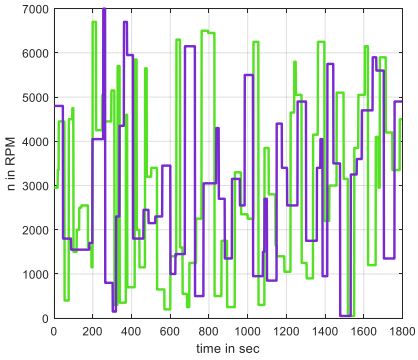
Leistungselektronik und Elektrische Antriebstechnik

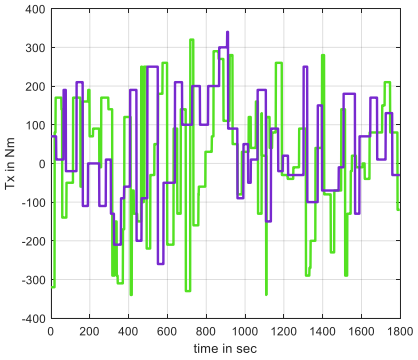
Prof. Dr.-Ing. Joachim Böcker

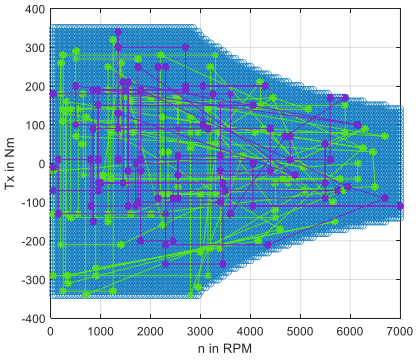
Bachelor / student / project / master thesis

Development of dynamic excitation profile algorithm for permanent magnet synchronous machine temperature estimation application

Permanent magnet synchronous machines are preferred machines for electric automobiles due to their high power and torque density. However, the permanent magnet material in these machines is highly sensitive to change in temperature and they need real-time temperature monitoring both for safe operation and proper functioning of the drive software. For this purpose, empirical data-driven temperature estimation techniques are demonstrated as effective approaches in different literatures. Hence, the electric machine is run at different speed-torque operating machines and exogenous parameters such as speed, current, dc-link voltage, etc. are recorded alongside measured temperatures using preinstalled temperature sensors in parts of the machine. Then, the temperature estimator is modeled and tuned based on the dataset collected. Here, the accuracy of the temperature estimator is highly affected by the quality of the data set in other words the excitation profile (operating points coverage and dynamics). The aim of this thesis is to prepare an efficient excitation profile for empirical measurement-based temperature estimation which minimizes the amount of time spent at the test-bench and maximizes the information content per time to ensure an optimal estimation result.







Task and Goals

- Research and literature review on dynamic experiment design (in particular system excitation)
- Preparation of speed-torque profile for PMSM machines considering electrical and thermal constraints
- Implementation of the profiles using MATLAB-Simulink to be built in dSPACE computers
- Write the documentation in the form of final thesis

Requirements

- Above average performance in the field of electric drive, system identification and optimization
- Prior knowledge of MATLAB-Simulink advantageous (alternatively Python)

Contact

Emebet G. Gedlu, Büro: E4.321, Tel. 05251-60-2220, gedlu@lea.upb.de