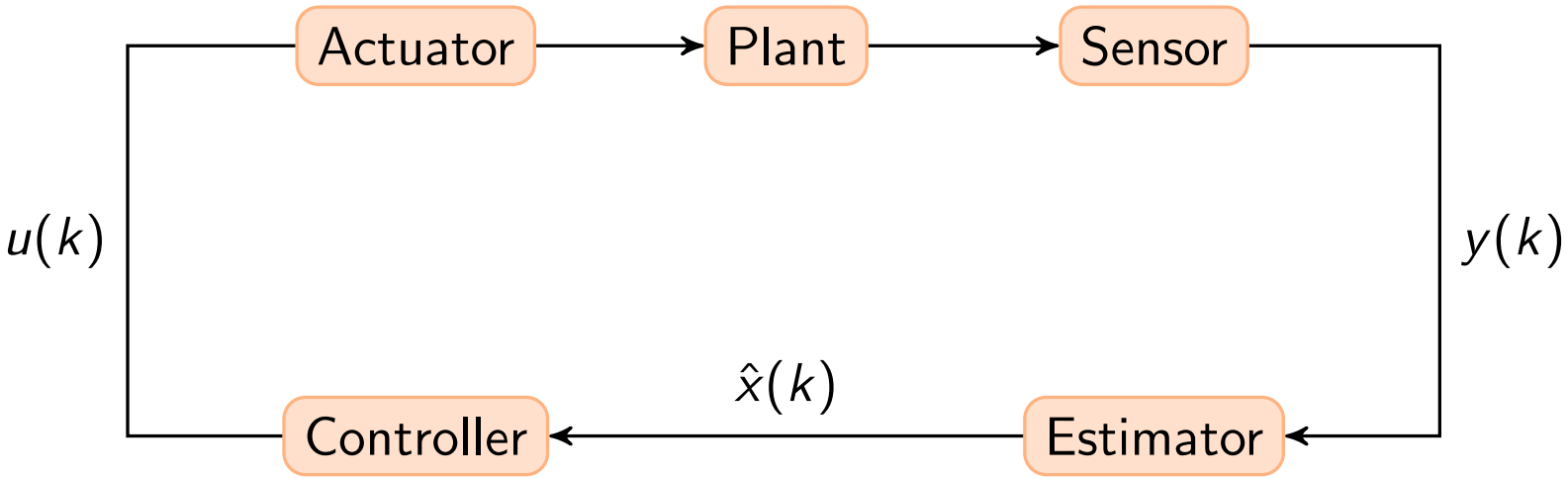
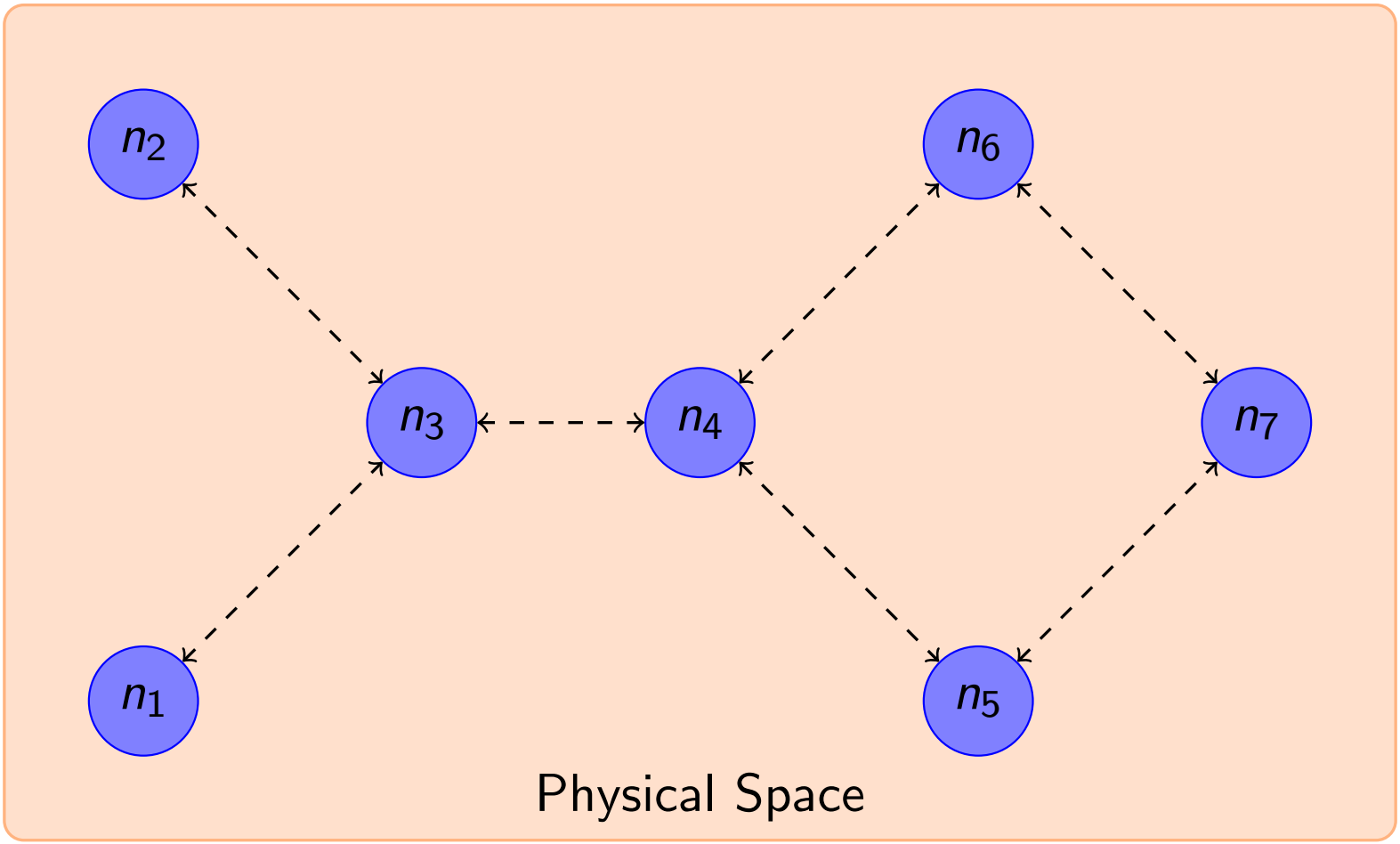
Course Overview

- Tuesday and Thursday 1:00-2:25 pm, 243 ANB
- Instructor: Yilin Mo (yilinmo@caltech.edu)
- Website:
  `www.cds.caltech.edu/wiki/index.php/CDS270(Fall2014)`
- Grading:
  - no required homework
  - no midterm or final exam
  - a 20 min research presentation on last week.
  - Pass or fail.
- You need to talk to Prof. Murray (murray@cds.caltech.edu) if you are not enrolled yet but want to add this course.

Classical Control System



Networked Control System



Each node could be a sensor, actuator, controller, router, or multi-functional.

NCS

Benefits:

- Flexibility
- Low installation and maintenance cost: off-the-shelf low cost devices, wireless networking,...
- "Resilient": avoid single point of failure (if you do it right)

Applications:

- smart grids
- sensor networks
- social networks
- ...

Challenges of NCS

- Interaction between communication and control:
  - communication is not perfect: packet drop, delay, corruption, quantization, ...
  - communication is expensive
- Distributed:
  - what is the best strategy for individual node given its limited information about the system? performance?
  - what information to share?
- Heterogeneity:
  - Nodes may have different energy, computation, communication constraints.
  - Nodes may have different goals. non-cooperative? malicious node?
- Scalability
- ...

Overview of the Course Contents

- Main topics covered:
  1. Packet-based estimation and control
  2. Consensus
  3. Distributed hypothesis testing and estimation
  4. Security
- Many results are new and have not yet been standardized.
- Lectures will summarize key elements, with selected details
- Additional references will be posted on the wiki pages.
- If you find a interesting topic in NCS that is not covered, please let me know.