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Modelling and control of a Magnetic Levitation System

Mid-project presentation

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Agenda

1. Project objectives
2. Modelling
3. Controlling
4. Future work

Figure 1: Magnetic Levitation System and its components

Title of the frame

My beautiful formula ($y = mx + q$) and some text.

A simple list:

- First item
- Second item
- Third item

$$\begin{aligned} \dot{x} &= Ax + Bu \\ y &= Cx + Du \end{aligned} \tag{1}$$

Project objectives

Magnetic Levitation System (MLS)

Magnetic Levitation System (MLS), also known as MagLev, is a highly nonlinear system that can be used to study control strategies. It's composed of two electromagnets that are driven in voltage to generate a magnetic field in order levitates a metallic ball sitting in between them.

Project objectives can be divided as follows.

Modelling:

- Literature review
- Equations of motion
- Parameters identification

Controlling:

- Simulink model
- Linear controllers
- Nonlinear controllers

Modelling

One of the main challenges of this project is to correctly model the interactions between the ball and the electromagnets.

To this aim, we have started from the energy conservation principle and model the system via Lagrange's equations:

$$\begin{cases} \dot{z} = v \\ \dot{v} = m^{-1}\left(\frac{1}{2}\frac{\partial L_1}{\partial z} I_1^2 + \frac{1}{2}\frac{\partial L_2}{\partial z} I_2^2 + mg\right) \\ \dot{I}_1 = L_1^{-1}\left(-R_1 I_1 + V_1 + R_1 I_{1min}\right) \\ \dot{I}_2 = L_2^{-1}\left(-R_2 I_2 + V_2 + R_2 I_{2min}\right) \end{cases} \tag{2}$$

What we are trying to achieve now.

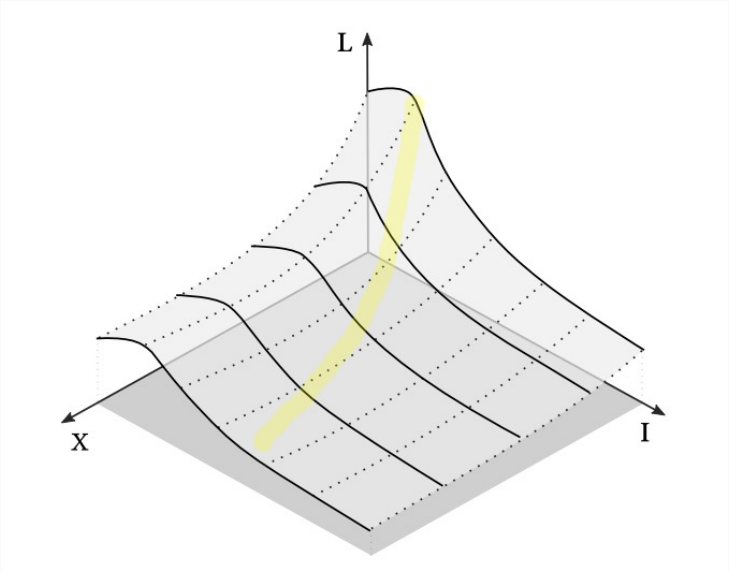

Figure 2: Inductance dependence over ball's position and current

Controlling

Future work

What we want to achieve?

References i

Questions?

Thank you!