Tutorial

Simulations of Electrical Machines and Drives using the Machines and the SmartElectricDrives Library

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Duration

The tutorial will take 2 – 3 hours

Abstract

The tutorial starts with an introduction to electric machines. This includes DC machines, asynchronous machines and permanent magnet synchronous machines. Simple applications of starting and operating the machines will be presented using the Machines package of the Modelica Standard Library. The limits of operation of open loop and mains supplied machines will be discussed.

For operating electric machines at variable speed (or torque) usually closed loop drives are used. The basic principle of a closed loop drive system will be explained. For the examples presented in this tutorial the SmartElectricDrives (SED) library will be used. An overview of the structure of the basic components (source, converter, machine, control unit, sensor and load) of the SED library will be given. The basics of controlling DC machines are outlined, followed by an introduction to space phasors (as the reference frames get explained the transformation blocks in the SED library get pointed out).

The torque controlled drive models of a DC machine, an asynchronous induction machine and a permanent magnet synchronous machine are presented. For these drive types the differences between `TransientDrives` and `QuasiStationaryDrives` will be compared. Then the `Sources` models will be explained and their parameterization will be discussed.

After this two examples using an asynchronous induction machine and a permanent magnet induction machine are shown. These examples will demonstrate the correct use of the bus connectors and the supplementary functions for estimating the control and machine parameters.

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