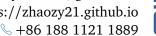
Ziyan Zhao

Ph.D. Candidate in Mechatronic Engineering

A803-3 Lee Shau Kee Science and Technology Building, Tsinghua University, Haidian District, Beijing, China.





EDUCATION

Department of Mechanical Engineering

Tsinghua University

Ph.D. in Mechatronic Engineering

Aug. 2021 - Jun. 2026 (Expected)

- **Ph.D. Supervisor**: Prof. Chuxiong Hu.
- **Fields of Interest**: Sensorless control; Motor drive; Robotics; Embedded development; Deep Reinforcement learning.

Department of Computer Science and Technology

Tsinghua University

Minor in Computer Science; GPA: 3.92/4.0.

Aug. 2018 - Aug. 2021

• Main Courses: C++ Programming; Data structures; Operating systems; Software Engineering; Computer Hardware Technology; Computer Networks; Fundamental Database; Computer Graphics; Introduction to Artificial Intelligence.

Department of Mechanical Engineering

Tsinghua University

Bachelor of Engineering, Mechanical Engineering.

Aug. 2017 - Aug. 2021

- **GPA**: 3.80/4.0; ranking 6 of 133.
- Main Courses: Mechanical Drawing; Design and Manufacturing; System Dynamics and Control;
 Robotics; Testing and Instrumentation; Mechatronic System Design; Product Engineering Design;
 Numerical Control Technology.

HONORS AND AWARDS

• National Scholarship for Postgraduates (Top 2%)	Oct. 2023
• Best Paper Award of 2023 IEEE Conference on Industrial Electronics and Applications	Aug. 2023
• First prize of Tsinghua University Agent Competition (2nd Place of 100+ competitors)	Mar. 2022
• Special Award of Meituan Cup 23rd Electronic Design Competition (1st Place)	Dec. 2021
• 1st Place of the 11th TI-Cup Tsinghua Digital System Innovation Design Competition	Oct. 2021
Tsinghua Future Scholar Scholarship	Aug. 2021
• Beijing Outstanding Undergraduate Award (Top 5%)	Jul. 2021
• Tsinghua Excellent Undergraduate Award (Top 10%)	Jun. 2021
• Excellent Graduation Thesis of Tsinghua University	Jun. 2021
• First prize of Tsinghua University Hardware Design Competition (Top 3 projects)	Sep. 2019

RESEARCHES

Precision Mechatronics and Control Lab Supervisor: Prof. Chuxiong Hu Tsinghua University Beijing, China

o Research on Ideal Sensorless Control of IPMSM

Aug. 2022 - Jun. 2023

- * Proposed the concept of "ideal sensorless control (ISC)", which aims to be applicable across the entire speed range, robust to motor parameter variations, and high in electrical efficiency.
- * Proposed a novel fundamental PWM excitation-based rotor position estimation algorithm that satisfies ISC and realized it using FPGA.
- * Experimental results demonstrate that the ISC offers superior advantages and can be more extensively applied in the field of servo control.
- * The proposed ISC method has the potential for integration with existing industrial systems.
- Back EMF-based Sensorless Control in the Whole Speed Range

Aug. 2021 - Jun. 2022

* Sensorless control technology can reduce costs, simplify the system, and prolong the service life.

- * Traditionally, the poor performance in the low-to-zero speed region limits the application range.
- * Proposed a novel back EMF-based mover position estimator to achieve consistent good accuracy in the whole speed range including high speeds, low speeds, temporary standstill, and speed reversals.
- * Built the entire sensorless drive and control system to verify the proposed algorithm.

INTERNSHIPS

3D Vision Hardware Group Supervisor: Ting Wang

Mech-Mind Robotics Beijing, China

Precision motion control of stepper motors for laser mirrors

Jun. 2021 - Sep. 2021

- * Contributed to replacing traditional costly galvanometer motors with more more compact and economical stepper motors.
- * Deployed Iterative Learning Control (ILC) algorithms to achieve satisfactory scanning precision.
- * Conducted experiments on STM32 platforms to prove the efficacy of the proposed method.

ADDTIONAL EXPERIENCE & PROJECTS

• SnakeGo — The 26th Tsinghua University Agent Competition (THUAC)

Mar. 2022

- * Written thousands of lines AI code to enable the intelligent agent win a game named SnakeGo.
- Resource Defense Battle Meituan Cup 23rd Electronic Design Competition

Dec. 2021

- * Crafted a smart car based on STM32 to compete for virtual resources on the game map.
- Ceramic Additive-Subtractive Composite Manufacturing Equipment

Oct. 2021

- * Designed a new ceramic manufacturing process, summarized as Extrusion-Curing-Milling.
- * Developed the Alpha prototype of the ceramic manufacturing equipment.
- Performance Robot: Steel Tongue Drum Play

Dec. 2019

* Let the robotic arm play steel tongue drum using motion capture technology.

SKILLS

- Languages: Python; C++; C#; Java; Verilog HDL.
- Modeling: MATLAB; Simulink; AutoCAD; Solidworks; Unity3D.
- Embedded development: Linux; ROS; ARM; FPGA; PCB design & assembly.
- AI: Common deep learning frameworks.

PUBLICATIONS

- [1] **Z. Zhao**, C. Hu, S. Wu, Y. Wang, Z. Wang and Y. Zhu, "A Novel Fundamental PWM Excitation-Based Rotor Position Estimation Method for Precision Sensorless Control of IPMSMs," 2023 IEEE 18th Conference on Industrial Electronics and Applications (ICIEA), Ningbo, China, 2023, pp. 28-33, doi: 10.1109/ICIEA58696.2023.10241791. (Best Paper Award)
- [2] **Z. Zhao**, C. Hu, Z. Wang, S. Wu, Z. Liu and Y. Zhu, "Back EMF-Based Dynamic Position Estimation in the Whole Speed Range for Precision Sensorless Control of PMLSM," IEEE Transactions on Industrial Informatics, vol. 19, no. 5, pp. 6525-6536, May 2023, doi: 10.1109/TII.2022.3205941. (**IF=12.3**)
- [3] S. Wu, C. Hu, **Z. Zhao** and Y. Zhu, "High-Accuracy Sensorless Control of Permanent Magnet Linear Synchronous Motors for Variable Speed Trajectories," IEEE Transactions on Industrial Electronics, vol. 71, no. 5, pp. 4396-4406, May 2024, doi: 10.1109/TIE.2023.3288145.
- [4] S. Wu, C. Hu, **Z. Zhao**, R. Zhou and Y. Zhu, "A Novel Flux Estimator Using $\alpha \beta$ Orthogonality Drift Elimination for High Performance Full-Speed-Range Sensorless Control," 2022 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), Sapporo, Japan, 2022, pp. 1315-1320, doi: 10.1109/AIM52237.2022.9863297.
- [5] Y. Wang, C. Hu, Z. Wang, S. Lin, **Z. Zhao**, W. Zhao, K. Hu, Z. Huang, Y. Zhu, Z. Lu, "Optimization-based non-equidistant toolpath planning for robotic additive manufacturing with non-underfill orientation," Robotics and Computer-Integrated Manufacturing, 2023, doi:10.1016/j.rcim.2023.102599.