

Software Lab:

Controls Concept for an Electric Motor using a Speedgoat Real-Time Target Machine

Setting

Design, test and validate motor control algorithms for electric motors using Simulink® and Speedgoat hardware. The Speedgoat motor control kit [1] enables you to control a brushless DC motor using field-oriented control (FOC), tune parameters on-the-fly, and estimate motor parameters.

The motor control kit is comprised of a 3-phase inverter module and a brushless DC motor. It works in conjunction with a Speedgoat target computer [2] that is equipped with an Intel 2.0 GHz quad-core CPU and a Simulink-programmable FPGA. The kit also includes documentation and Simulink Models for open- and closed-loop (field-oriented) control, parameter estimation, automatic PID tuning and desktop simulation with Simscape Electrical™.



The rapid control prototyping (RCP) workflow allows to test and verify control designs using real motors and hardware prototypes prior to selecting the final controller hardware.

Tasks

Using the motor control kit, you will develop a motor controls application for an electric vehicle. In the project you will be equipped with the required hardware and receive relevant trainings and learning materials.

- Ramp-up on Simulink and the relevant toolboxes including Simulink Real-Time [3]
- Familiarize with Speedgoat hardware, the motor control kit and the real-time workflow
- Set up an RCP workflow using relevant communication protocols such as Ethernet, CAN-FD and FlexRay
- Develop a set of control algorithms illustrating different control approaches. You will take into account controls with and without position sensing and different levels of complexity.
- [optional] Establish a hardware-in-the-loop (HIL) workflow. This will require setting up a model of the motor and a strategy how to calibrate.

Supervisor

Dr.-Ing. Christoph Hahn, Speedgoat GmbH, christoph.hahn@speedgoat.de

References

- [1] Electric Motor Control Kit, speedgoat.com/products-services/demo-kits/electric-motor-control.
- [2] Baseline real-time target machine, speedgoat.com/products-services/real-time-target-machines/baseline
- [3] Simulink Real-Time, mathworks.com/products/simulink-real-time