PhD - Model Predictive Control of Electrical Drives

Robert-Bosch-Straße, 71701 Schwieberdingen, Germany
Full-time
Legal Entity: Robert Bosch GmbH

Company Description

Do you want beneficial technologies being shaped by your ideas? Whether in the areas of mobility solutions, consumer goods, industrial technology or energy and building technology – with us, you will have the chance to improve quality of life all across the globe. Welcome to Bosch.

The Robert Bosch GmbH is looking forward to your application!

Job Description

Field-Oriented Control (FOC) is since many years the state-of-the-art control strategy for synchronous as well asynchronous machines. However, Model Predictive Control (MPC) is gaining attention as an advantageous alternative due to its superior characteristics, such as the systematic handling of input as well as states constraints.

Your tasks will be to investigate MPC methods for permanent magnet synchronous machines (PMSMs). The aim is to investigate its possible use in light electromobility as well as in high-dynamic small drives. The doctoral thesis will focus on:

- Research and development of nonlinear MPC schemes (e.g. Direct MPC and Indirect MPC) for PMSMs, with focus on product-relevant Key Performance Indices (KPIs), such as improving the Noise, Vibration, and Harshness (NVH) behavior, or reducing the losses via optimal modulation.
- Hardware implementation of the investigated MPC schemes on Field Programmable Gate Arrays (FPGA) and on microcontrollers.
- Investigation of the potential of Artificial Intelligence (AI) methods in combination with MPC (e.g. for the modelling task, or to reduce the high computational demand).
- Evaluation and benchmarking of the proposed control schemes with the state-of-the-art approaches.

Qualifications

- **Education**: Completed Master’s degree in electrical engineering or relevant field
- **Personality**: Independent, systematic and committed way of working
- **Experience and Know-how:** Solid knowledge in electrical drive systems, control theory and numerics, experience in modelling and simulation, especially in Matlab and Matlab Simulink, experience in Rapid-Prototyping, especially with dSPACE, initial experience in the use of AI-libraries, solid programming skills in C and Python, experience in HW-related SW development

- **Languages**: Very good command in German and English languages

Additional Information

The final Phd topic is subject to your university. Start: month year / according to prior agreement

Diversity and inclusion are not just trends for us but are firmly anchored in our corporate culture. Therefore, we welcome all applications, regardless of gender, age, disability, religion, ethnic origin or sexual identity.

Need support during your application?
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Job Location