URN etd-0407109-183704-218
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Statistics This thesis had been viewed 53 times. Download 0 times.
Department
Year 2007
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title DSP-Based Design and Implementation of a Sensorless Speed Control System for Treadmill
Date of Defense 0000-00-00
Page Count 103
Keyword
DSP
Sensorless control
Sliding mode observer

Abstract
The thesis develops a TMS320F2812 DSP-based (Digital Signal Processor) sensorless speed control system for an treadmill. In this system, the PMSM (Permanent Magnet Synchronous Motor) attached only Hall sensors but without encoder sensor, is used as the actuator. We design two modes in controlling the PMSM of treadmill. In starting mode, Hall sensor is used to detect the magnet position and the six-step square wave with PWM (Pulse Width Modulation) function is adopted to control the motor running speed. In normal mode, the developed sensorless speed controller based on the estimation of the motor back-EMF through a sliding mode observer and a cascaded low-pass filter to estimate the flux angle and the rotor speed is proposed. Then, those estimated values are feedback for vector control in the current loop of the PMSM drive and for speed control in the speed loop of the PMSM drive. However, all the control technologies proposed in this thesis are implemented by a TMS320F2812 DSP. That is, the functionalities needed for driving a sensorless PMSM motor of treadmill, such as SVPWM output generation, detection of magnetic pole position, commutation logic and switching strategy, estimation by hall sensor signal, rotor speed estimation, current vector control, are all implemented by the software in a DSP chip. Finally, an treadmill is used to validate the effectiveness of the proposed DSP-based sensorless speed control system.
Advisory Committee Ying-Shieh Kung - advisor

Files No Any Full Text File.
Date of Submission 2008-08-04