Design and Analysis of Robust Controller for Magnetic Levitation Systems

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ABSTRACT

This work presents a fuzzy gain scheduling control scheme for an electromagnetic suspension system, including both an electromagnet and a permanent magnet. The control system aims to ensure a gentle takeoff; maintenance of approximately zero power at an equilibrium point which varies according to payload, and finally, asmooth landing. An experiment with a single-degree-of-freedom levitation device is performed to demonstrate the success of the developed fuzzy controller. Experimental results confirm the smoothness and robustness of this control method. This study has presented an integrated gap-tracking and approximately zero-power control scheme for the electromagnetic levitated actuator with a permanent magnet and an electromagnet. These control functions include a gentle takeoff, an approximately zero-power levitation, and a smooth landing procedure for enhancing system reliability and safety. This study is a systematic approach to the design of fuzzy gain scheduled control systems based on multiple linear controllers for high performance during regulation and tracking. Experimental results demonstrate the effectiveness of the proposed controller.T.

Keywords : scheduling control,electromagnetic suspension system ,permanent magnet.

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