

Integration Project Systems and Control (SC42035)

Magnetic Levitation Experiment

Description

The 'magnetic levitation' setup consists of a vertical coil with an iron core and a steel ball placed below the coil. The objective is to levitate the ball and control its position by manipulating the current through the coil. Figure 1 shows the system, including a schematic with the relevant variables.

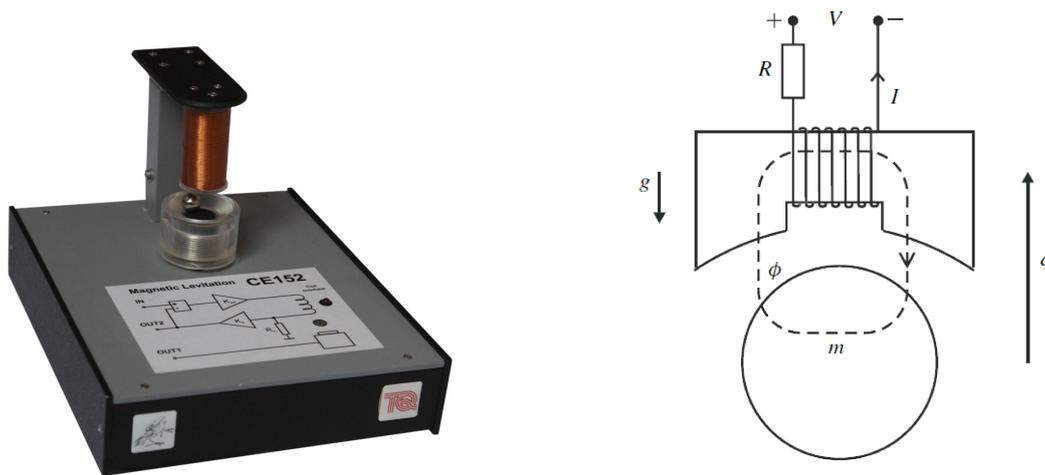


Figure 1: Left: a photograph of the magnetic levitation setup. Right: a schematic drawing.

This system has one control input u , which is the current applied to the coil. This input is commanded from the computer and is scaled between 0 and 1. There is one measured output: q – the position of the ball is also scaled between 0 and 1.

Control Objective

Design a controller that makes the ball position follow a specified reference trajectory. The controlled system should have zero steady-state error and adequate disturbance rejection properties, i.e., it should be able to recover from a small tick against the ball.

Simulink Template

A Simulink template `maglevtemplate.mdl` contains the necessary real-time interface blocks and some scopes. Make your own copy of this file (and other files in the same directory) and use it as a starting point for your experiments. Before starting the first simulation, define the sampling period h as a variable in the MATLAB workspace.