Xuan Lin

Postdoc Researcher
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Research Interests

Computational methods for motion planning and control of legged locomotion and manipulation.

Academic Positions and Education

Georgia Institute of Technology 2024-present
Postdoctoral Associate, Georgia Tech Manufacturing Institute

University of California Los Angeles 2023-2024
Postdoctoral Associate, Department of Mechanical Engineering

University of California Los Angeles 2023
Doctor of Philosophy, Mechanical Engineering, Major: Systems and Control, Minor: Robotics, Optimization

University of California Los Angeles 2019
Master of Science, Mechanical Engineering, Major: Systems and Control

Awards and Honors

First Place, Humanoid Adult Size division, RoboCup 2024
Finalist, Best Paper Award, UR 2024
Best Paper Award on Safety, Security, and Rescue Robotics, IROS 2019

Invited Talks

"Towards fast mixed-integer quadratic programming algorithms for real-time model predictive control"
Workshop for Generalizable and Robust Decision Making, Planning, and Control for Humanoid Loco-Manipulation, The 2023 IEEE-RAS International Conference on Humanoid Robots, 2023, Austin.

Industrial Experience

Applied Scientist Intern, Amazon Robotics and AI. Supervisor: Aaron Parness, Parker Owan 04/2020 – 09/2020

- My work focused on developing task-space impedance/admittance control on 7-DoF robot arms, and generated heuristics-based trajectory planner to manipulate items in environments crowded by other items
- Part of my work is reported by Amazon Science news "How Amazon Robotics researchers are solving a beautiful problem" (from 0:15 in the video "How the perception system sees available space")

Professional Membership and Service

Journal reviews
- IEEE Transactions on Robotics (T-RO)
- IEEE Transactions on Mechatronics (TMECH)
- IEEE Robotics and Automation Letters (RA-L)
- ASME Journal of Mechanisms and Robotics (JMR)

Conference reviews
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE-RAS 16th International Conference on Humanoid Robots (Humanoids)

Workshop Organizations

- Workshop for Generalizable and Robust Decision Making, Planning, and Control for Humanoid Loco-Manipulation Humanoids 2023, Co-organized with Prof. Yan Gu from Purdue, Prof. Ye Zhao from Gorgia Tech website

Peer Reviewed Publications

[1] **Xuan Lin**, et al. “Optimization Based Motion Planning for Multi-Limbed Vertical Climbing Robots.” 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2019. **(Best Paper Award on Safety, Security, and Rescue Robotics)**

[2] **Xuan Lin**, et al. “Multi-Limbed Robot Vertical Two Wall Climbing Based on Static Indeterminacy Modeling and Feasibility Region Analysis.” 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[3] Y Shirai, **Xuan Lin**, Y Tanaka, A Mehta, D Hong, “Risk-Aware Motion Planning for a Limbed Robot with Stochastic Gripping Forces Using Nonlinear Programming.” 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)/IEEE Robotics and Automation Letters 5 (4), 4994-5001

[4] Jingwen Zhang, **Xuan Lin**, and Dennis W Hong, “Transition Motion Planning for Multi-Limbed Vertical Climbing Robots Using Complementarity Constraints.” 2021 IEEE International Conference on Robotics and Automation (ICRA)

[5] **Xuan Lin**, Gabriel I. Fernandez, Dennis W. Hong, “Multi-Modal Multi-Agent Optimization for LIMMS, A Modular Robotics Approach to Delivery Automation.” 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[6] **Xuan Lin**, Gabriel I. Fernandez, Dennis W. Hong , “ReDUCE: Reformulation of Mixed Integer Programs using Data from Unsupervised Clusters for Learning Efficient Strategies.” 2022 IEEE International Conference on Robotics and Automation (ICRA)

[7] **Xuan Lin**, Min Sung Ahn, and Dennis W Hong, “Designing Multi-Stage Coupled Convex Programming with Data-Driven McCormick Envelope Relaxations for Motion Planning.” 2021 IEEE International Conference on Robotics and Automation (ICRA)

[8] Yusuke Tanaka, **Xuan Lin**, Yuki Shirai, Alexander Schperberg, Hayato Kato, Alexander Swerdlow, Naoya Kumagai, and Dennis Hong, “SCALER: A Tough Versatile Quadruped Free-Climber Robot.” 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[9] Yuki Shirai, **Xuan Lin**, Alexander Schperberg, Yusuke Tanaka, Hayato Kato, Varit Vichathorn, and Dennis Hong, “Simultaneous Efficient Contact-Rich Grasping and Locomotion Optimization Enabling Free-Climbing for Multi-Limbed Robots.” 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[10] Yusuke Tanaka, Yuki Shirai, Zachary Lacey, **Xuan Lin**, Jane Liu, Dennis Hong, “An Under-Actuated Whippletree Mechanism Gripper based on Multi-Objective Design Optimization with Auto-Tuned Weights.” 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). IEEE, 2021.

[11] Shirai, Yuki, **Xuan Lin**, Ankur Mehta, and Dennis Hong. “LTO: Lazy Trajectory Optimization with Graph-Search Planning for High DOF Robots in Cluttered Environments.” 2021 IEEE International Conference on Robotics and Automation (ICRA)

[12] **Xuan Lin**, Gabriel I. Fernandez, and Dennis W. Hong. "Evaluating Data-driven Performances of Mixed Integer Bilinear Formulations for Book Placement Planning." 2024 21st International Conference on Ubiquitous Robots (UR). IEEE, 2024. **(Finalist, Best Paper Award)**

Publications In Progress

[1] **Xuan Lin**. "Accelerate Hybrid Model Predictive Control using Generalized Benders Decomposition." *arXiv preprint arXiv:2406.00780* (2024).

[2] **Xuan Lin**, Jiming Ren, Samuel Coogan and Ye Zhao. “Optimization-based Task and Motion Planning under Signal Temporal Logic Specifications using Logic Network Flow.” ." *arXiv preprint arXiv: 2409.19168* (2024).