Robust controller design for single axis magnetic levitation system.

ABSTRACT

This paper demonstrates theoretically the main idea of magnetic force control in magnetic levitation system using flux density measurements. A Hall-effect sensor is used to sense the flux density in the air gap. The magnetic force is obtained by its proportional relation to the flux density. A simple magnetic levitation system which consists of a U-shaped electromagnet and a manipulator is used. First, the system dynamics are described in state space form using air gap displacement, velocity of the magnetically levitated manipulator, and the flux density as state variables. Second, the magnetic force regulated using Hf controller to achieve robust stability, disturbance/noise rejection and asymptotic tracking. Simulation results in terms of speed and accuracy are presented.

Keyword: Hf control; Nonlinear systems; Robust control; Uncertain systems.