

Master-thesis: „Optimal control techniques applied to power electronics“

Fraunhofer Institute for Solar Energy Systems ISE is the largest solar research institute in Europe. With our currently approx. 1200 employees, we operate application-oriented research for the technical use of solar energy. The engineers, technicians and students of the department "Power Electronics and Grid Technologies" are researching and developing innovative power electronics and control systems for regenerative energy systems, batteries and electro mobility.



Within the scope of a research project on nonlinear model predictive control approaches (NMPC) applied to power electronics converter systems, we are looking for outstanding students to support our research activities. The aim of the project is to develop a nonlinear model of a grid connected inverter and use NMPC strategies as well as nonlinear estimation techniques to highly improve its performance and capabilities. For this, an inverter and a control platform are available. The controller itself has a hybrid structure, consisting of programmable logic (FPGA) as well as a sequential processing unit (ARM), which shall be exploited to obtain real-time capable performance.

Possible Topics

- System identification and modeling
- Development of nonlinear estimators/observers
- Development of a real-time Linux software framework for the controller platform
- Development and implementation of nonlinear solvers in C and VHDL
- Development and implementation of real-time hybrid controller/estimator structures on a FPGA/CPU platform

Requirements (task dependent)

- Studying at a University or University of Applied Sciences
- Knowledge in fundamental control theory
- Experience in numerical optimization
- Good programming skills (C/VHDL)
- Experience in embedded hard- and software development

Focus: Real-time optimal control techniques
Duration: 6 months
Academic supervision: Moritz Diehl / Andrea Zanelli
Supervisor: Benjamin Stickan
Email: benjamin.stickan@ise.fraunhofer.de
Phone: +49 (0)761 4588 2125