

A The laboratory

Four magnetic levitation laboratory installations are available in the laboratory located as shown in Figure 1. A list of time slots will be available at the lab

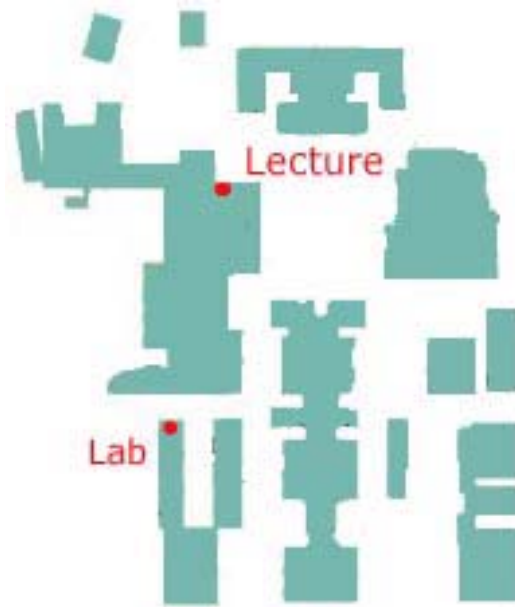


Figure 1: Laboratory location

and each group is responsible for booking time for experiments. Since there are relatively few laboratory installations with respect to the number of groups, each group is encouraged to use common sense regarding booking of time slots and time used at the laboratory. One way of reducing the time used in the laboratory is to meet prepared for the experiments to be conducted. That is, the theoretical work and simulations regarding the experiments is carried out in advance.

A.1 Using the computers

The user name and password to be used are both "student". The PC's are purely laboratory computers and should only be used for conducting experiments. They are not connected to the internet even though they have all the necessary components for using the internet. This is done deliberately, and the computers should not under any circumstance be connected to the internet. Each group must create their own working directory "D:\Group??". Further, the files needed for experiments is available on its:Learning and in the folder "D:\LabFiles" on the PC's in the laboratory. Make a copy of these files and store them under the groups folder before using them (do not make any changes to the files stored in

"D:\LabFiles" since these should be available to all the groups in their original state).

B Running experiments

B.1 Compiling and running experiments from SIMULINK

SIMULINK has a menu "WinCon" which is used to make a real-time program from SIMULINK. Enter "WinCon-Options-Solver". The value found in "Fixed step size" is the sampling period. It seems like a sampling period of $0.0005s$ is sufficient (sampling frequency of $2kHz$). The maximum sampling frequency that can be achieved with the system is $2MHz$, but the sampling frequency should not be too high due to the amount of space needed to store the data used to generate figures. In "WinCon-Options-Solver" it is also possible to choose the integration method to be used.

To make a real-time control law for the system using SIMULINK, we must run "WinCon-Build" when we have made a SIMULINK-diagram in accordance to our experiment setup (our control law and the appropriate input and output signal of the plant). After "Build" has finished, a new window from WinCon appears. This interface is now used to run the experiment (starting and stopping the system, generating plots ...)

B.2 Calibrating measurements

The measurements are vulnerable to variation of light in the room, and the measurement system therefore need to be calibrated before conducting experiments. The calibration is done in two steps:

- 1) Run "magcal0.mdl" (build it and start it with WinCon). This is an application which measures the voltage from the position sensor when the ball rests at the post (no input is applied to the system). Turn the screw labeled "Offset" until the position measurement shows $0V$.
- 2) Run magcal5.mdl. This is an application which measures the voltage from the position sensor when the ball is stuck to the electromagnet (the system is applied a current of $1.5A$, but it may be necessary to help the ball getting stuck to the electromagnet by lifting it from the post). Turn the screw labeled "Gain" until the position measurement shows $5V$ ($4.99V$).