YUNHAI HAN

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EDUCATION BACKGROUND

Georgia Institute of Technology 06/2022 - present
Ph.D. in Robotics *GPA: 4.00/4.00*

· **Advisor:** Harish Ravichandar and Ye Zhao

University of California, San Diego (UCSD) 09/2019 - 06/2021
M.S. in Dynamics & Controls, Mechanical and Aerospace Engineering *GPA: 3.846/4.00*

· **Relevant Course:** Robotics
· **Thesis & publication:** A Numerical Verification Framework for Differential Privacy in Estimation

Yanshan University 09/2015 - 07/2019
B.S. in Mechatronics, Mechanical Engineering *GPA: 3.761/4.5, Major GPA: 3.804/4.5*

· **Relevant Course:** Mechatronics *Ranking:* 2^{nd} of 594 (First six semesters)
· **Thesis (in Chinese):** Automatically tracking system using monocular vision algorithm PnP

FILED OF INTERESTS

Learning for contact-rich manipulation, Robot learning

PUBLICATIONS

- **Han. Y**, Liu. Y, Paz. D, and Christensen. I. H, "Auto-calibration Method Using Stop Signs for Urban Autonomous Driving Applications", International Conference on Robotics and Automation, 2021
- Christensen. I. H, Paz. D, H. Zhang, D. Meyer, Hao. X, **Han. Y**, Liu. Y, Andrew. L , Z. Zhong, S. Tang, "Autonomous Vehicles for Micro-Mobility", Autonomous Intelligent System
- **Han. Y**, Liu. F and M. C. YIP, "A 2D Surgical Simulation Framework for Tool-Tissue Interaction", International Conference on Intelligent Robots and Systems, 2020, Workshop
- Liu. F, Li. Z, **Han. Y**, J Lu, F Richter and M. C. YIP, "*Real-to-Sim* Registration of Deformable Soft Tissue with Position-Based Dynamics for Surgical Robot Autonomy", International Conference on Robotics and Automation, 2021
- **Han. Y** and Martínez. S, "A Numerical Verification Framework for Differential Privacy in Estimation", IEEE Control Systems Letters
- **Han. Y**, Batra. R, Boyd. N, Zhao. T, She. Y, Hutchinson. S, Zhao. Y, "Learning Generalizable Vision-Tactile Robotic Grasping Strategy for Deformable Objects via Transformer", arXiv:2112.06374
- M. E. Cao, J. Warnke, **Han. Y**, Ni. Xinpei, Zhao. Y, Coogan. S, "Leveraging Heterogeneous Capabilities in Multi-Agent Systems for Environmental Conflict Resolution", International Symposium on Safety, Security, and Rescue Robotics, 2022
- **Han. Y**, Boyd. N, Ni. Xinpei, Zhao. Y, "Multi-Robot Collaboration with Heterogeneous Capabilities", American Control Conference, 2022

RESEARCH PROJECTS

Auto-calibration Method for Urban Autonomous Driving Applications

- Present a system for dynamic camera calibration based on recognition of stop signs
- Track camera intrinsic parameters with clear convergences to stable values
- Published a paper at **ICRA 2021** as first-author
- Describe the system in a journal paper accepted by **Autonomous Intelligent Systems (AIS), Springer**

Surgical Simulation Framework for Tool-Tissue Interaction

- Propose a framework that continuously tracks the motion of tool and simulates the soft tissue deformation under the tool-tissue interactions
- Compute the implicit Euler energy for the future control and planning task
- Published a paper at **IROS Workshop (Cognitive Robotic Surgery)** as first-author and gave a spotlight presentation

***Real-to-Sim* Registration of Deformable Soft Tissue with Position-Based Dynamics**

- Propose an online, continuous, registration method to bridge from 3D visual perception to position-based dynamics modeling of soft tissues
- Account for differences between the simulation and the real, live surgical scenes
- Published a paper at **ICRA 2021** as third-author

Differentiable Position-based dynamics framework for manipulating soft tissues

- Design a backpropagation algorithm for the inverse control task in PBD framework, which is inspired by the methods used in Neural network
- Compute the optimal control actions to manipulate the soft tissues so that it can be deformed into a target shape

Numerical Verification Framework for Differential Privacy in Estimation

- Design a differential privacy test framework for distributional sensing systems using numerical verification method
- Capable of being easily extended to various estimators for verifying the claimed differential privacy
- Wrap up the algorithms, theoretical & simulation results in **Master's Thesis**
- Published a paper at **L-CSS with ACC option** as first-author

Learning Generalizable Tactile-based Robot Grasping Strategy for Deformable Objects via Transformer

- Propose a Transformer-based robot grasping framework for rigid grippers that leverage tactile information from a GelSight sensor for safe object grasping
- Learn physical feature embeddings from visual & tactile feedback and predict a final grasp through a multilayer perceptron (MLP) under the given grasping strength
- Command an optimal grasping strength to the gripper for safe grasping tasks by sampling through the predictions
- Submitted a paper to **T-MECH** as first-author

AWARDS & HONORS

AWARDS

- *06/2016* China Undergraduate Mathematical Contest in Modelling (CUMCM) — *Second Prize*
- *03/2017* Zhou Peiyuan Mechanics Competition — *National Excellence Award*
- *05/2017* National Undergraduate Electronic Design Contest — *Successful Entry Certificate*
- *09/2017* Asia-Pacific Mathematical contest in modeling (APMCM) — *Second Prize*
- *01/2018* Mathematical Contest in Modeling (MCM/ICM) — *Honorable Mention*
- *08/2018* RM RoboMasters — *Second Prize*

HONORS

- *11/2017* National Scholarship from Chinese Ministry of Education
- *07/2018* Certificate for Attendance of CDIO 2018 Academy (Japan)
- *06/2019* Certificate of Excellent Graduate in Hebei Province
- *09/2022* Georgia Tech IRIM Robotics PhD Fellowship

PROFESSIONAL SERVICE

ICRA 2021	Reviewer
AIM 2021	Reviewer
ICRA 2022	Reviewer
IROS 2022	Reviewer
ACC 2022	Session Chair
SSRR 2022	Reviewer
ICRA 2023	Reviewer

TEACHING EXPERIENCE

MAE145: Robotic Estimation & Planning — Winter. 2021
Teaching Assistant

MAE146: Introduction to ML Algorithms — Spring. 2021
Teaching Assistant

WORKING EXPERIENCE

Georgia Institute of Technology — Summer. 2021 - Spring. 2022
Research Assistant

TECHNICAL SKILLS

Programming	C/C++, Python, MATLAB/Simulink
Tool	STM32, ROS, Drake, Git, Linux, LaTeX
Language	Proficient in English and Chinese