Guowei Shi

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EDUCATION

Southern University of Science and Technology (SUSTech)   **Shenzhen, Guangdong, China**
Master of Engineering in Intelligent Manufacturing and Robotics   *Aug. 2022 - July 2025 (expected)*
GPA: 3.87 / 4.0   Advisor: Zhenzhong Jia

Southern University of Science and Technology (SUSTech)   **Shenzhen, Guangdong, China**
Bachelor of Engineering in Robotics Engineering   *Aug. 2018 - July 2022*
GPA: 3.79 / 4.0 (90.38 / 100.0), Ranking: 4 / 73   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   **Advisor: Zhenzhong Jia**
Graduate Student Researcher   *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   **Advisors: Wei Zhang**
Undergraduate Student Researcher   *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   **Advisor: Wenzeng Zhang**
Research Intern   *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

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