

# XIAOFENG GUO

Robotics Institute

Carnegie Mellon University, U.S.

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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

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## SELECTED PUBLICATIONS AND PATENTS

1. He, G.\*, **Guo, X.\***, Tang, L., Zhang, Y., Mousaei, M., Xu, J., Geng, J., Scherer, S. & Shi, G. (2025). Flying hand: End-effector-centric framework for versatile aerial manipulation teleoperation and policy learning. In *2025 Robotics: Science and Systems (RSS)*. IEEE.
2. **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*.
3. **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.
4. **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.
5. Huang, H. J., **Guo, X.**, & Yuan, W. (2022). Understanding Dynamic Tactile Sensing for Liquid Property Estimation. In *2022 Robotics: Science and Systems (RSS)*. IEEE.
6. 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.
7. **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.
8. 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.
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

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### **Flying Hand: End-Effector-Centric Framework for Versatile Aerial Manipulation Teleoperation and Policy Learning**

May 2024 – Now

*PhD student*

*CMU*

*Advisor: Prof. Guanya Shi and Prof. Sebastian Scherer*

- We propose a unified aerial manipulation framework with an end-effector-centric interface that decouples high-level platform-agnostic decision-making from task-agnostic low-level control.
- Our framework consists of a fully-actuated hexarotor with a 4-DoF robotic arm, a whole-body model predictive controller, and an end-effector-centric interface to receive commands from the high-level policy.
- Based on the high-precision ee-centric whole body MPC, we developed an intuitive ee-centric aerial teleoperation for versatile tasks and an imitation-learning based policies for versatile aerial manipulation.
- Real-world experiments show that the proposed framework significantly improves end-effector tracking accuracy, and can handle multiple aerial teleoperation and imitation learning tasks, including aerial writing, peg-in-hole, pick and place, light bulb changing, etc.

### **Flying Calligrapher: Contact-Aware Motion and Force Planning and Control for Aerial Manipulation**

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

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| • 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

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**Programming Skills and Software:** Python, C++, C, MATLAB, Julia, Isaac Gym, MuJoCo, Gazebo, Pybullet, Taichi, ROS/ROS2, PyTorch, Simulink, SolidWorks, AutoCAD

**Computing platforms:** Nvidia Jetson, Arduino, MSP430, STM32

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

**Languages:** Mandarin (native), English (fluent)