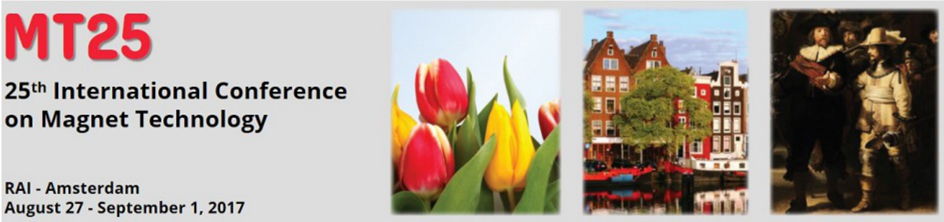

Contribution ID: **369** Type: **Poster Presentation of 1h45m**

Decoupling Control of Bearingless Permanent Magnet Synchronous Motor Using ANFIS Inverse System

Thursday, August 31, 2017 1:45 PM (1h 45m)

A bearingless permanent magnet synchronous motor (BPMSM) is a new type of motor with the magnetic bearing function applied to the traditional permanent magnet synchronous motor. Besides of the simple structure, high efficiency, and high torque density, the BPMSM can operate with no friction, no wear, high-speed and high-precision, and so on, which show great potential application in many industry fields, such as medical industry, chemical industry, and biotechnology. But the BPMSM has strong couplings among torque and suspension forces, and is a multi-variable and nonlinear system. Therefore, dynamic decoupling control is an indispensable condition for the stable operation of the BPMSM, and it is hard to implement for the traditional control methods. A novel decoupling control strategy is proposed in this paper, which applies inverse system based on the adaptive neural-fuzzy inference system (ANFIS). Firstly, invertibility analysis of the BPMSM original system is introduced. Secondly, an appropriate inverse system using the structure of ANFIS is established and trained with sample data. Thirdly, by series connection with the inverse system, the original system is pseudo-linearized, and the rotation and suspension system can realize decoupling control. Then, PID controllers are adopted as closed-loop controllers to realize the stability of the control system. The simulation results show that, comparing with the inverse system, the overshooting value and the setting time of the speed and radial displacement decrease about 40% under the change of parameters and the rotor can realize the full suspension with the proposed control strategy. Finally, the experiment is carried out with a 2.2 kW BPMSM as the prototype and the experimental results validate the effectiveness of the proposed control strategy.

Submitters Country

China

Primary authors: Prof. ZHU, Huangqiu (Jiangsu university); DU, Wei (Jinagsu university); ZHAO, Chenyin

Presenter: DU, Wei (Jinagsu university)

Session Classification: Thu-Af-Po4.05

Track Classification: E1 - Motors