LUNDS UNIVERSITET

A New Lab 3

FRTN10 Multivariable Control

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Some History

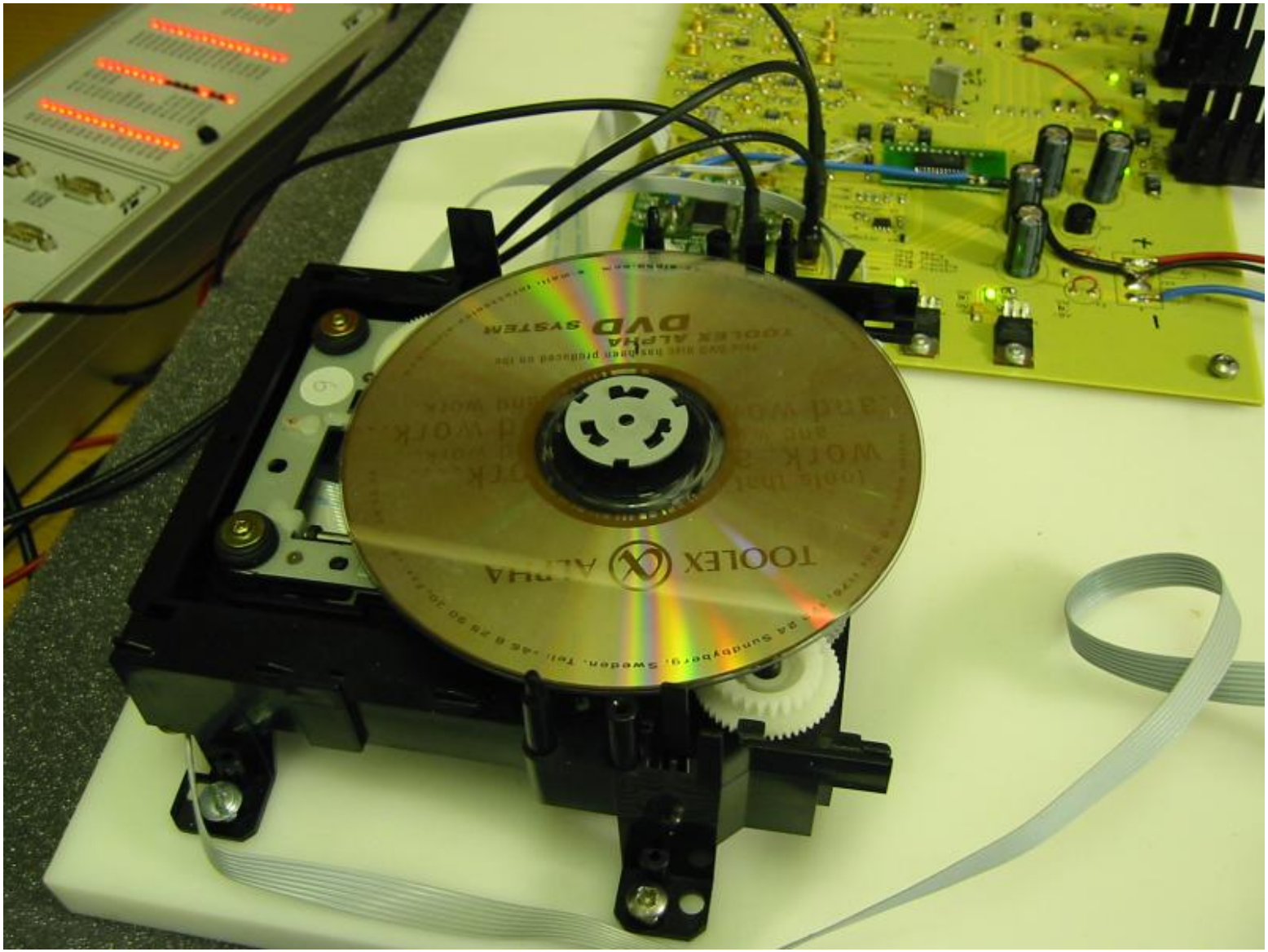
1983–2001	Computer-Controlled Systems. 4 labs
2002–2007	“New” Computer-Controlled Systems. 3 labs:

- Loop Shaping for Flexible Servo
- Decentralized Control of Quadruple Tank
- LQG Control of DVD Player

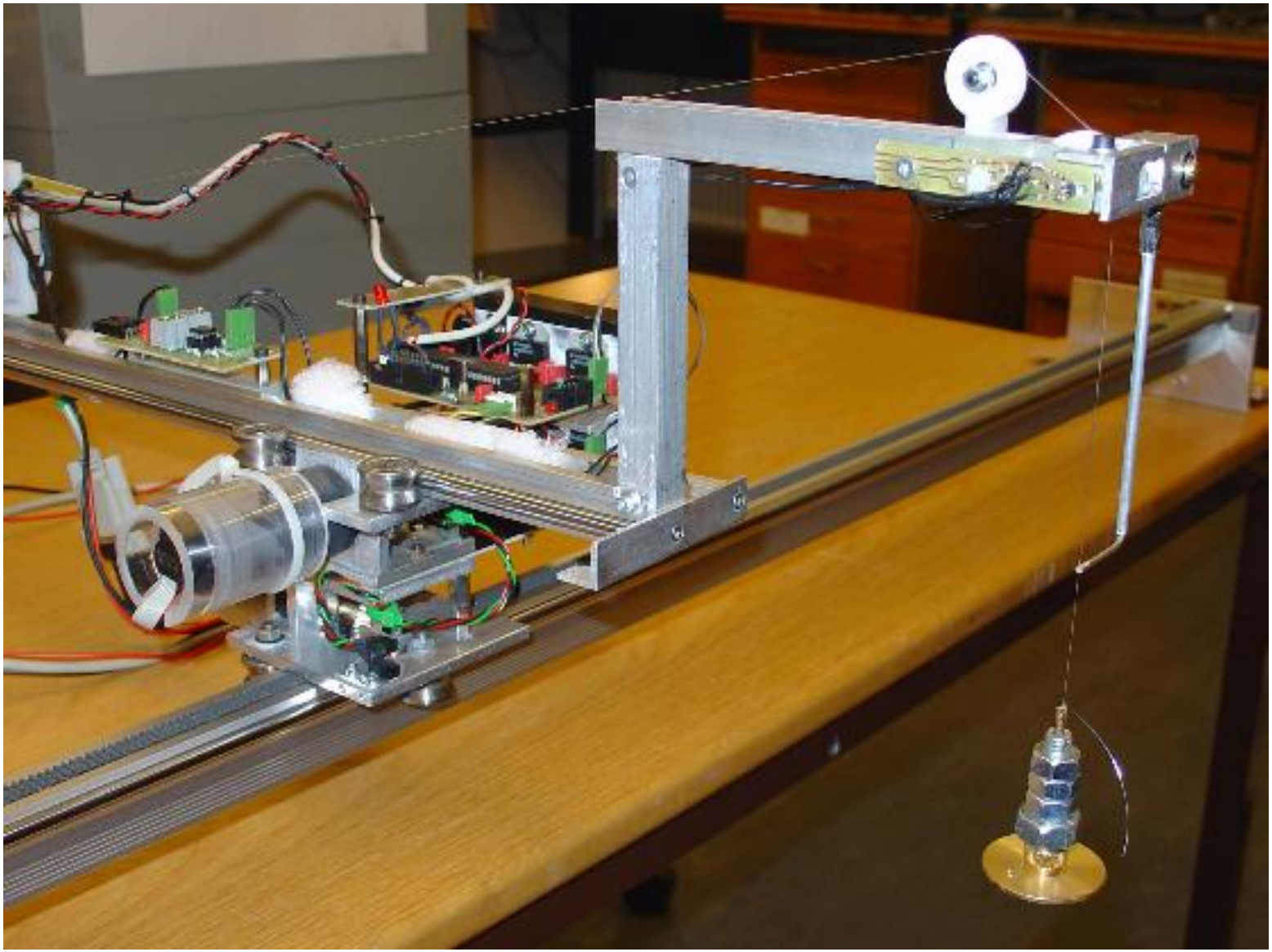
2008–present	Multivariable Control

- 2008: Rotating Crane replaces DVD Player
- 2018: MinSeg replaces Rotating Crane

DVD Player



Rotating Crane



Wish List for Lab 3

Ideally, the process for Lab 3 should be

- multivariable (full MIMO)
- “difficult” to control (not enough with a PID controllers)
- suitable for illustrating Kalman filtering and LQG control
- available in many copies
- fun

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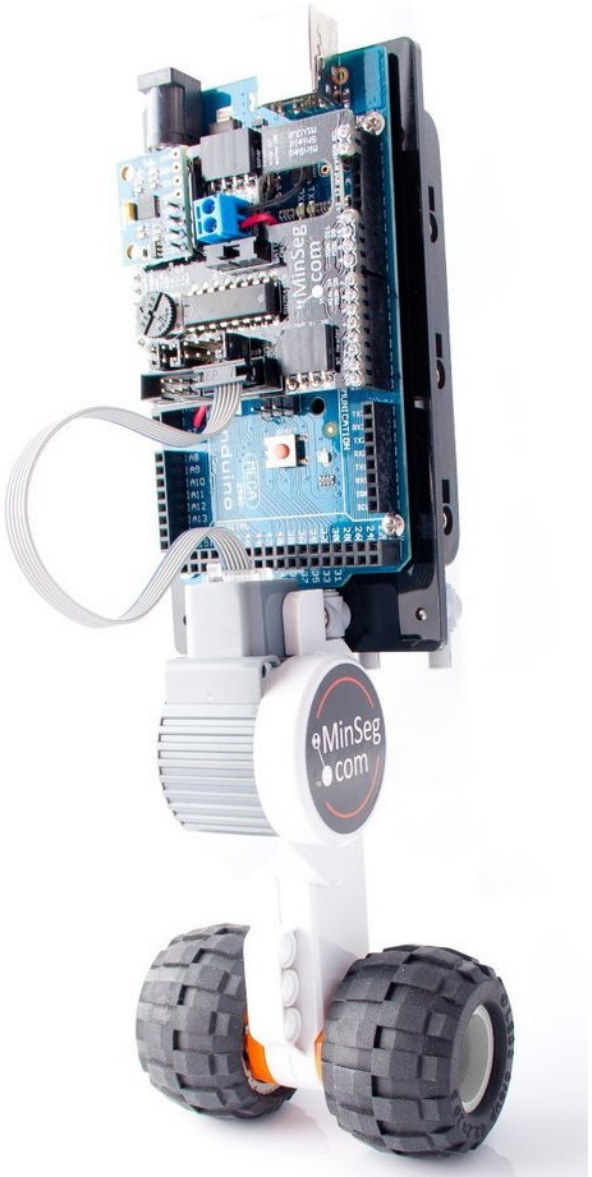
The MinSeg Robot



- Created 2013
- Arduino Mega 2560 microcontroller
- LEGO NXT DC motor with rotational encoder
- Inertial Measurement Unit with 3-D accelerometer and gyro
- USB connection for power, programming, and real-time communication with Matlab
- Also used in control courses in Luleå and Linköping

Some Limitations

- Existing linear model not good enough to design full-order Kalman filter
  - Sys Id needed
- Tedious to calibrate sensors
  - Automatic procedure?
- Time-consuming to recompile Simulink model after change
  - Let the students enter gain vectors in real time