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Author Ci-Yi Wang
Author's Email Address No Public.
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Abstract
The thesis aims at designing the drives for rotary and linear permanent magnet synchronous motors. Responsiveness, smoothness, and without steady-state error of dynamic response are general requirements of any controlled system. But, there exist uncertainties of parameter variation and external disturbances in the system to bother designers. The sliding-mode control, which provides the merits to overcome deficiency, is first considered in the drive. However, the knowledge of upper bound of the uncertainty has to be assumed such that many control algorithms are proposed to estimate it. In the thesis, instead of estimating this quantity, a fuzzy deadzone compensator is introduced to get rid of the steady-state error due to smaller value of uncertainty bound used in the sliding-mode control drive system.
The designed DSP-based drive includes space vector pulse-width modulation, the combination of sliding-mode control and deadzone compensation, and trajectory planning to obtain precisely positioning. Digital signal processor (DSP) TMS320LF2407 provides built-in analog-to-digital converters (ADCs) to sense currents and quadrature encoder pulse (QEP) to convert the encoder signals to close related loops. Finally, the effectiveness of the designed drive is verified by the step and sinusoidal responses as well as the disturbance rejection.
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