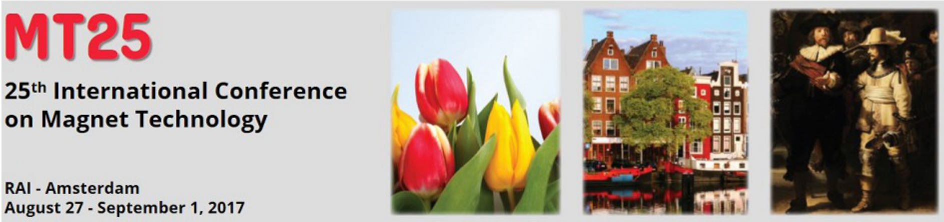

Contribution ID: **373** Type: **Poster Presentation of 1h45m**

Decoupling Control Based on Linear/Nonlinear Active Disturbance Rejection Switching for 3 Degrees of Freedom HMB

Monday, 28 August 2017 13:15 (1h 45m)

The hybrid magnetic bearing (HMB) is an electromagnetic device which supports the rotor without mechanical contact by using the attractive electromagnetic force and permanent magnet force. Compared with the conventional bearings, the HMB possesses several advantages such as no friction, no lubrication and sealing, high speed, high precision, long service life. Thus, the HMB has a broad prospect of application in the modern rotating machinery, including high-speed machine tool spindle, nuclear energy, flywheel energy storage system, and so on. As the most key part of the HMB system, the controller not only determines the rotor levitation performance, but also directly affects the key indexes of the HMB such as the turning precision of the rotor and bearing capacity. Thus, the design of the controller is particularly important in the design of the HMB system. Active disturbance rejection control (ADRC) is not dependent on the accurate mathematical model of the controlled object, and has characteristics such as high precision, low overshoot, fast convergence speed, and etc. To realize the high precision nonlinear decoupling control of the HMB, a linear/nonlinear active disturbance rejection switching control (SADRC) is proposed in this paper. Firstly, the basic structure of the HMB is introduced in detail, and the mathematical model of the suspension forces is developed by utilizing the equivalent magnetic circuit method. Secondly, a control strategy based on the SADRC is proposed. Then, the PID and SADRC model are designed and compared, and the simulation results show that the decoupling effect of the SADRC is better than that of the PID control. Finally, an experimental setup of HMB is built, and the feasibility and effectiveness of the proposed decoupling control strategy is validated with the results of the experiments.

Submitters Country

China

Primary authors: Prof. ZHU, Huangqiu (Jiangsu university); ZHAO, Zelong (Jiangsu University); ZHAO, Chenyin

Presenter: ZHAO, Chenyin

Session Classification: Mon-Af-Po1.05

Track Classification: E4 - Levitation and Magnetic Bearings