

EE/AA 448: Winter 2008

Sensors and Actuators

Instructor

Eric Klavins

Teaching Assistant

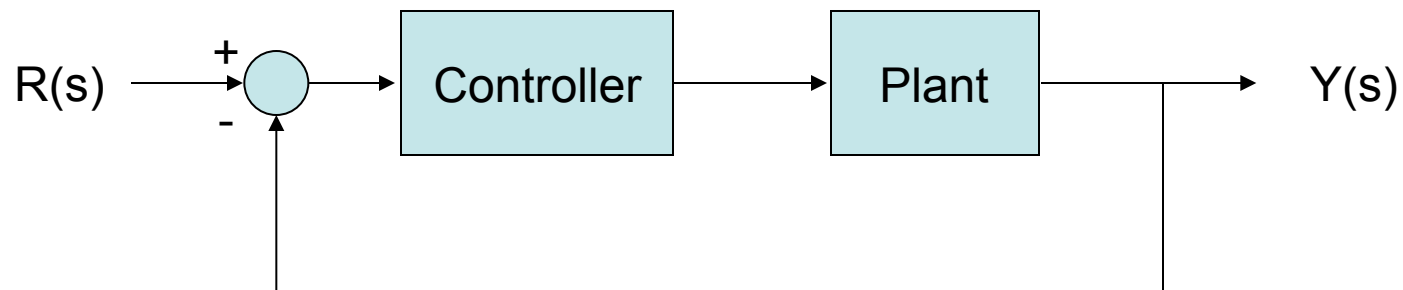
Steve Safarik ↔



Overview

In EE/AA 447 you learned

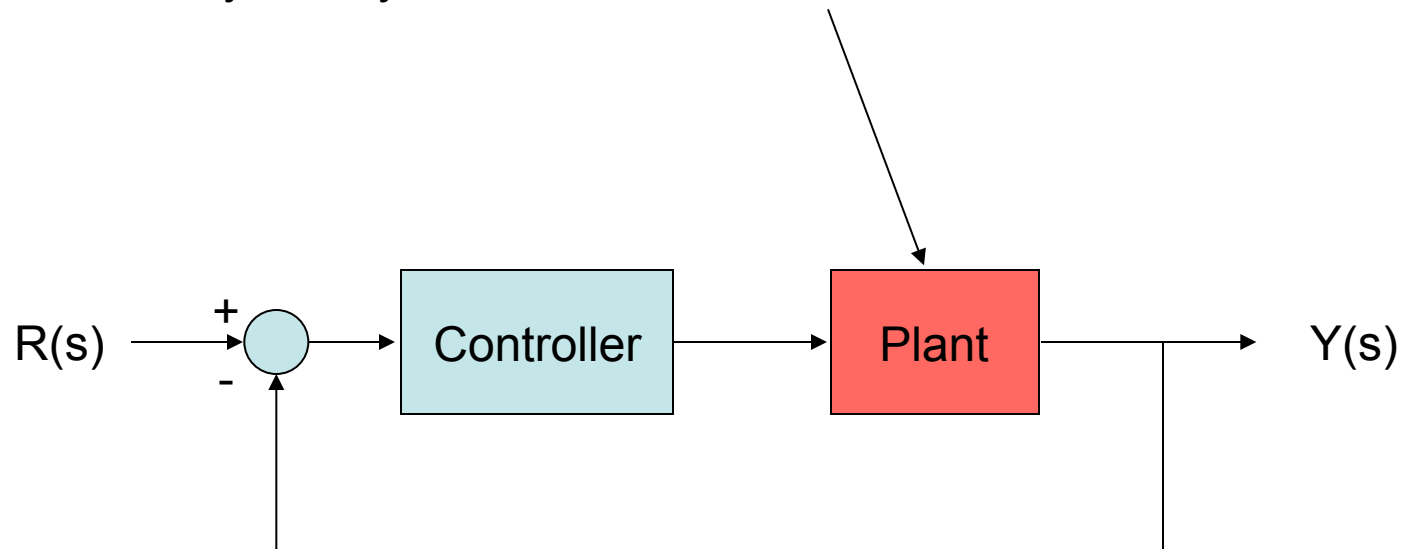
- to represent systems
- interconnect systems
- to design SISO controllers



In EE/AA 448 you will use these methods to control **physical systems**.

Issue No. 1: Modeling

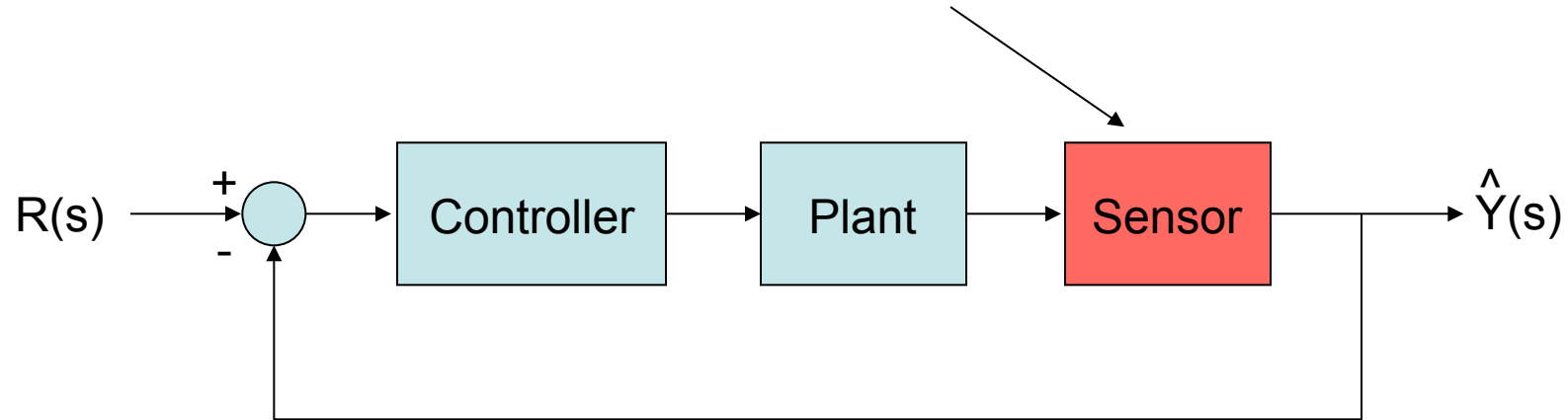
With a real system, you need to find a model.



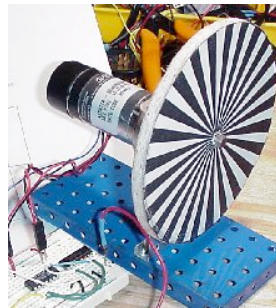
e.g. You might know that $G(s) \simeq \frac{s + a}{s + b}$, but what are a and b ?

Issue No. 2: Sensing

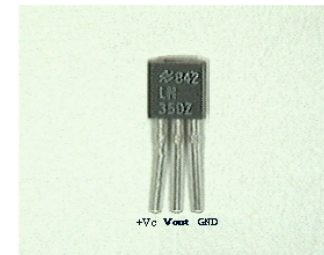
$Y(s)$ is *approximated* by a sensor.



e.g. The position of a motor is sometimes measured using an *encoder*, which gives a discrete output.

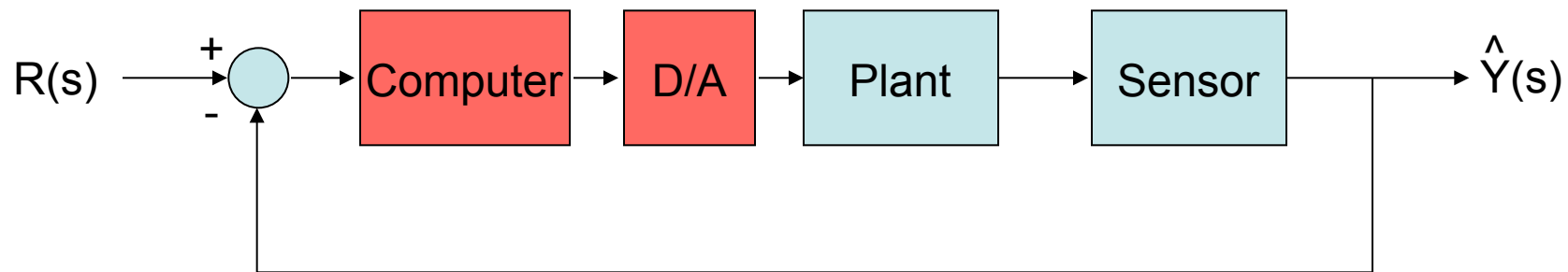


e.g. The temperature of a device can be measured with an LM35 IC, which outputs 10 mV per degree Celsius.



Issue No. 3: Computation

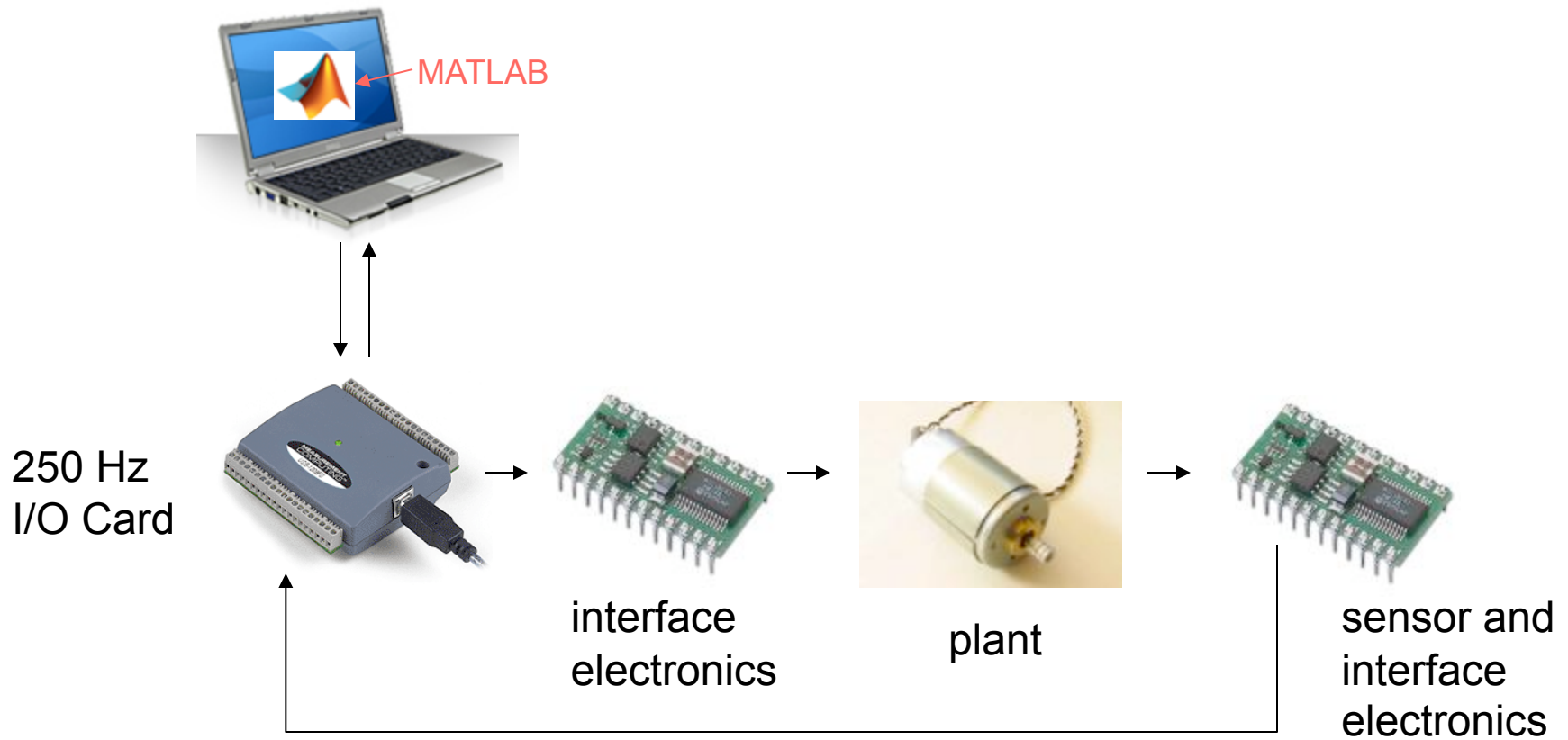
In this course, the controller will be implemented with a computer.



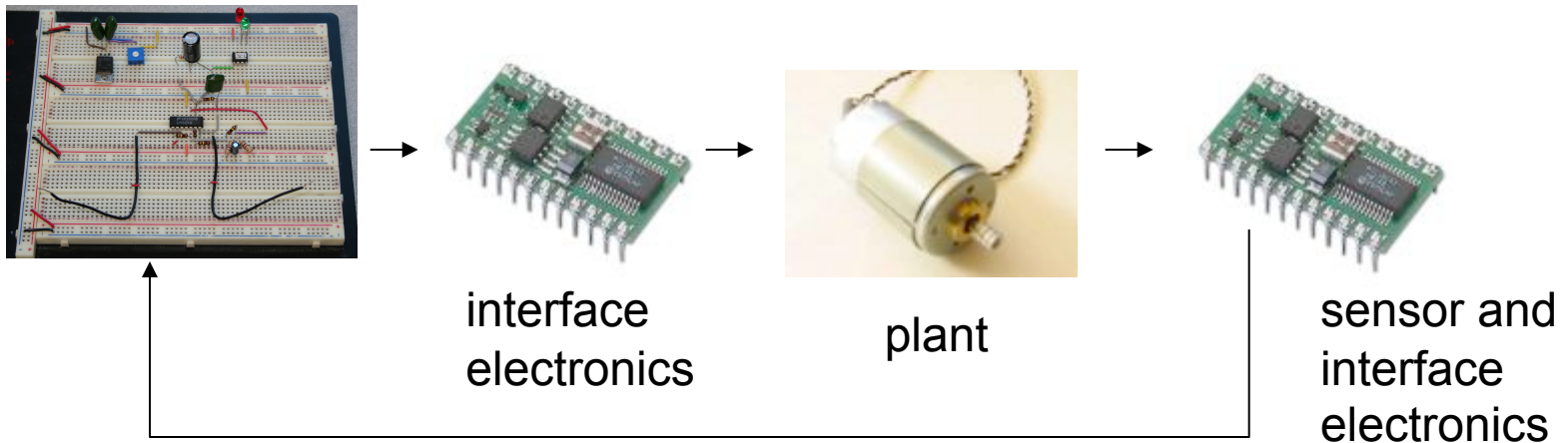
Issues:

- The computer runs at a fixed frequency
- The input and output must be discrete
- I/O has limited bandwidth

The Setup In This Course



Or ...



Course Structure

The course consists of weekly laboratory modules.

You will work in terms of two. Report the names of the students in your team to Steve Safarik by Friday 1/9/2009.

After the first lecture meeting (on Jan. 5), we will meet in the lecture room every Monday at 12:30-1:20 to introduce that week's module. (When Monday is a holiday, we will meet the Friday before that).

You and your partner will then have one week to complete the module and write up your results, which should take 3-6 hours.

The equipment needed to do the work will be available in Sieg 233.

Laboratory Schedule

The laboratory in Sieg 233 can accommodate up to four groups simultaneously. Thus your group may schedule three hours of priority time in the lab. If you decide to work in the lab at some other (additional) time, you may have to relinquish your lab station to a group that has reserved it.

The priority schedule will be maintained on the course wiki. Steve will send an email when he is ready for your requests.

The TAs and the instructor will hold office hours in Sieg 233 to answer questions, debug hardware and help you with your assignments. See the course web page for the schedule.

http://soslab.ee.washington.edu/mw/index.php/EE448_Winter_2009

Groups and Grading

Each group will have two students.

The work done by each student for each module should be approximately equal.

Students must alternate being the “lead author” for the report. The responsibilities of the lead author are to

- (1) collect the data;
- (2) collect text and figures;
- (3) produce the final copy of the report.

The lead author is not supposed to write the entire module her/himself. Instead, the lead-author should “produce” the writeup, like a producer produces a movie.

Your final grade will be based on the grades for each module. Modules for which you are the lead author will count double. If you do not participate equally in the work for the report, that will affect your grade.

Lab Report Guidelines

1. Title, authors group number, percentage of work done by each member.
2. A brief abstract stating the objectives and the main results.
3. An introduction providing the background and goals of the module.
4. A discussion of the relevant theory.
5. All significant calculations.
6. Representative results (in figures, tables, etc).
7. A discussion of the results and a conclusion.
8. A list of references (if any).

REPORTS ARE LIMITED TO 10 PAGES IN LENGTH (FEWER IS OKAY TOO).
YOU MAY **NOT** COLLABORATE WITH OTHER GROUPS TO PREPARE YOUR
REPORT.

Topics

- Organization
- Digital I/O
- Temperature Control
 - Modeling
 - Control
- Pendulum Control
 - Modeling
 - Control

Next

- 1/9: Meet to report groups and priority time
- 1/12: Lecture (MEB 246) on I/O Laboratory Module (the description will be the wiki by 1/12 in the morning)
- Week of 1/12: Work on your first module and writup. It is due on 1/19 (or 1/20 since 1/19 is MLK day).
- You can slide your reports under my door in CSE 236 for lab 1. The rest of the reports should be turned in in class.
- 1/16: Lecture (MEB 246) on temperature control (this is the only Friday lecture [1/19 is a holiday]).