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 HTML-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

• 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.
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