BorgWarner

Machine Learning for BLDC motor control

Background

BorgWarner is an automotive supplier with headquarters outside of Detroit, USA. At the site in Landskrona, drivetrain- and four-wheel-drive systems are developed and produced for passenger vehicle manufacturers around the world.

BorgWarner Landskrona has several applications of actuators using a Brushless DC, permanent magnet motor in different actuators. During last years, Machine Learning has become a hot topic, and we believe there could be a possible potential for using Machine Learning for motor control in BorgWarner actuators. A permanent magnet BLDC motor is controlled by sending currents through different coils. Then, a magnetic field is obtained which is applied in different directions to get the shaft with a permanent magnet to rotate. Field oriented control (FOC) is one of the main control approaches, where a typical FOC scheme consists of two inner current loops and one outer speed loop.

Proportional-integral (PI) controllers are commonly used to regulate the motor currents. But there are some ways we believe Machine Learning could be tested to possibly improve the motor control in our actuators. One idea is to replace PI controllers as well as the currently used PWM technique with a neural network, as the PI controllers cannot fully compensate for nonlinearities in the motor.

Tasks

- Implement and validate a simple model of the permanent magnet BLDC motor.
- Implement a Machine Learning strategy for motor control of a BLDC motor.
- Compare the implemented control strategy to the Field-Oriented Control implementation used in actuators today.

The master thesis shall be performed at BorgWarner, Landskrona.

Prerequisites: Control Theory, Machine Learning, MATLAB Simulink.

Result

The thesis outcome should be a written report, simulation models, comparison between ML motor control strategy and FOC and an oral presentation at BorgWarner.

Contact

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