



天津工业大学
计算机科学与技术学院

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个人信息

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研究成果

- 提出双足机器人在有限循环步态下的快速收敛模式 (**deadbeat mode**)
- 在欠驱动双足机器人上实现目标步态的控制算法
- 作为技术负责人参与空间站机械臂任务半物理仿真地面验证项目 (**MTVF**)
- 设计了足式机器人混合移动方式的末端执行机构。

教育经历

2012.10-2016.12, 日本北陆先端科技大学院大学, 信息科学系, 博士, 导师: 浅野文彦

2011.10-2012.9, 日本北陆先端科技大学院大学, 信息科学系, 硕士, 导师: 浅野文彦

2010.9-2011.7, 天津大学, 软件工程系, 硕士, 导师: 张加万

2006.9-2010.7, 天津大学, 计算机科学与技术系, 学士

工作经历

2016.4-2019.4, 清华大学, 航天航空学院, 智能空间系统联合实验室, 博士后。

2019.5至今, 天津工业大学, 计算机科学与技术学院, 讲师。

➤ **参与项目：**

1. 中国载人航天技术改造项目，“约束空间机械臂任务半物理仿真验证系统”，2016.12-2018.12，1065万元，型号项目，已结题。（第二参与人）
2. 中国空间技术研究院总体部，载人四批预研项目（921），“XX作业机器人”，2017.12-2019.12，100万元，已结题。（第二参与人）
3. 中国载人航天技术改造项目，批准号TC50LAB-1，“操作任务验证系统（机器人）平台研究”，2015.10-2016.10，565万元，已结题。（第三参与人）
4. 中国空间技术研究院总体部，自由研发项目，“空间机械臂跟踪捕获活动目标”，2016.1-2016.12，45万元，已结题。（第三参与人）
5. 浙江大学，横向课题，浮空作业机械臂集成与飞行试验，35万，2023.2-2024.12，已结题（主持）
6. 清华大学，横向课题，基于蛇形机械臂的狭小空间检测原理演示系统开发，40万，2022.8-2023.12，已结题（主持）

目前研究课题

1. 基于同轴驱动变形机制复合移动机制设计；
2. 多足变形越野机器人移动控制与实验；
3. 超冗余机械臂的运动规划、控制与实验。

招生要求

对机器人领域抱有浓厚热情，善于沟通协作，重视团队配合；喜欢动手实践，敢于探索尝试、勇于创新突破。零基础亦可报名，欢迎热爱科研、积极进取的同学加入团队共同成长。

发表文章

主要研究方向为移动机器人研发与控制，研发了对接式蛇形机器人与混合移动式六足越野机器人，其作品入围 2022 年源创杯全国总决赛。发表机器人顶会 ICRA (CCF B 类)、IROS (CCF C 类)、一区 TMECH、二区 RAL、Multibody Syst Dyn 等期刊/会议 20 余篇。

- 1) F. Asano and X. Xiao, "Role of deceleration effect in efficient and fast convergent gait generation," *2013 IEEE International Conference on Robotics and Automation(ICRA)*, Karlsruhe, Germany, 2013, pp. 5669-5674 (CCF B 会)
- 2) X. Xiao and F. Asano, "Analytical solution of target steady walking speed in 1-DOF limit cycle walking," *2015 IEEE International Conference on Robotics and Automation (ICRA)*, Seattle, WA, USA, 2015, pp. 4525-4531 (CCF B 会)
- 3) Fumihiko Asano, Yanqiu Zheng and Xuan Xiao , "Generation of Underactuated Bipedal Gait Completing in One Step," *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS2016)*, 2050-2055, Oct, (CCF C 会)
- 4) Xiao, X., Asano, F. Generating 1-DOF limit cycle walking at target walking speed by feed-forward and feedback limit cycle control. *Multibody Syst Dyn* 40, 155–175 (2017)
- 5) X. Xiao, O. Ma and F. Asano, "Control walking speed by approximate-kinetic-model-based self-adaptive control on underactuated compass-like bipedal walker," *2017 IEEE International Conference on Robotics and Automation (ICRA)*, Singapore, 2017, pp. 4729-4734 (CCF B 会)
- 6) Fumihiko Asano, Yasunori Kikuchi and Xuan Xiao, "Control of Underactuated Rimless Wheel That Walks on Steep Slope," *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS2017)*, Oct, 2017. (CCF C 会)
- 7) Y. Xue, Y. Zhang, W. Zheng, C. Jiang and X. Xiao, "Design, Control and Experiment of a Snake-like Robot with Gripper," *2020 17th International Conference on Ubiquitous Robots (UR)*, Kyoto, Japan, 2020, pp. 50-55
- 8) Y. Xue *et al.*, "Lywal: a Leg-Wheel Transformable Quadruped Robot with Picking up and Transport Functions," *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, 2021, pp. 2935-2941 (CCF B 会)
- 9) Y. Lin *et al.*, "Innovative Design and Simulation of a Transformable Robot with Flexibility and Versatility, RHex-T3," *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xi'an, China, 2021, pp. 6992-6998 (CCF B 会)
- 10) J. Qu, Z. Zhang, Y. Lin, Y. Zhang, J. Wang and X. Xiao, "A Collision-Free Fast Planning Algorithm for Snake-Like Redundant Manipulators via Reinforcement Learning," *2021 4th International Conference on Pattern Recognition and Artificial Intelligence (PRAI)*, Yibin, China, 2021, pp. 342-346
- 11) Lin Y, Wang J, Xiao X, et al. A snake-inspired path planning algorithm based on reinforcement learning and self-motion for hyper-redundant manipulators[J]. *International Journal of Advanced Robotic Systems*, 2022, 19(4)
- 12) F. Qin *et al.*, "Design and Experiments of Snake Robots with Docking Function," *2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan, 2022, pp. 1208-1214 (CCF C 会)
- 13) C. Sun, G. Yang, S. Yao, Q. Liu, J. Wang and X. Xiao, "RHex-T3: A Transformable Hexapod Robot With Ladder Climbing Function," in *IEEE/ASME Transactions on Mechatronics*, vol. 28, no. 4, pp. 1939-1947, Aug. 2023 (中科院一区)

- 14) Shihao Ma, Fatao Qin, Shufan Chen, Longchuan Li, Jianming Wang, Zengzeng Wang, Shuai Li, Xuan Xiao. Self-adaptive rolling motion for snake robots in unstructured environments based on torque control[J]. *Biomimetic Intelligence & Robotics*, 2023, 3(3):59-66
- 15) Ma, S., Wang, J., Li, L., Qin, F., Li, S., Wang, Z., ... Xiao, X. (2023). A cooperative strategy for snake robots to overcome the extreme terrain. *Advanced Robotics*, 38(1), 1–13.
- 16) Junjie Zhu, Mingming Su, Longchuan Li, Yuxuan Xiang, Jianming Wang, Xuan Xiao, Snake-inspired trajectory planning and control for confined pipeline inspection with hyper-redundant manipulators, *Biomimetic Intelligence and Robotics*, Volume 5, Issue 3, 2025,
- 17) P. Yao et al., "Superior Flexible Tactile Sensor With AI-Based Unit Microstructure Design for Human and Robot Parameters Monitoring Application," in *IEEE Sensors Journal*, vol. 25, no. 12, pp. 21238-21246, 15 June 2025
- 18) M. Dai, Y. Cui, J. Shao, Y. Ma, J. Wang and X. Xiao, "Strategy Design and Experimental Validation of Moving Through Ladders for Hexapod Robot," in *IEEE/ASME Transactions on Mechatronics*, vol. 30, no. 4, pp. 3108-3116, Aug. 2025 (中科院一区)
- 19) Yiliang Wang, Xuan Xiao, Shuqian He, Yanxiang, Han, Shuai Kang, Fumihiko Asano, Isao T. Tokuda and Longchuan Li, Adaptive Morphing and Environmental-Phase-Transition Enables Effective Locomotion inside Granular Media, *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS2025)*, Hangzhou, China, Oct, 2025 (CCF C 会)
- 20) Hao Shen, Yuxuan Yang, Yiliang Wang, Hongwei Zhu, Xintian Zuo, Jianming Wang and Xuan Xiao, Lywal-X: A Novel Wheel-claw Quadruped Robot, *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS2025)*, Hangzhou, China, Oct, 2025 (CCF C 会)
- 21) Zizhu Zhao, Jianming Wang, Michael Albert Sumantri, Chenghui Zhang, Sihan Feng, Xuan Xiao and Shiyong Meng*, JiAo: A Versatile Snake Robot with Elliptical Wheels for Multimodal Locomotion, *IEEE/RSJ International Conference on Intelligent Robots & Systems (IROS2025)*, Hangzhou, China, Oct, 2025 (CCF C 会)
- 22) Xiao, Xuan, Mingming Su, Bailiang Guo, Jingxue Wu, Jianming Wang, and Jiayu Liang. 2025. "Design and Experimental Validation of Pipeline Defect Detection in Low-Illumination Environments Based on Bionic Visual Perception" *Biomimetics* 10, no. 9: 569
- 23) Xiao, X.; Zhao, Z.; Qi, L.; Sumantri, M.A.; Liu, H.; Li, J.; Zheng, K.; Wang, J. Design and Experimental Validation of a Multimodal Snake Robot with Elliptical Wheels. *Biomimetics* 2025, 10, 532.
- 24) Xue, Y.; Wang, W.; Duan, M.; Jiang, N.; Zhang, S.; Xiao, X. Rolling vs. Swing: A Strategy for Enhancing Locomotion Speed and Stability in Legged Robots. *Biomimetics* 2025, 10, 435.
- 25) X. Xiao, K. Zhang, J. Zhu, J. Wang and R. Zhu, "Design and Validation of Docking-Based Cooperative Strategies for Snake Robots in Complex Environments," in *IEEE Robotics and Automation Letters*, 2026, vol. 11, no. 3, pp. 3190-3197, (中科院二区)
- 26) S. Meng, H. Yang, K. Shen, H Xu, G. Chen, J. Wang, and X. Xiao, Bending Perception-Based Variable Stiffness Control for Snake Robots in Pipe Navigation, *2026 IEEE International Conference on Robotics and Automation (ICRA)*, 2026 (CCF B 会 已接收)