Basic examination on elastic vibration control of an electromagnetic levitation system for thin steel plate

by

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Abstract

A method involving the application of electromagnetic technology is under consideration for improving the surface quality of conveyed steel plates. However, these studies have been conducted using experience-based techniques for the tuning of the controller such as the optimal control theory. The sliding mode control theory can solve this problem in the levitation mode of the steel plates. In this study, we aim to develop a noncontact support system for thin steel plates with high robustness using sliding mode control, which is tolerant to factors such as disturbance with respect to control signals and the external force of the system. We applied the 1DOF model and a continuous model for the modeling of sheet steel. Then, experiments were carried out under several conditions, and the obtained results were compared with the optimal control results. As a result, it was verified that the suppressive effect of the sliding mode control on disturbance is sufficient and the application of the continuous model enables the construction of a system with robustness to the disturbance of the external force.

Keywords: Steel plate, electromagnetic levitation, disturbance, elastic vibration, continuous model, optimal control, sliding mode control

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