

# Guowei Shi

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## EDUCATION

### Southern University of Science and Technology (SUSTech)

*Master of Engineering in Intelligent Manufacturing and Robotics*

GPA: 3.87 / 4.0

Shenzhen, Guangdong, China

Aug. 2022 - July 2025 (expected)

Advisor: Zhenzhong Jia

### Southern University of Science and Technology (SUSTech)

*Bachelor of Engineering in Robotics Engineering*

GPA: 3.79 / 4.0 (90.45/100.0), Ranking: 4 / 73

Shenzhen, Guangdong, China

Aug. 2018 - July 2022

Advisor: Wei Zhang

## PUBLICATIONS

(\* indicates equal contribution)

### JOURNALS:

[1] Foot Vision: A Vision-Based Multi-Functional Sensorized Foot for Quadruped Robots

Authors: **G. Shi\***, C. Yao\*, X. Liu, Y. Zhao, Z. Zhu and Z. Jia

In: **IEEE Robotics and Automation Letters (RA-L)**, 2024 [[Paper](#)] [[Video](#)] [[IEEE Spectrum](#)]

[2] STAF: Interaction-Based Design and Evaluation of Sensorized Terrain-Adaptive Foot for Legged Robot

Traversing on Soft Slopes

Authors: C. Yao, **G. Shi**, P. Xu, S. Lyu, Z. Qiang, Z. Zhu, L. Ding and Z. Jia

In: **IEEE/ASME Transactions on Mechatronics (TMECH)**, 2024 [[Paper](#)]

[3] TAIL: A Terrain-Aware Multi-Modal SLAM Dataset for Robot Locomotion in Deformable Granular Environments

Authors: C. Yao\*, Y. Ge\*, **G. Shi\***, Z. Wang\*, N. Yang, Z. Zhu, H. Wei, Y. Zhao, J. Wu and Z. Jia

In: **IEEE Robotics and Automation Letters (RA-L)**, 2024 [[Paper](#)] [[Website](#)]

### CONFERENCES:

[4] Adaptive Planar Foot with Compliant Ankle Joint and Multi-modal Sensing for Quadruped Robots

Authors: **G. Shi\***, C. Yao\*, W. Wang, Z. Zhu and Z. Jia

In: **IEEE International Conference on Robotics and Biomimetics (ROBIO)**, 2022 [[Paper](#)]

[5] Predict the Physics-Informed Terrain Properties Over Deformable Soils using Sensorized Foot for Quadruped Robots

Authors: C. Yao\*, **G. Shi\***, Y. Ge, Z. Zhu and Z. Jia

In: **IEEE International Conference on Advanced Robotics and Mechatronics (ICARM)**, 2023 [[Paper](#)]

[6] Are We Ready for Planetary Exploration Robots? The TAIL-Plus Dataset for SLAM in Granular Environments

Authors: Z. Wang\*, C. Yao\*, Y. Ge\*, **G. Shi\***, N. Yang, Z. Zhu, H. Wei, Y. Zhao, J. Wu and Z. Jia

In: **IEEE International Conference on Robotics and Automation Workshop on Field Robotics**, 2024 [[Paper](#)]

[7] Height Control and Optimal Torque Planning for Jumping With Wheeled-Bipedal Robots

Author: Y. Zhuang\*, Y. Xu\*, B. Huang\*, M. Chao, **G. Shi**, X. Yang, K. Zhang, C. Fu

In: **IEEE International Conference on Advanced Robotics and Mechatronics (ICARM)**, 2021 [[Paper](#)] [[Video](#)]

## RESEARCH EXPERIENCES

### ROMA Lab, SUSTech

*Graduate Student Researcher*

Advisor: Zhenzhong Jia

Aug. 2022 - present

#### 1. Vision-based Multi-Functional Sensorized Feet for Quadruped Robots [1]

- **Foot Vision Design:** Proposed the Foot Vision design, which is, to the best of my knowledge, the first vision-based sensorized foot for dynamic legged robots. It integrates a single camera to sense contact forces and torques, estimate surface inclination, and perceive foot-terrain interaction.
- **Foot Pose and Contact Force Estimation:** Developed a vision-based approach for stable foot pose estimation and introduced a learning-based method to estimate 6D contact forces during highly dynamic locomotion.
- **Experimental Validation and Performance:** Conducted extensive experiments demonstrating that Foot Vision significantly improves contact perception for dynamic quadruped locomotion across various environments.

## 2. Terrain-Adaptive Planar Feet for Quadruped Robots [2, 4, 5]

- **Sensorized Planar Foot Design:** Designed a multi-modal sensorized planar foot equipped with IMUs, joint encoders, and force/torque sensors, enabling accurate estimation of local inclination and contact forces for quadruped robots.
- **Foot Sole Optimization:** Optimized the foot sole studs based on foot-terrain interaction mechanics and developed a single-foot testbed to validate the enhanced traction performance of the optimized sensorized foot.
- **Mobility Enhancement on Granular Slopes:** Conducted extensive experiments demonstrating that the planar foot with optimized studs improves quadruped locomotion on granular slopes, enhancing mobility and stability.

## 3. Perception and Control for Legged Locomotion in Harsh Environment [3, 6]

- **Sensor Suite Design:** Designed a sensor suite for mobile robots, including RGBD cameras, Lidar, IMUs, and a global positioning system, to enhance environmental perception.
- **Dataset Collection:** Collected a comprehensive multi-modal SLAM dataset for robot locomotion on deformable granular terrain.
- **Control Development:** Developed a controller utilizing model predictive control (MPC) and whole-body control (WBC) to enable robust quadruped locomotion.
- **Terrain-Aware Controller:** Created a terrain-aware controller that integrates terrain information into the whole-body controller, improving quadruped locomotion on inclined terrains.

**CLEAR Lab, SUSTech**

*Undergraduate Student Researcher*

**Advisors: Wei Zhang**

*July 2019 - July 2022*

### 1. Xiaotian-Hybrid: A Novel Wheeled-Quadruped Platform [Paper]

- **Design and Manufacturing Contribution:** Contributed to the design and manufacture of the wheeled-quadruped robot Xiaotian-Hybrid, combining mobility from wheels and versatility from quadrupedal movement.

### 2. Mini-Nezha: A Novel Wheeled-Bipedal Robot [7]

- **Design and Balance Control Development:** Contributed to the design and development of a balance controller for the wheeled-bipedal robot, enhancing stability and maneuverability.

**Tsinghua University**

*Research Intern*

**Advisor: Wenzeng Zhang**

*June 2021 - Aug. 2021*

### 1. A Novel Multi-Modal Grasping Robot Hand

- **Multi-Modal Gripper Design:** Designed a multi-modal gripper utilizing the dorsum of the fingers for parallel grasping and the phalanges for self-adaptive grasping, enhancing versatility in robotic manipulation.

## HONORS & AWARDS

- Chinese National Encouragement Scholarship, 2020
- Southern University of Science and Technology Excellent Graduate, 2022
- SUSTech Department of Mechanical and Energy Engineering Outstanding Postgraduate Student, 2023
- SUSTech Zhicheng College Scholarship, 2019-2021

## SELECTED COURSES

Matrix Analysis (A+)	Modern Control and Estimation (A-)	Advanced Kinematics and Dynamics of Mechanisms (A)
Walking Robot (A)	Robot Modeling and Control (A)	Machine Learning for Engineering (A)
Soft Robotics (A)	Advanced Robotics Control (A)	Collaborative Robot Learning (A)

## TEACHING ASSISTANT

- **Autonomous Robotic Systems**, SUSTech MEE5115, Graduate-level Spring 2023
- **Fundamentals of Control Engineering**, SUSTech ME307, Undergraduate-level Fall 2022

## SKILLS

<b>Robot platform</b>	Unitree A1 & Go1
<b>Programming</b>	Python, C/C++, Java
<b>Software</b>	SOLIDWORKS, MATLAB, MuJoCo, PyBullet, Gazebo, Issac Gym, Webots
<b>Others</b>	Linux, ROS, Pinocchio, Eigen, OSQP, qpOASES, CasADi, OpenCV, PyTorch