Stabilization of a Three-Pole Active Magnetic Bearing by Hybrid Control Method in Static Mode

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Abstract : The design and implementation of the hybrid control method for a three-pole active magnetic bearing (AMB) is proposed in this paper. The system is inherently nonlinear and conventional nonlinear controllers are a little complicated, while the proposed hybrid controller has a piecewise linear form, i.e. linear in each sub-region. A state-feedback hybrid controller is designed in this study, and the unmeasurable states are estimated by an observer. The gains of the hybrid controller are obtained by the Linear Quadratic Regulator (LQR) method in each sub-region. To evaluate the performance, the designed controller is implemented on an experimental setup in static mode. The experimental results show that the proposed method can efficiently stabilize the three-pole AMB system. The simplicity of design, domain of attraction, uncomplicated control law, and computational time are advantages of this method over other nonlinear control strategies in AMB systems.

Keywords : active magnetic bearing, three pole AMB, hybrid control, Lyapunov function