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Abstract
This main research of this thesis is to develop an intelligent sensorless speed controller for permanent magnet synchronous motor (PMSM) using the TI-TMS320F2812 DSP. In sensorless technique, a sliding mode observer and a low-pass filter is utilized to estimates the back-EMF of the PMSM, then the magnetic angle and rotor speed of the motor is obtained using the estimated back-EMF value. These estimated values are feedback for vector control in the current loop and for speed control in the speed loop. To increase the performance of the speed controller, an adaptive fuzzy controller consisted by a fuzzy controller, a reference model and adjustable mechanism is applied and the rules of the fuzzy controller can be updated in real time by adjustable mechanism. Combined the sensorless technique and adaptive control technique into the speed controller of the PMSM drives, and the performance can be improved, the cost can be reduced and the reliability can be increased. The DSP chip used in the thesis has the complete motor peripheral which includes 12 channels of PWM output, 2 set of QEP input, 12 channels 12-bit A/D converter and 56 bits GPIO, and, therefore it is very suitable for develop a fully digital AC motor drives which need to perform the functions of the intelligent controller, coordinate transformation, SVPWM output, QEP detection, vector control and magnetic angle estimating method. At last, an experimental system, based on TI TMS320F2812 DSK board, is set up and some experimental results are proven the correctness and validity of the proposed control algorithm.
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