Ruyi Zhou

http://ellinier.github.io

Email : zhouryhit@gmail.com
Mobile : +86-180-5312-8674

Education

Eidgenössische Technische Hochschule Zürich (ETH Zürich) — Switzerland, Zürich
Visiting Ph.D. of Robotics — *Jul. 2022 – Jan. 2024*

- Research topic: Physics-aware navigation for legged robots
- Advisor: Professor Marco Hutter

Harbin Institute of Technology — Harbin, Heilongjiang
Ph.D. of Aerospace Science and Technology — *Sep. 2019 – Present*

- Research Interests: Space robots, Terrain sensing, Physical scene understanding
- Advisor: Professor Liang Ding

Harbin Institute of Technology — Harbin, Heilongjiang
Master of Mechanical Engineering — *Sep. 2017 – Jul. 2019*

- Dissertation: "Research on Modeling of Terrain Geometrical and Mechanical Properties Based on Planetary Rovers' Visual Information"
- Honors: First-class scholarship of Harbin Institute of Technology

Hunan Normal University — Changsha, Hunan
Bachelor of Mechanical Design, Manufacturing and Automation — *Sep. 2013 – Jun. 2017*

- Honors: Excellent Graduation Thesis, National scholarship, National motivational scholarship

Publications

- J. Chen, J. Frey*, R. Zhou, T. Miki, G. Martius, M. Hutter, **Identifying terrain physical parameters from vision-towards physical-parameter-aware locomotion and navigation**, *IEEE Robotics and Automation Letters*, **9(11)**, 9279 - 9286 (2024).
- L. Ding*†, R. Zhou†, T. Yu†, H. Yang, X. He, *et al.* **Lunar rock investigation and tri-aspect characterization of lunar farside regolith by a digital twin**, *Nature Communications*, **15(1)**, 2098 (2024).
- P. Arm*†, G. Waibel†, J. Preisig, T. Tuna, R. Zhou, *et al.* **Scientific exploration of challenging planetary analog environments with a team of legged robots**, *Science Robotics*, **8(80)**, eade9548 (2023).
- W. Feng, L. Ding*, R. Zhou, C. Xu, H. Yang, *et al.* **Learning-Based End-to-End Navigation for Planetary Rovers Considering Non-Geometric Hazards**, *IEEE Robotics and Automation Letters*, **8(7)**, 4084 - 4091 (2023).
- P. Xu, L. Ding*, Z. Li, H. Yang, Z. Wang, H. Gao, R. Zhou, Y. Su, Z. Deng, Y. Huang, **Learning physical characteristics like animals for legged robots**, *National Science Review*, **10(5)**, nwad045 (2023).
- R. Zhou, W. Feng, L. Ding*, H. Yang, H. Gao, *et al.* **MarsSim: A high-fidelity physical and visual simulation for Mars rovers**, *IEEE Transactions on Aerospace and Electronic Systems*, **59(2)**, 1879 - 1892 (2022).
- L. Ding*, P. Xu, Z. Li, R. Zhou, H. Gao, *et al.* **Pressing and rubbing: physics-informed features facilitate haptic terrain classification for legged robots**, *IEEE Robotics and Automation Letters*, **7(3)**, 5990 - 5997 (2022).
- L. Ding*†, R. Zhou†, T. Yu†, H. Gao*, H. Yang*, *et al.* **Surface Characteristics of the Zhurong Mars Rover Traverse at Utopia Planitia**, *Nature Geoscience*, **15(3)**, 171 - 176 (2022).
- L. Ding*†, R. Zhou†, Y. Yuan†, H. Yang, J. Li, *et al.* **A 2-year locomotive exploration and scientific investigation of the lunar farside by the Yutu-2 rover**, *Science Robotics*, **7(63)**, abj6660 (2022).
- Z. Gong, L. Ding*, H. Xing, H. Gao, P. Xu, R. Zhou, Y. Lu, H. Yue, **Suppression in any configuration: A versatile coupling improved multi-objective manipulation framework for modular active vibration isolation system**, *Mechanical Systems and Signal Processing*, **166**, 108478 (2022).
- P. Xu, L. Ding*, Z. Wang, H. Gao, R. Zhou, *et al.* **Contact Sequence Planning for Hexapod Robots in Sparse Foothold Environment Based on Monte-Carlo Tree**, *IEEE Robotics and Automation Letters*, **7(2)**, 826 - 833 (2021).

- P. Xu, L. Ding*, H. Gao, R. Zhou, N. Li, Z. Deng, **Environmental Characterization and Path Planning for Legged Robots Considering Foot-terrain Interaction**, *Journal of Mechanical Engineering*, **56(23)**, 21 - 33 (2020). (in Chinese)
- R. Zhou, L. Ding*, H. Gao, W. Feng, *et al.* **Mapping for Planetary Rovers from Terramechanics Perspective**, in *Proc. IEEE/RSJ Int. Conf. Intelligent Robots Syst.*, Macau, China, China, 1869 - 1874 (2020). **(Finalists of the IROS ICROS Best Application Paper Award)**
- R. Zhou, W. Feng, H. Yang*, H. Gao, N. Li, Z. Deng, L. Ding*, **Predicting Terrain Mechanical Properties in Sight for Planetary Rovers with Semantic Clues**, *arXiv preprint*, arXiv:2011.01872, 2020.
- R. Zhou, W. Feng, Z. Deng, H. Gao, L. Ding*, N. Li, **Sensitivity analysis and dominant parameter estimation of wheel-terrain interaction model**, *Acta Aeronautica et Astronautica Sinica*, 42(1), 24076 (2021). (in Chinese)
- L. Ding*, P. Xu*, H. Gao, Z. Wang, R. Zhou, Z. Gong, G. Liu, **Fault Tolerant Free Gait and Footstep Planning for Hexapod Robot Based on Monte-Carlo Tree**, *arXiv preprint*, arXiv:2006.07550, 2020.
- F. Lv, H. Gao, Y. Bai, N. Li, L. Ding, R. Zhou, Z. Deng, G. Liu, **Extraction of Speed-Independent Vibration Features for Terrain Classification in Lugged-Wheel Rovers**, in *Proc. IEEE Int. Conf. Robot. Biomimetics*, Kuala Lumpur, Malaysia, Malaysia, 1580 - 1585 (2018).

Projects

ESA-ESRIC Space Resources Challenge | *Python, Pytorch, ROS* July. 2022 – September. 2022

- Developed a rock segmentation model for legged robots working on emulated lunar environments.
- Developed a scene semantic segmentation model for semantic mapping of legged robots working on emulated lunar environments.

Common Terrain in Emulated Mars (CTEM) | *Python, Pytorch* Sep. 2019 – Nov. 2020

- Established a well-annotated terrain semantic segmentation dataset for planetary scene understanding.
- Developed a light-weighted terrain semantic segmentation model with competitive accuracy and speed for resources-limited rovers.

Scholarship & Awards

ETH Robotics Research Fellowship Jul. 2023
National Scholarship for Graduate Students Sep. 2022
CSC Visiting Scholarship Aug. 2021
IROS ICROS Best Application Paper Award Finalist Oct. 2019