Zirui Liu

Huazhong University of Sci & Tech. Hubei, China
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ResearchGate·ORCID·Google Scholar·Github.io

SKILLS

Programming: C, MATLAB, Python, LaTeX

Tools: Simulink, Embedded Coder, Altium Designer, JMAG, Pspice

EDUCATION

Ph.D. in Electrical Engineering, Huazhong University of Sci. and Tech. Hubei, China. Jun. 2025

- Thesis: "Real-Time Electro-Thermal Parameters Identification in Nonlinear Models of PMSM"
- Main Subjects: PMSM, Power Electronic, Modern Control & Observe Theory, Data & Model Fusion

B.Sc. in Electrical Engineering and Automation, Hunan University, Hunan, China Jun. 2019

- GPA**: 3.77/4.00** RANK: **2/263**
- Thesis: "Design of Modulation Method for High-speed PMSM"
- Main Subjects: PMSM, Nonlinear system, Sensorless Control, SiC MOSFET

SELECTED PUBLICATIONS LIST

- **Z. Liu,** X. Fan, W. Kong, L. Cao and R. Qu, "Improved Small-Signal Injection-Based Online Multi-parameter Identification Method for IPM Machines Considering Cross-Coupling Magnetic Saturation". *IEEE Transactions on Power Electronics*, vol. 37, no. 12, pp. 14362-14374, Dec. 2022
- **Z. Liu**, W. Kong, X. Fan and R. Qu, "Online Multi-Parameter Observation of IPM Machine with Reconstructed Nonlinear Small-Signal Model Based on Dual EKF". *IEEE Transactions on Industrial Electronics*, vol. 71, no. 2, pp. 1234-1245, Feb. 2024
- **Z. Liu,** B. Shen, W. Kong, X. Fan, K. Peng and R. Qu, "Analytical Approach for Position Observation Error Correction in IPMSM Sensorless Drives Using Online Multi-Parameter Estimation". *IEEE Transactions on Power Electronics*, vol. 39, no. 8, pp. 9230-9243, Aug. 2024
- **Z. Liu**, W. Kong, X. Fan, Z. Li, P. Kai, R. Qu, "Hybrid Thermal Modeling with LPTN-Informed Neural Network for Multi-Node Temperature Estimation in PMSM" *IEEE Transactions on Power Electronics*, vol. 39, no. 9, pp. 10897-10909, Sept. 2024

PROJECTS

100kW High Temperature Integrated Two-level VSI & PMSM System 2019 – 2023

- Power device, capacitor and other controller components early selection and design
- Design of SiC MOSFET module gate drive for high temperature operation (up to 175℃)
- Self-sensing and auto-tuning algorithm for dual three-phase PMSM with Embedded Coder
- Prototype testing in different operation condition

1200 V Cascaded Multilevel Converter 2019 – 2021

- Led early device selection and system modeling simulation
- Designed a gate driver for MOSFET discrete devices and developed a 4-level single-phase prototype
- Developed a capacitor voltage balancing and pre-charge strategy

1kW 28V Low Voltage High-speed Electrical Pump System 2020 – 2021

- Design of control chip, inverter and EMC in one PCB
- Low cost resistor-based phase current sampling with full-closed-loop position sensorless control
- Development of harmonic current injection for low electrolytic capacitance design
- Prototype testing in different operation condition

12kVA interleave DC/DC & Three Phase DC/AC Controller 2020 – 2022

- Schematic design of the control board and power board
- Testing of the integrated interleave Bidirectional DC/DC & Three Phase DC/AC
- Design of the three-layer controller & Power electronic drive & Power loop PCB structure.
- Control strategy for engine starter & generator integration using synchronous reluctance machine

All-In-One Thermal Controller for EV Application 2020 – 2022

- Design and testing of IGBT drive and EMC for integrated controller
- Loss calculation for thermal Finite element analysis
- PCB schematic and layout review
- Simulation design for PMSM and BLDC sensorless control

IPMSM Test Platform for EV Application 2022 – 2024

- FEA for nonlinear flux characteristic analysis for IPMSM
- Up to 20 temperature sensors installed inside different positions
- Developed model & data fusion framework for online thermal modelling and temperature estimation
- Open sourced project on thermal modelling: LPTN-informed-LSTM

AWARDS

Four times The first prize Scholarship 2018, 2022, 2023, 2024
Three times Merit Student 2016, 2017, 2018
Meritorious Winner in The Mathematical Contest in Modeling (MCM) Mar. 2017
Second Prize of Mid China Area in The Undergraduate Electronic Design Contest Nov. 2017
Outstanding Winner in the Future Smart Car Competition Nov. 2021

SERVICES

Reviewer:

- IEEE Transactions on Power Electronics
- IEEE Transactions on Transportation Electrification
- IEEE Journal of Emerging and Selected Topics in Power Electronics
- IEEE Transactions on Industrial Informatics

Conference

- Reviewer of the 7th International Electrical and Energy Conference 2024 (CIEEC 2024)
- Reviewer of the 26th international Conference on Electrical Machines and Systems (ICEMS 2023)
- Reviewer & Volunteer of the 6th International Electrical and Energy Conference 2024 (CIEEC 2023)
- Section Chair of the 3rd China International Youth Conference on Electrical Engineering (CIYCEE 2022)