Department of Electronic Control Engineering

Study of Magnetic Levitation Conveyance System, Development of Tour Guide Robot

Yoshimitsu KOBAYASHI
Associate Professor, Dr. Eng.
Email : kobayashi@gifu-nct.ac.jp

Research Fields Control Engineering, Machine Mechanics

Keywords Magnetic Levitation, Mobile Robot

Research Outline

Study of Electromagnetic Levitation Conveyance System

This study is to apply an active electromagnetic levitation system to a painting and conveyance system at non-contact. It is necessary to control the three-dimensional motion of the levitated object. However it is difficult to measure the position. We propose how to estimate three-dimensional position without a position sensor. A state observer estimates the three-dimensional position of the levitated object from four Hall voltages and the current and input voltage to the electromagnet. Three-dimensional motion and conveyance control is realized by a state-feedback and two-degree-of-freedom optimal servo controller based on the estimated position.

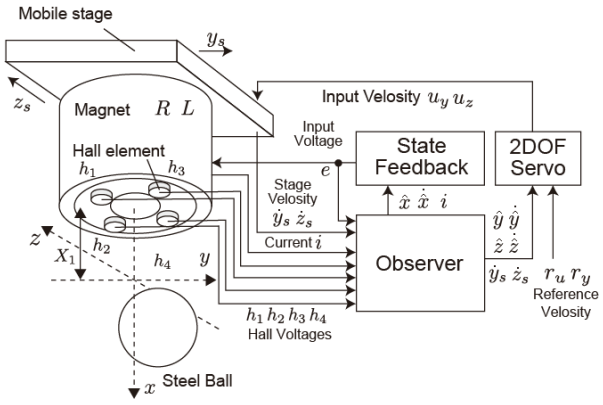

Fig. 1 Three-dimensional motion control of magnetic levitation system with position estimation.

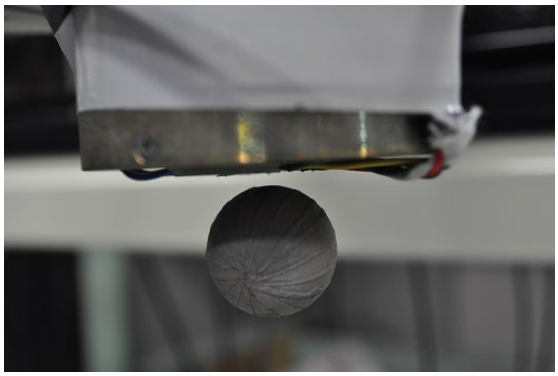

Fig. 2 Electromagnetic levitation conveyance system.

Development of Tour Guide Robot

We are developing a tour guide robot to explain children the exhibits of the science and art museum. This robot is an inverted pendulum type mobile robot with a self-righting mechanism which has a low center of gravity. The self-righting mechanism is adopted in robot design for the purpose of safety and reliability because it can return the robot to the upright position without an active control. An attitude angle control with a state-feedback control is implemented to damp sway in order to improve driving performance.

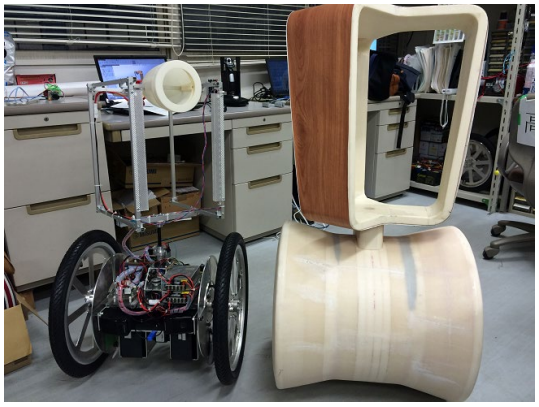

Fig. 3 Inverted pendulum type mobile robot with a self-righting mechanism.

Fig. 4 Design of tour guide robot.