

XIAOFENG GUO

Robotics Institute

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EDUCATION

Carnegie Mellon University

Pittsburgh, U.S.

PhD program in Robotics

Aug. 2020 – present

- GPA: 3.83/4.00
- Advisor: Prof. Guanya Shi, and Prof. Sebastian Scherer
- Anticipated graduation date: Mar. 2026

Tsinghua University

Beijing, China

Bachelor of Engineering in Mechanical Engineering

Aug. 2016 – Jun. 2020

- GPA: 3.56/4.00
- Visiting summer research intern at Georgia Institute of Technology Jul. 2019 – Oct. 2019

PUBLICATIONS AND PATENTS

1. **Guo, X.**, He, G., Xu, J., Mousaei, M., Geng, J., Scherer, S., & Shi, G. (2024). Flying Calligrapher: Contact-Aware Motion and Force Planning and Control for Aerial Manipulation. *IEEE Robotics and Automation Letters*.
2. **Guo, X.**, He, G., Mousaei, M., Geng, J., Shi, G., & Scherer, S. (2024, May). Aerial interaction with tactile sensing. In *2024 IEEE International Conference on Robotics and Automation (ICRA)* (pp. 1576-1582). IEEE.
3. **Guo, X.**, Huang, H. J., & Yuan, W. (2023, October). Estimating Properties of Solid Particles Inside Container Using Touch Sensing. In *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (pp. 8985-8992). IEEE.
4. Huang, H. J., **Guo, X.**, & Yuan, W. (2022). Understanding Dynamic Tactile Sensing for Liquid Property Estimation. In *2022 Robotics: Science and Systems (RSS)*. IEEE.
5. Deng, Y., Guo, D., **Guo, X.**, Zhang, N., Liu, H., & Sun, F. (2020). MQA: Answering the question via robotic manipulation. In *2020 Robotics: Science and Systems (RSS)*. IEEE.
6. **Guo, X.**, Blaise, B., Molnar, J., Coholich, J., Padte, S., Zhao, Y., & Hammond, F. L. (2020, May). Soft foot sensor design and terrain classification for dynamic legged locomotion. In *2020 3rd IEEE International Conference on Soft Robotics (RoboSoft)* (pp. 550-557). IEEE.
7. Deng, Y.^{*}, **Guo, X.^{*}**, Wei, Y.^{*}, Lu, K.^{*}, Fang, B., Guo, D., Sun, F., & Liu, H. (2019). Robot Grasping in Cluttered Environment with Active Exploration. In *2019 International Conference on Intelligent Robots and Systems (IROS)*. IEEE.
8. **Guo, X.**, Mo, A., Luo, C., & Zhang, W. (2018). DSCL Hand: A Novel Underactuated Robot Hand of Linearly Parallel Pinch and Self-adaptive Grasp with Double-Slider Co-circular Linkage Mechanisms. In *2018 International Conference on Intelligent Robotics and Applications (ICIRA)* (pp. 64-76). Springer, Cham
9. A Chinese patent which has been published and is to be authorized: Conccyclic connecting rod gear slide shaft type linear flat clamp self-adaptive finger device, Applicant: Tsinghua University, Inventor: **Xiaofeng Guo**, An Mo, Wenzeng Zhang, Public number: 108818580A
10. A Chinese patent which has been published and is to be authorized: Sucker-gripper composite grabbing device, Applicant: Tsinghua University, Inventor: Bin Fang, Huaping Liu, **Xiaofeng Guo**, Yuhong Deng, Kai Lu, Yixuan Wei, Public number: 109465840A

RESEARCH EXPERIENCE

Universal Aerial Teleoperation/Manipulation

May 2024 – Now

PhD student

CMU

Advisor: Prof. Guanya Shi and Prof. Sebastian Scherer

- We developed a UAM platform that has large workspace and wrench space, having potential to execute versatile aerial manipulation tasks, including inspection, pick and place, etc. We developed the motion planner and controller for the UAM platform to generate reference trajectory and track it accurately. We developed an end-effector-centric interface for human teleoperation, makes it easy to execute versatile tasks and collect human demonstration data.

Flying Calligrapher

Sep. 2023 – May 2024

PhD student

CMU

Advisor: Prof. Guanya Shi and Prof. Sebastian Scherer

- We proposed a contact-aware trajectory planning algorithm to generate dynamically feasible contact force and motion trajectory in the contact plane. We developed a contact-aware hybrid motion-force control algorithm to enable the UAM to track the continuous time varying contact force and motion reference simultaneously, while compensating for friction force. We developed a system and pipeline for a novel aerial calligraphy task.

Aerial Manipulation with Tactile Sensing

Oct. 2022 – Sep. 2023

PhD student

CMU

Advisor: Prof. Guanya Shi and Prof. Sebastian Scherer

- We developed a new aerial manipulator system which integrated tactile sensor with a fully-actuated UAV. We proposed a pipeline that leverages tactile feedback for real-time force tracking using a hybrid motion-force controller and a method to utilize a vision-based tactile sensor for wall texture detection during aerial interaction.

Estimating Properties of Solid Particles using Touch Sensing

Aug. 2020 – Oct. 2022

PhD student

Carnegie Mellon University

Advisor: Prof. Wenzhen Yuan

- We designed and fabricated a high-speed GelSight, a new tactile sensor with both high temporal resolution (815 Hz) and high spatial resolution (640×480). We designed a sequence of actions and designed feature extraction to estimate multiple properties of solid particles, including mass, volume, particle shape, and particle size.

Understanding Dynamic Tactile Sensing for Liquid Property Estimation

Aug. 2021 – Jan. 2022

PhD student

Carnegie Mellon University

Advisor: Prof. Wenzhen Yuan

- We proposed a simple physics-inspired model to explain the liquid oscillation after perturbation and sense that using tactile sensing. We extracted the decay rate and oscillation frequency of the tactile signals to estimate the liquid volume and viscosity.

MQA: Answering the Question via Robotic Manipulation

Oct. 2019 – Aug. 2020

Research Assistant

Tsinghua University

Advisor: Prof. Huaping Liu

- We formulated a novel Manipulation Question Answering (MQA) task. We build a novel MQA dataset including a variety of object models, bin scenarios and question-answer pairs, and established a corresponding benchmark. We designed a deep Q-Network for the robot to effectively generate manipulations actions to complete the MQA task.

Foot Sensor Design and Terrain Classification for Dynamic Locomotion

Jul. 2019 – Oct. 2019

Research Intern

Georgia Institute of Technology

Advisor: Prof. Ye Zhao

- We designed and fabricated a soft contact pad for a legged robot with multiple types of sensors embedded in for acquiring rich sensing information of terrains, using the tactile sensor, acoustic sensor, capacitive sensor, and accelerometers. We performed feature extraction on the multi-modal signals and developed a terrain classification algorithm, which had a high classification accuracy of 96.7%.

Composite Grasping System for Cluttered Environment

Oct. 2017 – Dec. 2019

Research Assistant

Tsinghua University

Advisor: Prof. Huaping Liu

- We designed and fabricated three kinds of composite robotic hands that combined the suction cup and different grippers for efficient grasping. We designed an object recognition algorithm based on tactile sensing and vision. We developed an efficient grasping strategy and trained an active exploration model which can push down the stacked objects to make the cluttered environment sparse until there is an object predicted to be easily grasped.

SELECTED AWARDS AND HONORS

- 1st Prize at Tsinghua Academic and Science Competition Apr. 2019
- School Scholarship of Tsinghua University: Academic Performance Dec. 2018
- 1st Place at the 20th National Robot and Artificial Intelligence Competition Oct. 2018
- 3rd Place at the 13th ASME Student Mechanism and Robot Design Competition Aug. 2018
- School Scholarship of Tsinghua University: Technological Innovation Dec. 2017

ADDITIONAL INFORMATION

Programming Skills and Software: Python, C, C++, MATLAB, Julia, Simulink, ROS/ROS2, SolidWorks, AutoCAD, PyTorch, PyBullet, Gazebo, MuJoCo, Isaac Sim.

Computing platforms: Nvidia Jetson, Arduino, MSP430, STM32

Experimental Skills: 3D Print, Laser Cutter, Lathe, Band Saw, Drill, Soldering Station

Languages: Mandarin (native), English (fluent)