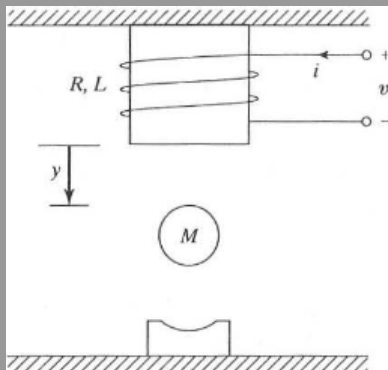Project Proposal
ECES 511

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Electromechanical Magnetic-Ball Suspension

- Make an object levitate by controlling the current

Mathematical Model

Variables

- R - Resistance
- L - Inductance
- v - Voltage
- m - Mass
- K - Coefficient that relates force to the magnetic field
- g - Gravity
- i - Current
- y - Distance of Mass M to electromagnet

$$v(t) = Ri(t) + L\frac{di(t)}{dt}$$

$$m\frac{d^2y(t)}{dt^2} = mg - K\frac{i^2(t)}{y(t)}$$

I/O and State Variables

- We control the current i
- Goal is to control distance y

$$\vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} i \\ y \\ \dot{y} \end{bmatrix} = \begin{bmatrix} \text{Current} \\ \text{Distance} \\ \text{Velocity} \end{bmatrix}$$