# Let's make the lab great!

2017-05-03

Vision

- Small & cheap processes, which students can bring home (and perhaps use remotely over internet)

- Pedagogic lab manuals, introducing control concepts and encouraging hacking

- A PhD course, where we develop the lab together and learn new (control) engineering skills, as well as gain team work experience

Let's focus on getting something simple working before starting new sub-projects.

LUND
UNIVERSITY

Proposed architecture

Simple physical process

- iron rod
- aluminium ring
- coil
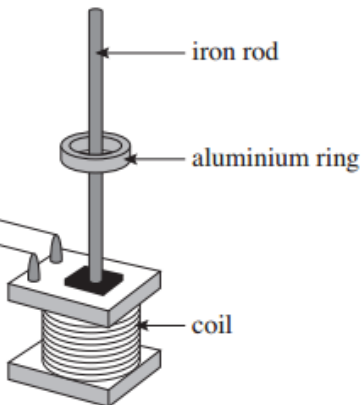
Homemade cape
- **Analog IO**
- **Amps/drivers**

Beaglebone for:
- **ADC/DAC**
- **Ethernet comm.**
- **Lab process comm.**
- **(Running controller)**

Lab PC with Julia lab GUI

julia

LUND
UNIVERSITY

Activities (What to do?)

- Choice of one-chip computer (Marcus will introduce the Beaglebone shortly)

- Implementing protocol for communication between one-chip computer and PC

- PC lab GUI in Julia

- Choice of process (**let's make one work, then expand!**) to make, based on what control principles we want to demonstrate (suggestions shortly)

- Mechanical hardware design. Interesting cheap technologies include 3D print, laser cut.

- Electronics design of cape with I/O and drivers

Responsibilities (Who does what?)

- I/O programming. Mentor: Anders B

- GUI programning in Julia. Mentor: Fredrik/Mattias (who might be mentoring themselves?)

- Mechanical design and prototyping. Mentor: Pontus A

- Electronics design. Mentor: Kristian

- Pedagogic lab manuals. Mentors: Bo & Tore
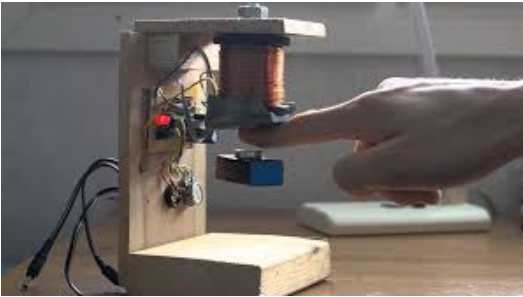
- Documentation. Mentor: Anders N

Proposed course structure

- We form workgroups (soon!)

- Each group writes a document specifying requirements. These are then circulated among the groups.

- Course credits proportional to commitment. Negotiated with Kristian & Anton.

- Graduation upon fulfilment of requirements (checked by other groups), and online posting of clean documentation.
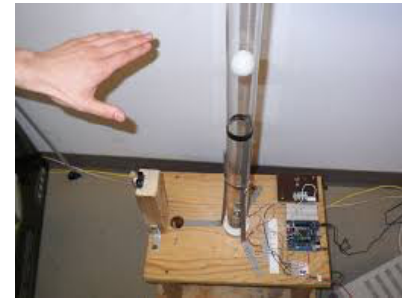
- There is a course web page:
  https://www.control.lth.se/Education/DoctorateProgram/lab-development.html

- And a gitlab group, where your repos can go:
  https://gitlab.control.lth.se/labdev

LUND
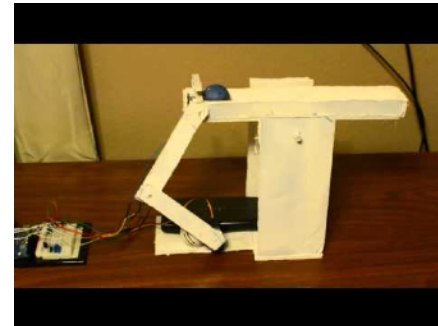UNIVERSITY

Possible lab processes

levitating magnet

ball in pipe

Ours need to look a lot more professional than these...

**DC servo
ball on beam**

Up next

- Marcus Greiff: Beaglebone

- Mattias Fält: Julia

- Anders Ro: Lab processes and related initiatives

- Discussion of practical considerations

- **Who in interested in doing what?**

- Homework (next=last slide)

Homework

- Think about control topics to demonstrate and suitable processes

- Seek inspiration online!

- What I/O capabilities do we want/need? 10 V I/O for reverse compatibility and some sort of motor drivers are a minimum

- Let Kristian know if you come across something or have other ideas!