

WEI ZHU

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EDUCATION

Oct. 1 st , 2020 – Sept. 25 th , 2023	Tohoku University, Japan	Robotics (PhD)
<i>Minors: reinforcement learning, social navigation, multi-agent motion planning, legged robots</i>		
<i>Advisor: Prof. Mitsuhiro Hayashibe</i>		
Sept. 1 st , 2017 – Jun. 30 th , 2020	Nankai University, China	Control Science and Engineering (Master)
<i>Minors: reinforcement learning, nonlinear control, snake robots</i>		
<i>Advisor: Prof. Yongchun Fang</i>		
Sept. 1 st , 2013 – Jun. 30 th , 2017	Nankai University, China	Intelligent Science and Technology (Bachelor)
<i>Minors: reinforcement learning, snake robots</i>		

RESEARCH INTEREST

My research interest lies at the intersection of **control, robotics, and learning**. My research aims to develop intelligent autonomous agents with **deep reinforcement learning** frameworks in either industry (e.g., robotic manipulation and autonomous driving) or human society (e.g., navigation among crowds and multi-agent motion planning). I am interested in making the end-to-end reinforcement learning algorithms applicable both in simulated and real worlds. Applications of my research include motion planning of snake robots, balancing control and motion planning of wheeled bipedal robots, navigation with quadruped and humanoid robots, and visual manipulation with robotic arms.

WORK EXPERIENCE

Apr. 1 st , 2024 – Present	Postdoc	Georgia Institute of Technology
<i>Minors: Reinforcement learning for social navigation with a humanoid robot</i>		
Oct. 13 th , 2023 – Mar. 29 th , 2024	Engineer	JD Logistics, China (Forbes TOP500)
<i>Minors: Path planning for service mobile robots and self-driving cars</i>		
May 29 th , 2023 – Oct. 12 th , 2023	Internship	JD Logistics, China (Forbes TOP500)
<i>Minors: Path planning for service mobile robots</i>		
May 9 th , 2022 – Sept. 23 rd , 2022	Internship	Panasonic, Japan (Forbes TOP500)
<i>Minors: Model based deep reinforcement learning for robot manipulation</i>		

PUBLICATIONS & SUBMISSIONS

PhD Dissertation

Prior Knowledge-free Robot Navigation in Dynamic Environments through Deep Reinforcement Learning, July 2023.

Master Dissertation

Mechanical Design and Intelligent Control of Modular Snake-like Robots, June 2020.

Submission

1. W. Zhu and M. Hayashibe, Sampling Efficient Deep Reinforcement Learning for Dynamic Navigation with Raw Laser Scans, revising.
2. W. Zhu, A. Shamsah, A. Raju, and Y. Zhao, Learn to Navigate through Socially Interactive Environments for Bipedal Robots with Full-body Dynamics, revising.
3. Z. Yao, X. Chen, M. Hayashibe, W. Zhu, and N. Xu, Local Collision Avoidance for Unmanned Surface Vehicles based on an End-to-End Planner with a LiDAR Beam Map, *IEEE Transactions on Intelligent Transportation Systems*, under review, 2024.
4. Z. Yao, X. Chen, M. Hayashibe, N. Xu, T. Yuan, and W. Zhu, Spatiotemporal Feature-Encoded Navigation for USVs in Unpredictable Maritime Scenarios, *IEEE Internet of Things Journal*, under review, 2024.

Journal

1. W. Zhu and M. Hayashibe, Autonomous Navigation System in Pedestrian Scenarios using a Dreamer-based Motion Planner, *IEEE Robotics and Automation Letters* (RA-L), IF4.3, 2023.
2. W. Zhu, and M. Hayashib, A Hierarchical Deep Reinforcement Learning Framework with High Efficiency and Generalization for Fast and Safe Navigation, *IEEE Transactions on Industrial Electronics* (TIE), IF8.1, 2022.
3. W. Zhu, X. Guo, D. Owaki, K. Kutsuzawa, and M. Hayashibe, A Survey of Sim-to-Real Transfer Techniques applied to Reinforcement Learning for Bio-Inspired Robots, *IEEE Transactions on Neural Networks and Learning Systems* (TNNLS), IF14.2, 2021.
4. F. Raza, W. Zhu, M. Hayashibe, Balance Stability Augmentation for Wheel-legged Biped Robot through Arm Acceleration Control, *IEEE Access*, IF3.9, 2021.
5. W. Zhu, X. Guo, Y. Fang, and X. Zhang, A Path-Integral-Based Reinforcement Learning Algorithm for Path Following of an Auto-Assembly Mobile Robot, *IEEE Transactions on Neural Networks and Learning Systems* (TNNLS), IF14.2, 2020.
6. W. Zhu, X. Guo, Y. Fang, and X. Zhang, Development of a Reconfigurable Modular Snake-like Robot and Research on Multiple Motion Modes, *Information and Control*, 2020.
7. X. Guo, W. Zhu, and Y. Fang, Guided Motion Planning for Snake-like Robots Based on Geometry Mechanics and HJB Equation, *IEEE Transactions on Industrial Electronics* (TIE), IF8.1, 2019.
8. Y. Fang, W. Zhu, and Xian Guo, Target-Directed Locomotion of a Snake-Like Robot Based on Path Integral Reinforcement Learning, *Pattern Recognition and Artificial Intelligence*, 2018.

Conference Proceedings

1. W. Zhu and M. Hayashibe, Learn to Navigate in Dynamic Environments with Normalized LiDAR Scans, *IEEE International Conference on Robotics and Automation* (ICRA), 2024.
2. W. Zhu, F. Raza, and M. Hayashibe, Reinforcement Learning based Hierarchical Control for Path Tracking of a Wheeled Bipedal Robot with Sim-to-Real Framework, in *IEEE/SICE International Symposium on System Integration* (SII), 2022.
3. X. Zhang, X. Guo, Y. Fang, and W. Zhu, Reinforcement Learning-based Hierarchical Control for Path Following of a Salamander-like Robot, in *IEEE/RSJ International Conference on Intelligent Robots and Systems* (IROS), 2020.
4. X. Guo, W. Zhu, and Yongchun Fang (2019). Any Curve Path Following of Snake-like Robots, in *IEEE International Conference on Robotics and Biomimetics* (ROBIO), 2019.

5. X. Zhang, Y. Fang, W. Zhu, and X. Guo, A Novel Locomotion Controller Based on Coordination Between Leg and Spine for a Quadruped Salamander-Like Robot, in ***International Workshop on Robot Motion and Control*** (RoMoCo), 2019.
6. W. Zhu, X. Guo, and Y. Fang, Design of a Modular Snake Robot and Control with Internet of Things, in ***Chinese Automation Congress*** (CAC), 2017.

Patent

1. Y. Fang, W. Zhu, X. Guo, and X. Zhang, Auto-assembly Modular Robot, ***Chinese Patent***, No. ZL 2019 1 0083530.X, 2022.
2. Y. Fang, W. Zhu, X. Guo, and X. Zhang, A Claw-bolt-baffle Mechanism, ***Chinese Patent***, No. ZL 2019 1 0083528.2, 2022.

HIGHLIGHTS

1. MEXT Scholarship from Japanese Government (2020.10-2023.9)
2. National Scholarship from Nankai University (2019.12, top 3%)
3. Paper attached video <https://youtu.be/B01vbc-Lx1Q>, 15K views

ACADEMIC SERVICES

Reviewer

- IEEE Robotics and Automation Letters (RA-L)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE Transactions on Industrial Electronics (TIE)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Transactions on Industrial Informatics (TII)
- Scientific Report