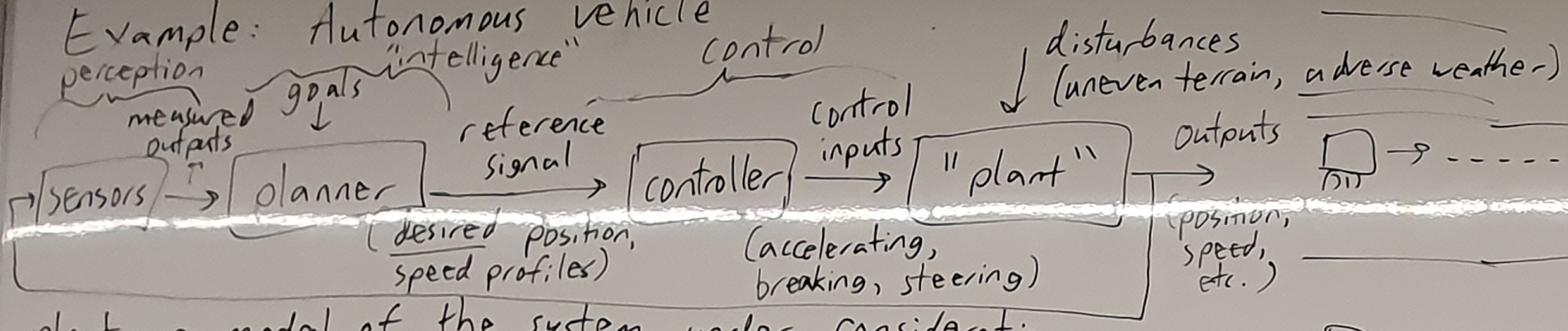
Course Administration

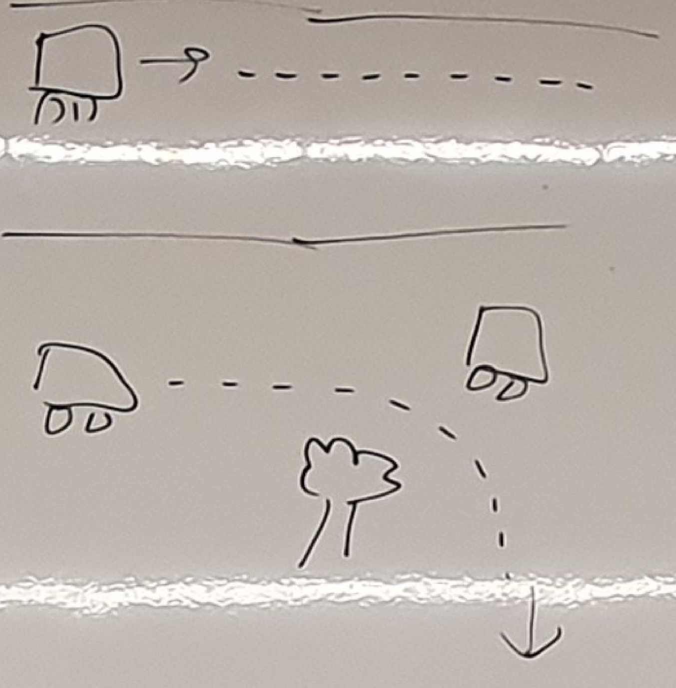
Outline has the complete information - please read it in detail

Course Requirements:

- homework assignments (graded, lowest grade dropped)
- laboratory component (5 labs + quiz)
- midterm exam (on February 24th from 9:00 - 10:30 am)
- final exam (scheduled by the registrar)
- 3 makeup lectures (info on LEARN)

Example: Autonomous vehicle





plant - a model of the system under consideration

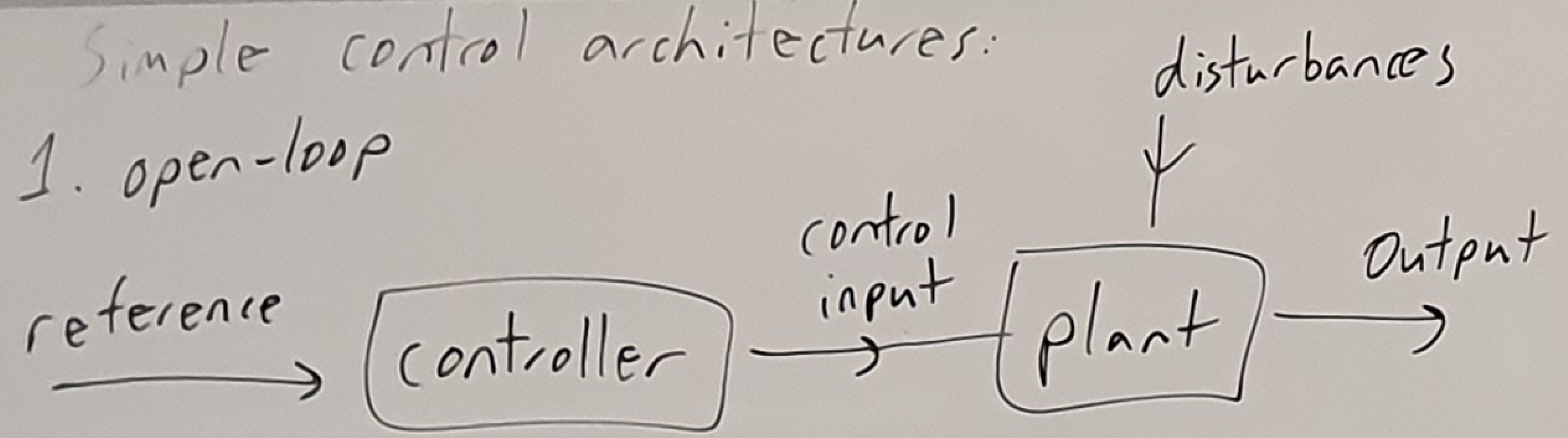
controller - provides "control" over the plant

Typical control problem:

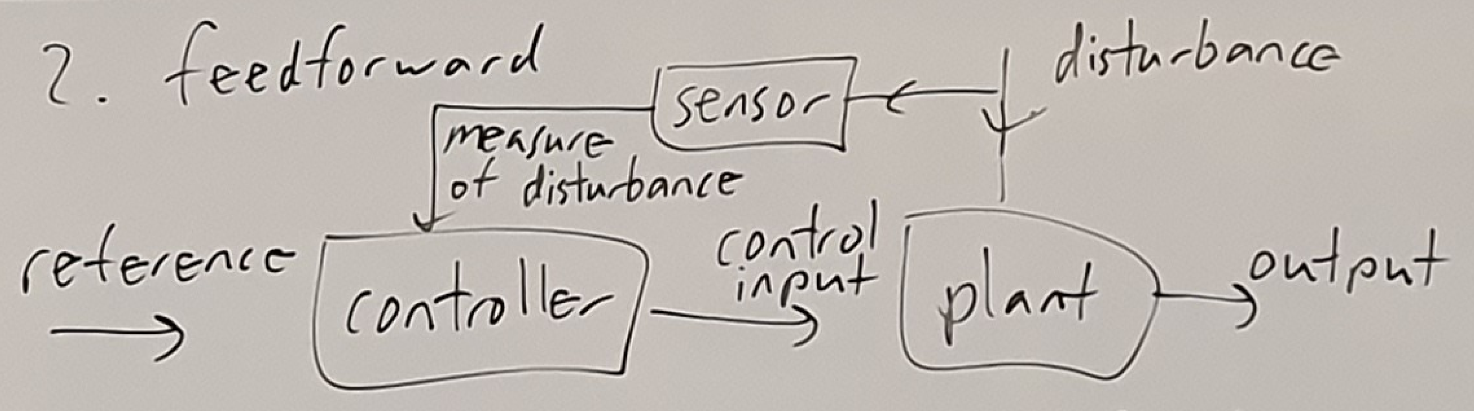
- vary the control inputs so that the outputs follow reference signals
- "plant" is typically a dynamic system: present output values don't only depend on the present control input values (they depend on the past history of control input values too)

Simple control architectures:

1. open-loop

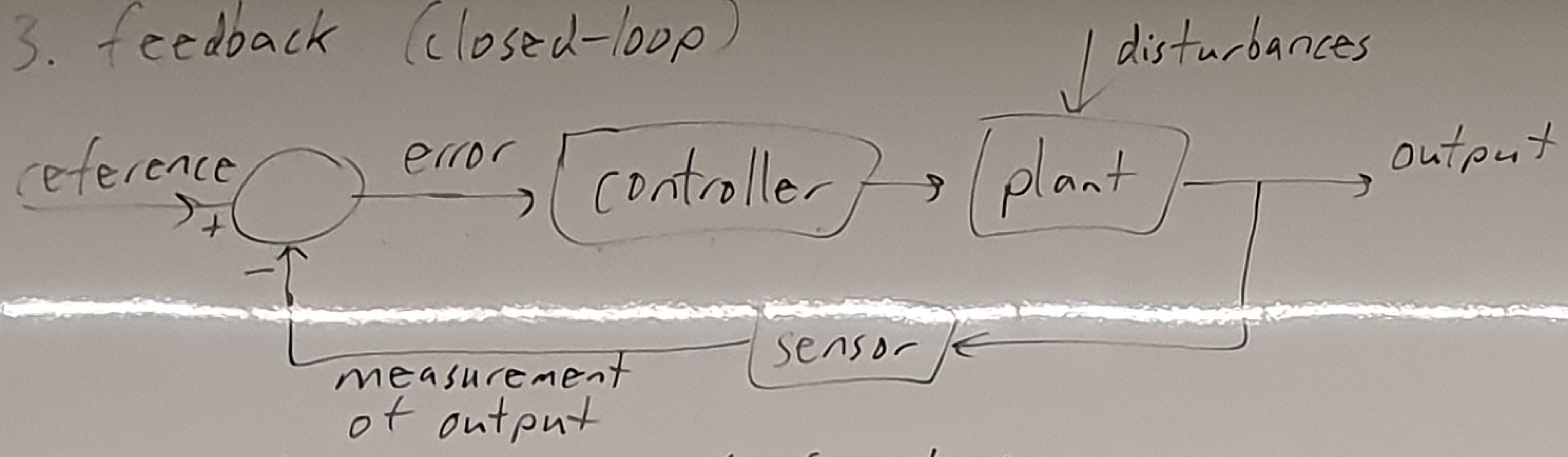


2. feedforward



+ may be able to compensate for (reject) disturbances
- sensitive to plant variations or uncertainty

3. feedback (closed-loop)

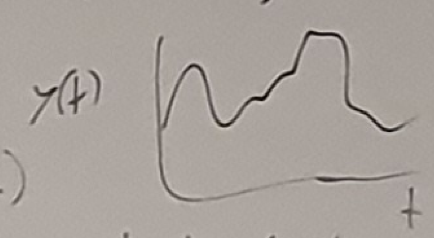


potential benefits of feedback:

+ tracking (minimization of error) (regulation)
+ stabilization of an unstable plant
+ reduced sensitivity to plant variations or uncertainty (robustness)
+ reduced sensitivity to disturbances (disturbance rejection)

We will develop an abstract mathematical framework for modeling, analyzing, and designing control systems.

- signal: a real or complex valued functions of a real variable t
  - t will usually represent time
    - e.g., "s" (otherwise)
  - if the domain of the signal is $\mathbb{R}$ or an interval in $\mathbb{R}$, the signal is continuous-time (CT)
    - e.g., most physical signals (position, velocity, etc.)



  - if the domain is a discrete set like $\mathbb{Z}$ or $\mathbb{N}$ (or a subset of them) the signal is discrete-time (DT)
    - e.g. values stored in a computer, sampling of a CT signal

Ex. A simple signal that is often used as a reference in control systems is a unit step:

CT: