TOEFL iBT*® 107/120), Mandarin Chinese (native), Cantonese (native)

Programming: C/C++, Python, Julia, Pascal

Tools: Git, MATLAB/Simulink, Wolfram Mathematica, ROS, VS Code, LaTeX

Miscellaneous

Athletics: Centre Back/Full Back, HITSZ Student Soccer Team 2017 – 2021

Volunteer services: 2018 Hong Kong Universities and Colleges Forum at HITSZ 2018