Motor Application Tuning Wizard

Customize motor control applications to your PMSM

Overview

Current trends in motor control application development are increasing motor drive efficiency, decreasing cost and speeding up time to market. The way to accomplish demanding requirements is an implementation of state-of-the-art motor control algorithms and use of motors capable to be driven with high efficiency.

Freescale offers such solutions with sensorless control of permanent magnet synchronous motors (PMSM). The sensorless algorithm implementation decreases total cost eliminating a rotor position sensor.

Instead of the position sensor, the sensorless algorithm estimates rotor position by calculating a state observer in real time. Such complex routines require precise settings of motor model parameters.

To simplify process of control algorithm parameter calculations, setting and tuning, the Tuning Wizard tool was developed.

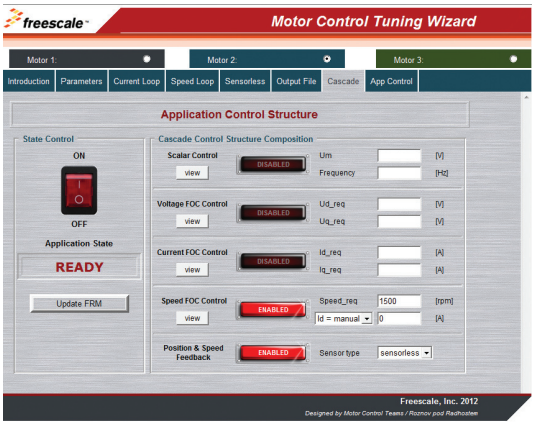
Features

The Tuning Wizard is an HMTL-based user-friendly graphical plug-in tool for FreeMASTER. The tool can be used for PMSM field-oriented control application development and real-time parameter tuning and helps motor control users to adapt Freescale motor control applications to their motors without detailed knowledge of source code and control constant calculations.

Tuning Wizard Key Features

- Static calculation of control parameters
- Real-time tuning of selected control structures
- Storing output constants in header file
- Configurable IDE

Figure 1: Tuning Wizard Control Structure Page



- Up to three PMSMs support
- Fractional 16-, 32-bit and floating number format selector
- Online update of selected application control variables

To run new PMSM using Freescale application code, the input parameters are required to be added into the Tuning Wizard. The parameters are used for calculations of state observer, control loop PI controller and application dependent constants. Required parameters can be taken from the motor data sheet or using a Freescale procedure for PMSM parameter measurement.

The Tuning Wizard plug-in tool consists of several dedicated control tabs. The tab configuration depends on an application type (sensor or sensorless). Available control tabs are:

1. **Introduction:** Basic application description
2. **Parameters:** Obligatory input motor and application parameters
3. **Current loop:** Inner control loop, PI controller (parallel or recurrent form) of d,q currents
4. **Speed loop:** Outer loop, PI controller (parallel or recurrent form), speed ramp and filter
5. **Position and speed:** Sensor selector (quadrature encoder, Hall sensors, SinCos, resolver)
6. **Sensorless:** BEMF DQ observer, tracking observer
7. **Output file:** List of constants generated to output header file in required target format
8. **Cascade:** Application tuning based on cascade control structure (scalar, voltage FOC, current FOC, speed FOC, field weakening)
9. **App control:** FreeMASTER user-defined control page

Freescale Enablement

The Tuning Wizard tool will be delivered as part of the PMSM reference designs to enable users an adaptation of Freescale motor control applications.

Prepared application notes will explain the Tuning Wizard concept from the structure and feature point of view and also how to integrate the plug-in tool to existing motor control applications.

Application notes and other information about the Tuning Wizard tool are available at **freescale.com/motorcontrol**.

How to Reach Us:

Home Page:
freescale.com

Motor Control Portfolio Information:
freescale.com/motorcontrol

e-mail:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
1-800-521-6274
480-768-2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064, Japan
0120 191014
+81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
2 Dai King Street
Tai Po Industrial Estate,
Tai Po, N.T., Hong Kong
+800 2666 8080
support.asia@freescale.com

For more information, visit freescale.com/motorcontrol

Document Number: BBTNGWZRDART REV 0