Advanced Motor Control Algorithms for Electric Vehicles

Research Focus

- Implementation of Computationally Efficient MPC on automotive MCUs.

Contact

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Short Description

This project explores the application of MPC algorithms to automotive motor control systems, leveraging cutting-edge MCUs. The goal is to develop an MPC algorithm tailored for automotive motor control that achieves performance on par with the current industry-leading SVPWM algorithm; under the same switching frequency of the motor controller, this algorithm is expected to further enhance motor phase current quality, reduce harmonic losses, and improve the full-map operating efficiency of automotive electric drives.

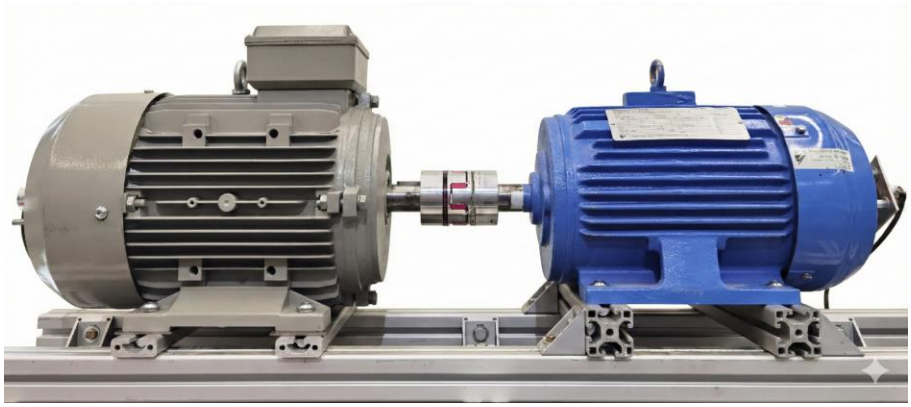

Figure: Motor Test Bench

Publications

- Y. Sun, Y. Wang, Z. Li and Z. Zhang, "A Harmonic-Reduced Vector-Sequence-Variable Predictive Control for Power Converters," *2025 IEEE Energy Conversion Conference Congress and Exposition (ECCE)*, Philadelphia, PA, USA, 2025, pp. 1-5, **DOI**: **10.1109/ECCE58356.2025.11259770.**
- W. Tian**,** Q. Yang, X. Gao, P. Karamanakos, X. Yin, R. Kennel and M. Heldwein, "Fast Indirect Model Predictive Control for Variable Speed Drives," in *IEEE Transactions on Power Electronics*, vol. 38, no. 11, pp. 14475-14491, Nov. 2023, **DOI**: 10.1109/TPEL.2023.3307773.

- Q. Duan, W. Tian, Q. Yang, X. Gao, Y. Mao, P. Karamanakos, R. Kennel and M. Heldwein, "Computationally Efficient Overmodulation Methods for Synchronous Motor Drive Systems," in *IEEE Transactions on Industrial Informatics*, vol. 19, no. 4, pp. 6182-6195, April 2023, **DOI**: **10.1109/TII.2022.3207773**.