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Nonlinear Control of a Magneto-Rheological Fluid Electrohydraulic Positioning System

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Abstract:

Herein we report the identification of magneto-rheological fluid (MRF) electrohydraulic system and the development of a fuzzy logic controller for the MRF directional valve. The available system is lacking a proper controller and highly nonlinear. The nonlinearities involve hysteresis effects due to magnetic properties of the fluid and the stiction phenomenon in the actuator. In order to implement the fuzzy logic controller, the input and output of the system is obtained by experiment and then identified using the Hammerstein–Weiner model. The identified model is 81.64% fit to the actual system and is used to develop and tune the fuzzy controller. Results show that with the developed fuzzy controller, the response time of the system has improved to 0.3 s, percentage overshoot, and the error is reduced considerably to 10%, respectively.