

Tithiwat Therdbankerd 2010: Improved Adaptive Sliding Mode Controller Design and Parameter Identification using Particle Swarm Optimization for Linear Permanent Magnet Synchronous Motor. Master of Engineering (Information and Communication Technology for Embedded Systems), Major Field: Information and Communication Technology for Embedded Systems, Department of Electrical Engineering. Thesis Advisor: Assistant Professor Peerayot Sanposh, D.Sc. 100 pages.

Accurate and effective parameter identification is an important engineering task in high performance control system design. One emerging approach to effectively identify such nonlinear or dynamic unknown parameters is to use Particle Swarm Optimization (PSO) algorithm. Linear Permanent Magnet (LPM) motor is a high performance actuator employed in many applications that require direct linear motion without mechanical transmission for high acceleration and accurate positioning.

However, the knowledge of the LPM motor parameters alone do not guarantee that the nominal values of the LPM motor parameters are sufficient for all controllers. A sliding mode control, which has a simple structure and robustness properties, can overcome the uncertain parameter variations and external disturbances. Although the adaptive sliding mode controller can effectively reduce some of the chattering phenomena, it is still susceptible to large external disturbances and large parameter variations.

Therefore, this thesis proposes: (1) a simple PSO based method with chirp input signals to identify the LPM motor's parameters and (2) an improved adaptive sliding mode controller to reduce the chattering phenomena to control the LPM motor.

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