Dr. Zhenyu Wei

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EDUCATION

Zhejiang University   Sep 2020 - Jun 2025
Ph.D., College of Control Science and Engineering, Hangzhou, China
- Major in Control Science and Engineering
- Dissertation: Trajectory Optimization and Guidance Control for Payload Fairing Recovery
- Advisor: Zhijiang Shao

Carnegie Mellon University   Sep. 2023 - Sep. 2024
Visiting Ph.D., Department of Chemical Engineering, Pittsburgh, USA
- Research Topic: Distributed Nonlinear Model Predictive Control for Cooperative Rendezvous
- Advisor: Lorenz T. Biegler

Sichuan University   Sep. 2016 - Jun. 2020
B.E., College of Aeronautics and Astronautics, Chengdu, China
- Major in Flight Vehicle Control and Information Engineering

RESEARCH INTEREST

- Numerical optimization; Guidance & control; Reinforcement learning; Multiple vehicle cooperation
- Over five years of experience in nonlinear optimal guidance & control and reinforcement learning; Published 10+ peer-reviewed papers in top-tier journals and influential international conferences; Proven ability to lead or cooperate interdisciplinary projects from concept to implementation.

RESEARCH EXPERIENCE

Research Assistant, Zhejiang University, China   Jan 2025 - Sep 2025
- Proposed a Model predictive deep reinforcement learning algorithm for UAV terminal landing control. The method leverages the prior model knowledge to ensure the validity of the DRL control.
- Proposed a coordinated guidance and control method for multiple UAVs landing. The approach provides collision-free landing trajectories and satisfies the online demand.
- Developed a nonlinear cubic polynomial guidance algorithm for multiple UAVs to accomplish missions with arrival-time constraints. The method is capable of generating trajectories using only three iterations.

Research Assistant, Carnegie Mellon University, USA   Sep 2023 - Sep 2024
- Proposed a distributed control method for an unmanned vehicle cooperative rendezvous mission. The approach is fully distributed and guarantees input-to-state stability for the unmanned air/underwater vehicle cooperative rendezvous process.
- Proposed a coordinated distributed control algorithm for the cooperative recovery of UAV. The method is proven to be stable and effectively realizes cooperative rendezvous of UAV and the vessel despite disturbances.
- Developed an alternate infinite horizon NMPC strategy that overcomes the computational barrier of previous infinite horizon NMPC methods. The resulting NMPC approach is recursively feasible and inherits the stability guarantees of infinite horizon NMPC.

Research Assistant, Zhejiang University, China   Jan 2021 - Jun 2023
- Formulated the dynamic model of a multi-body UAV with heavy payload, and developed closed-loop simulation environment under Python.
- Proposed a guidance and control method to improve UAV terminal landing accuracy. The method leverages the high-order dynamic model to design trajectory optimization and tracking algorithm.
- Proposed a deep reinforcement learning algorithm to achieve the precision landing of a UAV. The approach efficiently provides a smooth control profile and generates the control within 5ms.

Research Assistant, Zhejiang University, China   Jun 2020 - Dec 2020
- Developed a trajectory reconstruction method based on Successive convexification for reusable launch vehicle pin-point landing.
- Developed a moving finite-element method to locate the breakpoints of singular control problems and reduce non-collocation-point error.

Research Assistant, Sichuan University, China   Jan 2018 - May 2019
- Developed a portable UAV for rescue mission. Installed and debugged the flight control system, and trained the image recognition model. Conducted the field test flight of the hand-made UAV.

PUBLICATIONS ([Google Scholar](#))

Journal Papers
[1] **Z. Wei**, Z. Shao, L.T. Biegler, "Distributed control method for vehicle cooperative rendezvous," *Journal of Guidance, Control, and Dynamics*, 2025. DOI: 10.2514/1.G008445
[2] **Z. Wei**, Z. Shao, L.T. Biegler, "Parafoil system cooperative recovery: A coordinated distributed NMPC approach," *IEEE Transactions on Aerospace and Electronic Systems*, 2024.
DOI: 10.1109/TAES.2024.3378193
[3] **Z. Wei**, Y Gao, Z. Shao, C. Wang, "Dynamic-model-based closed-loop guidance and control for heavy parafoil system precision landing," *Aerospace Science and Technology*, 2024.
DOI: 10.1016/j.ast.2024.108964
[4] **Z. Wei**, K Chen, Z. Shao, "Trajectory optimization for collaborative recovery of parafoil systems using unmanned vessel," *Proceedings of the Institution of Mechanical Engineers, Part G: Journal of Aerospace Engineering*, 2023.
DOI: 10.1177/09544100231212647
[5] Y Gao, **Z. Wei**, Z. Shao, W. Chen, Z. Song, L.T. Biegler, "Enhanced moving finite element method based on error geometric estimation for simultaneous trajectory optimization," *Automatica*, 2023.
DOI: 10.1016/j.automatica.2022.110711

Conference Papers
[1] K Chen, **Z. Wei**, Z. Shao, "Six-DoF parafoil system trajectory optimization via nonlinear homotopy-penalty interior-point method," *China Automation Congress*, 2025.
[2] K Chen, **Z. Wei**, Z. Shao, "Nonlinear homotopy-penalty interior-point method for Six-DoF powered landing guidance," *Chinese Process Control Conference*, 2025.
[3] **Z. Wei**, Y. Gao, Z. Shao, "Synchronize the parafoil and the vessel: a hierarchical distributed nonlinear model predictive control approach," *American Control Conference*, 2024.
[4] **Z. Wei**, Z. Shao, "Precision landing of autonomous parafoil system via deep reinforcement learning," *IEEE Aerospace Conference*, 2024.
[5] **Z. Wei**, C Wang, Z. Shao, "Simultaneous trajectory optimization for reusable payload fairing recovery via an initialization-enhanced hp-adaptive pseudospectral method," *AIAA SciTech Forum*, 2024.
[6] **Z. Wei**, Y Gao, Z. Shao, "Autonomous parafoil system precision landing via closed-loop guidance and control considering six-degree-of-freedom model," *AIAA SciTech Forum*, 2024.
[7] K Wang, Z Chen, **Z. Wei**, F. Lu, J Li, "A new smoothing technique for Bang-Bang optimal control problems," *AIAA SciTech Forum*, 2024.

[8] **Z. Wei**, Z. Shao, "Trajectory reconstruction algorithm for powered landing of reusable rockets," *China Automation Congress*, 2022.

Under review
[1] **Z. Wei**, K Wang, Z. Shao, L.T. Biegler, "Coordinated guidance and control for multiple parafoil system landing," *Advances in Space Research*, 2025.
[2] **Z. Wei**, Z. Shao, "Precision terminal landing of autonomous parafoil system: A model predictive deep reinforcement learning approach," *IEEE Transactions on Aerospace and Electronic Systems*, 2025.
[3] D San, Y Tong, **Z. Wei**, O Gerdes, L.T. Biegler, "Nonlinear model predictive control with an infinite horizon approximation," *Journal of Process Control*, 2025.
[4] K Wang, C. Ding, **Z. Wei**, P. Wang, Z Chen, "Ensuring well-posedness in trajectory shaping guidance for impact time control," *Automatica*, 2025.

SKILLS

- Programming: Python, C++/C, Matlab
- Programming Tools: Pyomo, IPOPT, Pytorch, ROS2, Linux, Git, LATEX
- Technical skills: Build fixed-wing UAVs, Debug automatic flight control systems
- Language: Chinese (Native), English (Proficient, IELTS 7.5), Spanish (Beginner)

HONOR AND AWARDS

- Outstanding PhD graduates — Zhejiang University
- PhD Rising Star Scholarship — Zhejiang University
- PhD Freshman Scholarship — Zhejiang University
- Outstanding Undergraduate graduates — Sichuan University
- National Scholarship for Graduate Students — Ministry of Education of China

PROFESSIONAL SERVICE

- Reviewer for ISA Transactions
- Reviewer for Aerospace Science and Technology
- Reviewer for IEEE Transactions on Aerospace and Electronic Systems
- Reviewer for American Control Conference
- Reviewer for AIAA SciTech Forum

FUNDING & PROJECTS

- Participant, National Natural Science Foundation of China (No 61773341)
- Participant, National Natural Science Foundation of China (No 62173301)
- Leader, Zhejiang University Small-Scale Research Fund (Reinforcement Learning Based Guidance and Control for Parafoil System Precision Landing)

REFERENCE

Prof. Zhijiang Shao   szj@zju.edu.cn
College of Control Science and Engineering, Zhejiang University, China

Prof. Lorenz T. Biegler   lb01@andrew.cmu.edu
Department of Chemical Engineering, Carnegie Mellon University, USA

Prof. Kun Wang   wongquinn@zju.edu.cn
Department of Aerospace Engineering, Universidad Carlos III de Madrid, Spain