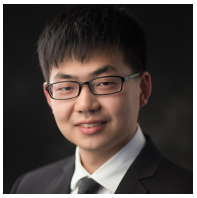
冯朝 (FENG Zhao)

(+86) 18707192582 dadoudou7 1187929257 Google Scholar Blog
个人主页 : https ://mefengzhao.github.io/ orcid.org/0000-0001-7213-9413
fengzhaozhao7@whu.edu.cn fengzhao92@outlook.com
湖北省武汉市武昌区东湖南路 8 号武汉大学工学部九教 A9519
出生年月：1992.09.14 籍贯：河南新乡



简介

冯朝，武汉大学机器人学院副研究员，先后于 2014 年 6 月与 2020 年 6 月在武汉大学动力与机械学院获得工学学士与工学博士学位。2019 年 1 月至 2020 年 3 月，通过国家留学基金委作为联合培养博士生在新加坡国立大学电子与计算机工程系进行交流研究。2020 年 10 月至 2022 年 10 月在澳门大学 UM Macao Postdoctoral Associateship 的资助下进行博士后研究。2022 年 11 月至 2025 年 7 月为武汉大学动力与机械学院副研究员。主要从事面向手术机器人、微操作机器人等精密运动系统的先进控制与驱动的基础理论与方法研究，在跨尺度压电精密驱动、柔顺机构设计、非线性建模、智能控制、人机交互等方面建立了深厚的理论基础。目前主持在研国家自然科学基金青年项目、湖北省自然科学基金、广东省基础与应用基础研究基金、武汉市知识创新专项项目 - 曙光计划与航空科学基金。相关成果已在 IEEE/ASME Transactions on Mechatronics、Mechanical Systems and Signal Processing、Mechanism and Machine Theory、IEEE Robotics and Automation Letters 等 SCI/EI 检索期刊/会议发表论文 40 余篇（其中第一/共一/通讯/共同通讯作者 19 篇），获得 International Conference on Intelligent Robotics and Applications (ICIRA 2016) 最佳学生论文奖，IEEE International Conference on Advanced Robotics and Mechatronics (IEEE ICARM 2018) 最佳论文提名奖，IEEE ICARM 2023 最佳论文提名奖。

教育背景与研究经历

2025 年 7 月 – 至今 **副研究员** , 机器人学院，武汉大学 , 湖北武汉
研究兴趣：柔性机构设计，精密运动控制，机器人系统

2022 年 10 月 –2025 年 7 月今 **副研究员** , 机械工程系，动力与机械学院，武汉大学 , 湖北武汉
研究兴趣：柔性机构设计，精密运动控制，机器人系统

2020 年 10 月 –2022 年 10 月 **Research Fellow, 澳大濠江博士后助学金**，
Faculty of Science and Technology, *University of Macau*, Macau
研究内容：“机器人复杂约束环境下的位置与柔顺接触控制策略”
合作导师 : *Prof. WAN Feng*

2014 年 9 月 –2020 年 6 月 **博士**，机械电子工程，保研直博生，动力与机械学院，武汉大学 , 湖北武汉
博士论文题目：“压电驱动系统的位置/接触力精密跟踪控制方法研究”
导师 : 肖晓晖教授

2019 年 1 月 –2020 年 3 月 **联合培养博士** , Mechatronic Engineering，Department of Electrical and Computer Engineering, *National University of Singapore (NUS)*, Singapore
研究内容：“Position and Force Control of a Piezoelectric Actuator-based Surgical Device”
导师 :*Prof. LEE Tong Heng, Prof. TAN Kok Kiong*

2010 年 9 月 –2014 年 6 月 **本科**，机械设计制造及其自动化，动力与机械学院，武汉大学 , 湖北武汉
毕业设计题目：“面向微操作机器人的三维定位平台设计”
导师 : 肖晓晖教授

研究方向

机构综合 : 柔顺机构设计(Compliant Mechanism)
跨尺度驱动机构(Cross-scale Driving Mechanism)
机械超材料(Mechanical Metamaterial)
连续体机器人(Continuum Robot)

控制方法 : 面向重复/周期信号的迭代学习控制(Iterative Learning Control) 与重复控制(Repetitive Control)
滑模与自适应控制(Sliding Mode and Adaptive Control), 阻抗控制(Impedance Control)
数据驱动控制(Data-driving Control)

应用研究 : 面向靶向穿刺与精密定位的压电驱动操作机器人
面向微创手术的连续体机器人设计与控制
机械臂的位置与柔顺操作

</> 项目经历

2025.01-2027.12 国家自然科学基金青年项目(项目批准号：52405034), 主持
2024.03-2026.03 湖北省自然科学基金青年项目(项目批准号：2024AFB126), 主持
2023.06-2025.06 武汉市科技创新局 - 曙光计划(项目批准号：202301020102025 2), 主持
2025.01-2027.12 广东省基础与应用基础研究基金(项目批准号：2023A1515110156), 主持
2024.05-2025.10 航空科学基金(项目批准号：ASFC202400020S5001), 主持
2014.01-2017.12 国家自然科学基金面上基金(项目批准号：51375349), 项目骨干
2019.01-2020.03 新加坡科技研究局(A*STAR)(项目批准号：1031490002), 项目骨干
2017.05-2019.05 深圳市基础研究计划(项目批准号：JCYJ20170306171514468), 项目骨干

奖励与荣誉

2012.12 2011-2012 年度武汉大学三等奖学金(<15%)
2013.12 2012-2013 年度武汉大学一等奖学金(<5%)
2013.12 2012-2013 年度国家励志奖学金(<2%)
2016.06 武汉大学优秀本科毕业生
2016.08 International Conference on Intelligent Robotics and Applications（(ICIRA 2016) 最佳学生论文奖
2017.12 武汉大学优秀研究生
2018.06 国家建设高水平大学公派研究生项目奖学金(CSC)
2018.06 IEEE International Conference on Advanced Robotics and Mechatronics (ICARM 2018) 最佳会议论文奖入围
2020.06 武汉大学优秀毕业研究生
2020.10 澳大濠江博士后助学金 UM Macao Postdoctoral Associateship (UMPA)
2020.12 武汉大学研究生学术创新奖二等奖
2023.06 武汉大学 2023 届优秀学士论文指导老师
2023.07 International Conference on Advanced Robotics and Mechatronics (ICARM 2023) 最佳会议论文奖入围
2023.08 “ 申昊杯”第五届中国研究生机器人创新设计大赛优秀指导老师
2024.01 武汉大学 2023 年中国研究生创新实践系列大赛优秀指导老师
2024.08 International Conference on Advanced Robotics and Mechatronics (ICARM 2024) Session Chair
2025.06 武汉大学 2023 届优秀学士论文指导老师

学术论文

(1) 期刊论文（第一作者/通讯作者）

1. Zhu, C., **Feng, Z.***, He, J., & Xiao, X. (2025). Rail Transit Line-Sign Text Detection with Patch-based Region Proposal Network. **IEEE Transactions on Intelligent Transportation Systems**. Accepted.
2. Chen, W., Li, R., Li, Y., Ye, T., & **Feng, Z.*** (2025). A novel low-frequency driving and high-speed motion stick-slip piezoelectric actuator based on two-stage compliant amplification mechanisms. **Smart Materials and Structures**. Accepted.
3. Zuo, C., **Feng, Z.***, & Xiao, X. (2024). CMDS-SLAM : real-time efficient centralized multi-robot dense surfel SLAM. **Measurement Science and Technology**, 35(11), 116303.
4. Li, Y., Ye, T., Ling, J., Xiao, X., & **Feng, Z.*** (2024). A novel F-shaped linear guiding mechanism based compliant positioning stage with restricted parasitic motion. **Precision Engineering**, 88, 674-685.
5. Zuo, C., **Feng, Z.***, & Xiao, X. (2024). CCMD-SLAM : communication-efficient centralized multi-robot dense SLAM with real-time point cloud maintenance. **IEEE Transactions on Instrumentation and Measurement**. Accepted.
6. Zhang, H., Zhang, X., **Feng, Z.***, & Xiao, X. (2023). Heterogeneous multi-robot cooperation with asynchronous multi-agent reinforcement learning. **IEEE Robotics and Automation Letters**, 9(1), 159-166.
7. **Feng, Z.**, Liang, W., Ling, J., Xiao, X., Tan, K. K., & Lee, T. H. (2022). Precision force tracking control of a surgical device interacting with a deformable membrane. **IEEE/ASME Transactions on Mechatronics**, 27(6), 5327-5338.
8. **Feng, Z.**, Liang, W.Y., Ling, J., Xiao, X.H., Tan, K.K.,& Lee, T.H.(2021) Adaptive Robust Impedance Control for an Ear Surgical Device with Soft Interaction. **IEEE/ASME Transactions on Mechatronics**, 27(3), 1784-1795.
9. **Feng, Z.**, Ming, M., Ling, J., Xiao, X.H., Yang, Z.X.,& Wan, F. (2022). Fractional Delay Filter based Repetitive Control for Precision Tracking : Design and Application to a Piezoelectric Nanopositioning Stage. **Mechanical Systems and Signal Processing**, 164, 108249.
10. **Feng, Z.**, Liang, W.Y., Ling, J., Xiao, X.H., Tan, K.K.,& Lee, T.H. (2020). Integral Terminal Sliding Mode based Adaptive Integral Backstepping Control for Precision Motion of a Piezoelectric Ultrasonic Motor. **Mechanical Systems and Signal Processing**, 144, 106856.
11. **Feng, Z.**, Ling, J.,Ming, M., Liang, W.Y., Tan, K.K., & Xiao, X.H. (2020). Signal-transformation-based Repetitive Control of Spiral Trajectory for Piezoelectric Nanopositioning Stages. **IEEE/ASME Transactions on Mechatronics**, 25(3), 1634-1645.

12. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2019). Integrated Modified Repetitive Control with Disturbance Observer of Piezoelectric Nanopositioning Stages for High-speed and Precision Motion. **Journal of Dynamic Systems, Measurement, and Control**, 141(8), 081006.
13. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2018). A Model-data Integrated Iterative Learning Controller for Flexible Tracking with Application to a Piezo Nanopositioner. **Transactions of the Institute of Measurement and Control**, 40(10), 3201-3210.
14. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2017). Data-based Double-feedforward Controller Design for a Coupled Parallel Piezo Nanopositioning Stage. **Proceedings of the Institution of Mechanical Engineers, Part I : Journal of Systems and Control Engineering**, 231(10), 881-892.
15. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2017). High-bandwidth and Flexible Tracking Control for Precision Motion with Application to a Piezo Nanopositioner. **Review of Scientific Instruments**, 88(8), 085107.

(2) 会议论文（第一作者/通讯作者）

1. Li, Y., Ye, T., Ling, J., Xiao, X., & **Feng, Z.*** (2023, July). Design, Optimization and Analysis of a Novel Compliant Guiding Mechanism for Piezo-Driven Vibration Microinjection. In 2023 International Conference on Advanced Robotics and Mechatronics (**ICARM**) (pp. 19-24). IEEE.
2. Li, R., Li, J., Li, Y., Chen, W., & **Feng, Z.*** (2024, July). A Modified K-Means GMM-GMR Hysteresis Model for Piezo-Actuated Positioning System. In International Conference on Intelligent Robotics and Applications (pp. 3-14). Singapore : Springer Nature Singapore.
3. **Feng, Z.**, Ling, J., & Shen, Y. (2022, August). Discrete-Time Integral Terminal Sliding Mode based Repetitive Control for Periodic Motion Tracking. In 2022 IEEE 11th Data Driven Control and Learning Systems Conference (**DDCLS'22**) (pp. 1031-1036).
4. **Feng, Z.**, Ling, J., Wan. F., & Yang, Z. X. (2021, May). Iterative Learning Enhanced Integral Terminal Sliding Mode Control for Precision Motion Systems. 2021 IEEE 10th Data Driven Control and Learning Systems Conference (**DDCLS'21**) (pp. 778-783).
5. Liang, W. Y#., **Feng, Z.#**, Wu, Y., Gao, J., Ren, Q., & Lee, T. H. (2020, August). Robust Force Tracking Impedance Control of an Ultrasonic Motor-actuated End-effector in a Soft Environment. In 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**) (pp. 7716-7722).
6. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2019, August). Model-assisted Extended State Observer based Repetitive Control for High Precision Tracking of Piezoelectric Nanopositioning Stages. In 38th Chinese Control Conference (**CCC2019**).
7. **Feng, Z.**, Ling, J., Ming, M., & Xiao, X.H. (2016, August). Data-driven Feedforward Decoupling Filter Design for Parallel Nanopositioning Stages. In International Conference on Intelligent Robotics and Applications (**ICIRA**) (pp. 709-720). Springer, Cham.

(3) 合著论文

1. Ye, T.,**Feng, Z.**, Ling, J., & Li, Y. (2024). A Novel W-Shaped Flexure-Guided Mechanism for High-Frequency Piezo-Actuated Micromanipulations. **IEEE/ASME Transactions on Mechatronics**. Accepted.
2. Duan, Y., Ling, J., **Feng, Z.**, Ye, T., Sun, T., & Zhu, Y. (2024). A survey of needle steering approaches in minimally invasive surgery. **Annals of Biomedical Engineering**, 52(6), 1492-1517.
3. Ling, J., **Feng, Z.**, Chen, L., Zhu, Y., & Pan, Y. (2023). Neural network-based iterative learning control of a piezo-driven nanopositioning stage. **Precision Engineering**, 81, 112-123.
4. Ling, J., Ye, T., **Feng, Z.**, Zhu, Y., Li, Y., & Xiao, X.H (2022). A Survey on Synthesis of Compliant Constant force/torque Mechanisms. **Mechanism and Machine Theory**, 176, 104970.
5. Ling, J., Chen, L., **Feng, Z.**, & Zhu, Y. (2022). Development and test of a high speed pusher-type inchworm piezoelectric actuator with asymmetric driving and clamping configuration. **Mechanism and Machine Theory**, 176, 104997.
6. He, S., Lu, H.,**Feng, Z.**, & Xiao, X.H. Position Tracking for Multi-Channel Double-Crystal Monochromator Scanning Based on Iterative Learning Control. **Actuators** (Vol. 11, No. 7, p. 177).
7. Chen, L., Zhu, Y., Ling, J., & **Feng, Z.** (2022). Theoretical Modeling and Experimental Evaluation of a Magnetostrictive Actuator with Radial-nested Stacked Configuration. **Nonlinear Dynamics**, 1-17.
8. Ren, Q., Zhu, W., **Feng, Z.**, & Liang, W.Y. (2021). Learning-Based Force Control of a Surgical Robot for Tool-Soft Tissue Interaction. **IEEE Robotics and Automation Letters**, 6(4), 6345-6352.
9. Ming, M., Liang, W.Y., **Feng, Z.**, Ling, J., Al Mamun, A., & Xiao, X.H. (2021). PID-type Sliding Mode-based Adaptive Motion Control of a 2-DOF Piezoelectric Ultrasonic Motor Driven Stage. **Mechatronics**, 76, 102543.
10. Ling, J., **Feng, Z.**, Kang, X., & Xiao, X.H. (2021). Bandwidth Enhancement in Damping Control for Piezoelectric Nanopositioning Stages with Load Uncertainty : Design and Implementation. **Journal of Vibration and Control**, 27(11-12), 1382-1394.
11. Chen, L., Zhu, Y.C., Ling, J., & **Feng, Z.** (2021). Development and Test of a Two-dimensional Stacked Terfenol-D Actuator with High Bandwidth and Large Stroke. **IEEE/ASME Transactions on Mechatronics**, 26(4), 1951-1959.
12. Qiu, C.C., Ling, J., Zhang, Y.K., Ming, M.,**Feng, Z.**, & Xiao, X.H. (2021). A Novel Cooperative Compensation Method to Compensate for Return Stroke of Stick-slip Piezoelectric Actuators. **Mechanism and Machine Theory**, 159, 104254.

13. Ye, T.T., Ling, J., Kang, X., **Feng, Z.**, & Xiao, X.H. (2021). A Novel Two-stage Constant Force Compliant Micrograpper. **Journal of Mechanical Design**, 143(5).
14. Ling, J.,**Feng, Z.**, Zheng, D., Yang, J., Yu, H., & Xiao, X.H. (2021). Robust Adaptive Motion Tracking of Piezoelectric Actuated Stages using Online Neural-network-based Sliding Mode Control. **Mechanical Systems and Signal Processing**, 150, 107235.
15. Ming, M., **Feng, Z.**,Ling, J., & Xiao, X.H. (2020). Disturbance Observer based Model Prediction Control with Real-time Modified Reference for a Piezo-actuated Nanopositioning Stage. **Transactions of the Institute of Measurement and Control**, 42(4), 813-822.
16. Ling, J., **Feng, Z.**, Ming, M., Guo, Z., & Xiao, X.H. (2019). Signal Transformed Internal Model Control for Non-raster Scanning of Piezo-actuated Nanopositioning Stages. **International Journal of Control, Automation and Systems**,18(8), 1915-1925.
17. Ling, J., **Feng, Z.**, Ming, M., & Xiao, X.H. (2019). Model Reference Adaptive Damping Control for a Nanopositioning Stage with Load Uncertainties. **Review of Scientific Instruments**, 90(4), 045101.
18. Ling, J., Rakotondrabe, M., **Feng, Z.**, Ming, M., & Xiao, X.H. (2019). A Robust Resonant Controller for High-Speed Scanning of Nanopositioners : Design and Implementation. **IEEE Transactions on Control Systems Technology**. 28(3), 1116-1123.
19. Ming, M., Ling, J., **Feng, Z.**, & Xiao, X.H. (2018). A Model Prediction Control Design for Inverse Multiplicative Structure based Feedforward Hysteresis Compensation of a Piezo Nanopositioning Stage. **International Journal of Precision Engineering and Manufacturing**, 19(11), 1699-1708.

发明专利

1. **冯朝** , 李瑞颉 , 陈万江 , 李嘉鹏 , 罗国相 , 肖晓晖 . 迟滞特性正逆向模型建模方法、系统、设备及存储介质 . 授权 . **专利号：ZL202410973649.5**
2. **冯朝** , 李嘉鹏 , 李帅刚 , 李瑞颉 , 陈万江 , 袁竞一 , 何宇航 . 一种移动机器人行走结构、悬挂结构及移动机器人 . 实审 . **申请号：202410847551.5**
3. **冯朝** , 陈万江 , 李瑞颉 , 李嘉鹏 , 罗国相 , 肖晓晖 . 一种具有二次位移放大功能的压电驱动器 . 实审 . **申请号：202410357397.3**
4. **冯朝** , 李嘉鹏 , 李帅刚 , 李瑞颉 , 袁竞一 , 陈万江 , 徐丽雯 , 何宇航 . 一种基于连杆组的双环变形轮及可移动设备 . 实审 . **申请号：202410878195.3**
5. **冯朝** , 李嘉鹏 , 尚健峰 , 孔伟鹏 , 王文鑫 , 何宇航 . 一种面向神经外科微创手术的连续体机器人 . 实审 . **申请号：202411984816.2**
6. **冯朝** , 尚健峰 , 孔伟鹏 , 何宇航 , 徐丽雯 , 罗宁 . 一种基于牵拉结构的变刚度连续体机器人 . 实审 . **申请号：202411471883.4**
7. 凌杰 , 肖晓晖 , 邱灿程 , **冯朝** , 明敏 , 叶婷婷 . 一种实现双向驱动的粘滑式压电驱动器及控制方法 . 授权 . **专利号 : ZL202010547153.3**
8. 凌杰 , 肖晓晖 , 叶婷婷 , **冯朝** , 明敏 , 邱灿程 . 授权 . 一种连续两行程两级常力输出微夹钳及控制方法 . **专利号：ZL202010563464.9**

(最近更新 :2025 年 8 月 1 日)