

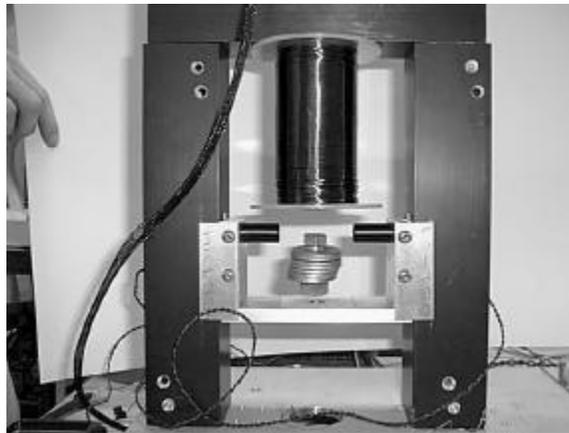
**Department of Mechanical and Aerospace Engineering
University Of Texas at Arlington
Honors Dynamic Systems
Modeling, Simulation and Automatic Controls
MAE 4410 - SPRING Y2K
PROJECTS**

General Rules and Background for the Lab

The projects in this class will be designed to take advantage of a physical electromechanical system available in the Manufacturing, Automation and Robotics Research (MARR) Lab in room 123 Woolf Hall. The experimental setup was developed partially as a senior synthesis design project and subsequently refined as a Masters Project. This experimental setup is still being refined and some electronics/electrical work is currently under way. So, please be very careful when you are working with it. Again, this is an experimental setup and extreme care must be taken. In addition, the MARR lab is used for teaching and research in robotics and students power on and use the existing robots. The robots have visuals when they are on, however, bulbs could burn out. Therefore, by entering the lab you agree that you will be extra careful, observe the safety rules and do not approach the robots while the power is on and not disturb experimental setups.

Experiment Description

The projects will be performed using a Magnetic Levitation (maglev) device. This device consists of various parts such as an electromagnet, an object to be levitated, an analog controller, support structure and power supplies.



The projects are designed such that the theory presented in class is applied to a real world application.

We will use only one experimental setup for various reasons with the most compelling reason being that if we understand the experimental setup, the various components of the system and their relationships, then it will be easier to apply new concepts as compared to applying new concepts to new experiments. Therefore, we hope to understand all the issues associated with maglev systems!

Project 1

The first project is assigned such that you familiarize yourselves with the experimental setup, the safety issues associated with the MARR lab and the lab in general.

Project 2

I. Part a) Modeling

- In this project, you are to develop the non-linear dynamic equations of motion for the object. You are to define any assumptions.
- Develop a Matlab simulation of the system assuming as inputs the quantities that you identify as needed.

II. Part b) Linearization

- You need to identify a linearization point and linearize the non-linear dynamic equations.
- Develop a Matlab simulation of the system assuming as inputs the quantities that you identify as needed.

III. Part 3) System Identification

- As part of this project, you will need to identify the various parameters of the maglev system through a series of experiments. These parameters include but not limited (amended as we proceed) the characteristics of the electromagnet, the sensor, etc.
- You will accomplish this task by collecting a set of experimental measurements. For example, if you would like to find the electromagnetic force you will need to plot the current and the distance from the electromagnet of objects of known weight and then plot it or perform some statistical analysis on it.