Topic 1

What are robots?

... and are they coming to get us?

ADMINISTRIVIA

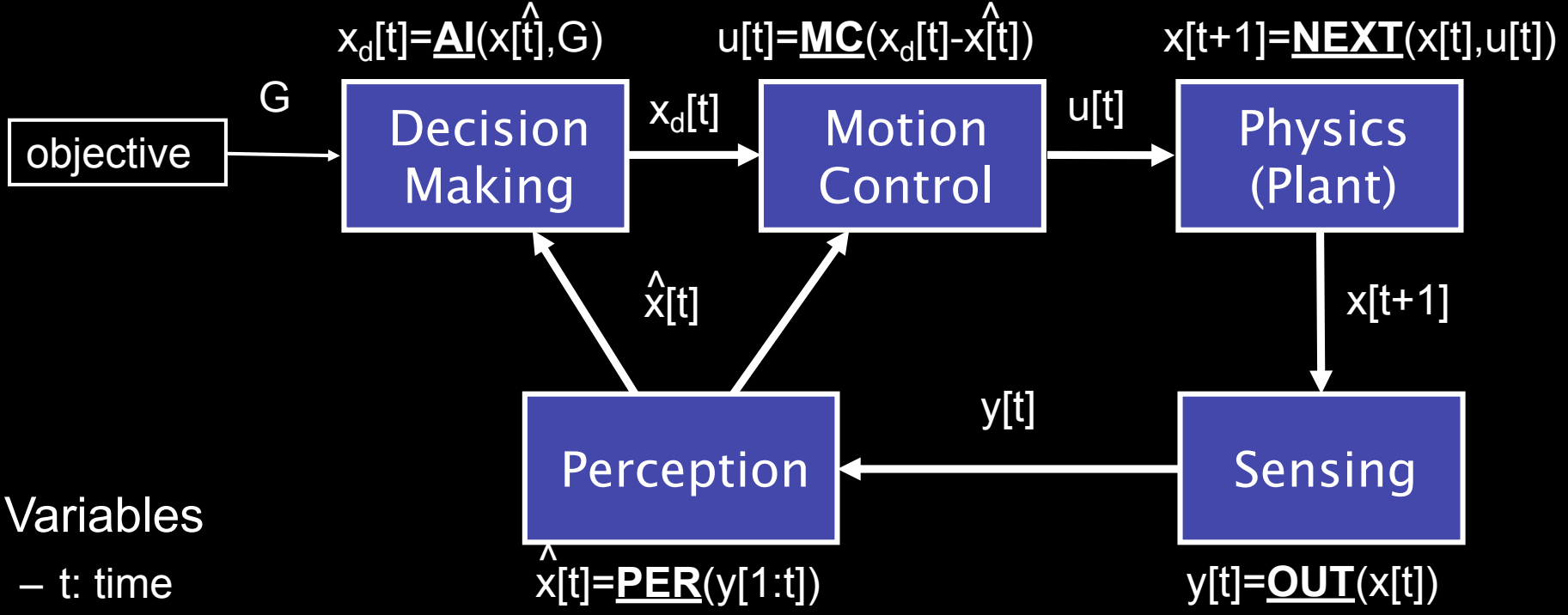
- **Mailing list**:
  - tstaff abruptly migrated lists to a new server
  - use "lists" server instead of "list" server
    - https://lists.cs.brown.edu/sympa/info/cs148.2010-11.f
- **Project 1 assigned:**
  - "Enclosure Escape" due Sept 17
    - http://brown-robotics.org/index.php?title=CS148_Assignment_Enclosure_Escape
  - assigned early if you want to install ROS
    - http://code.google.com/p/brown-ros-pkg/
  - robot allocation and programming lab next Friday

What is a robot?

- What are the components of an autonomous robot?
- Name some examples of robots

The Robot Control Loop

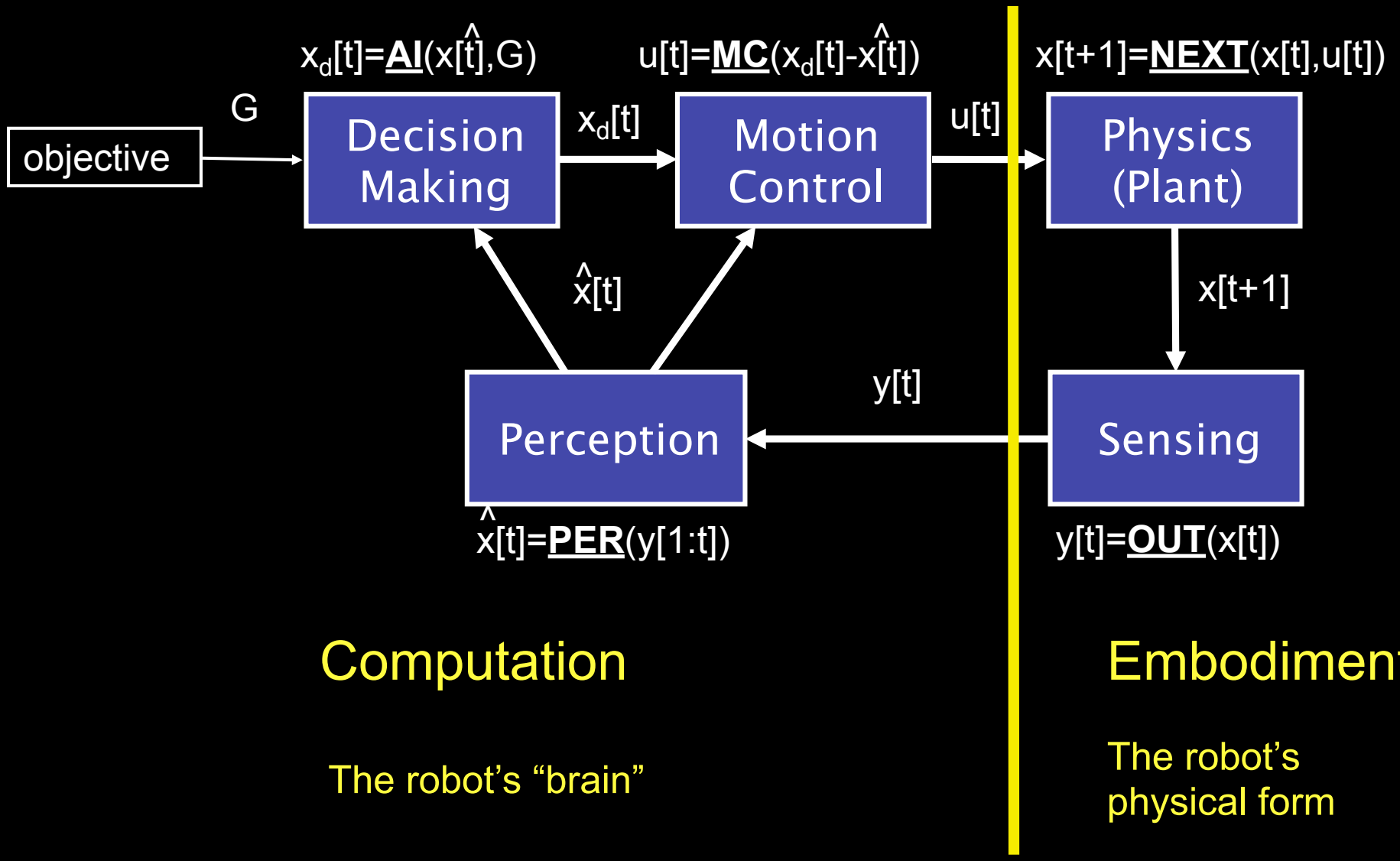
(autonomous feedback control)



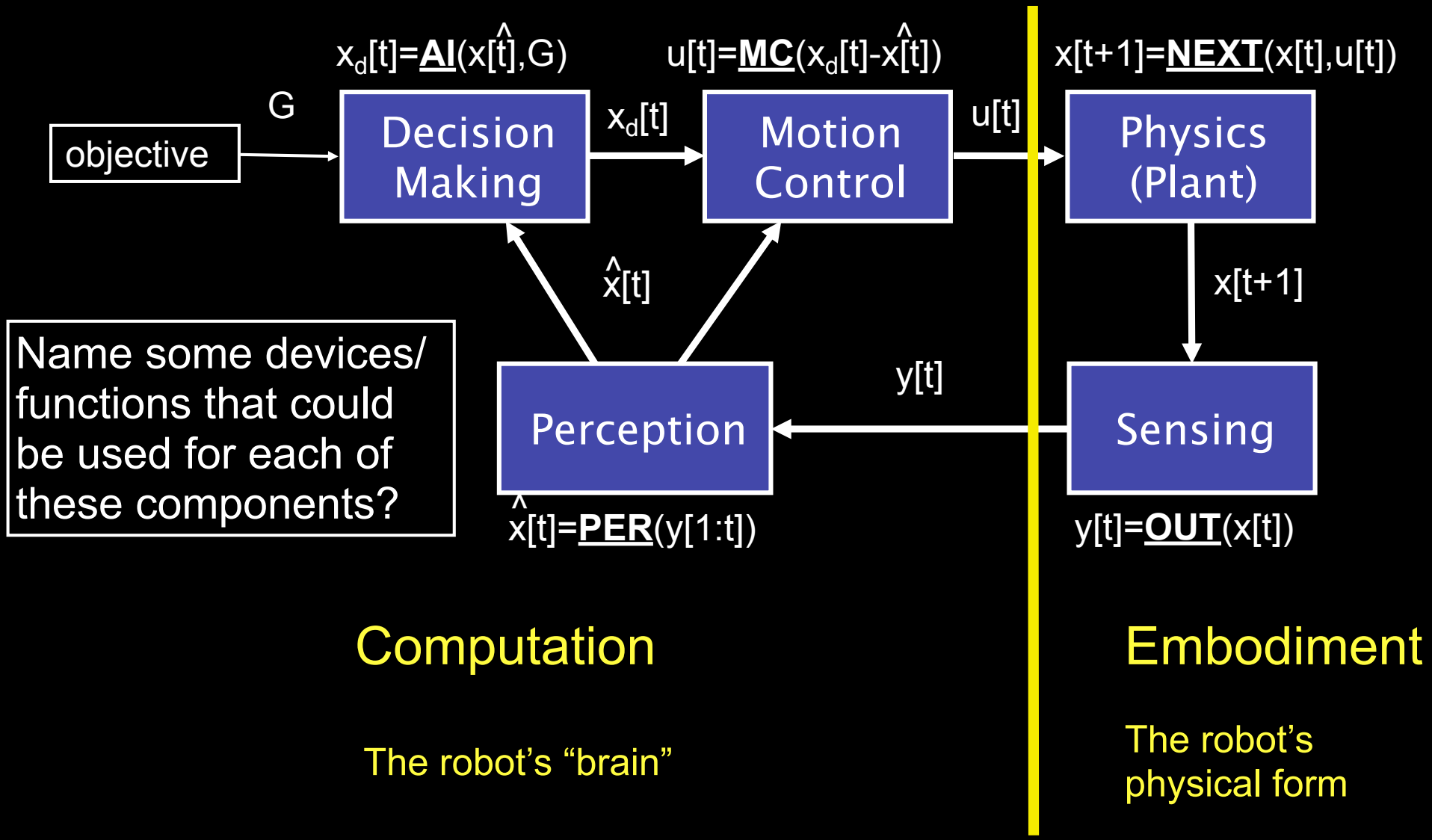
- Variables
  - t: time
  - x[t]: current world state
  - $\hat{x}[t]$: estimated state
  - $X_d[t]$: desired state
  - G: robot objective
  - y[1:t]: sensor readings
  - u[t]: motor forces

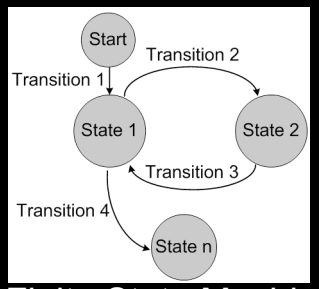
The functions of all autonomous robots can be cast into this control loop

The Robot Control Loop



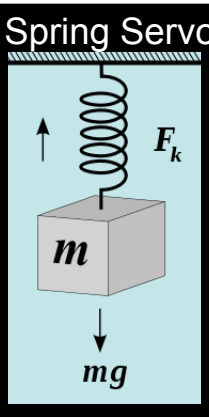
The Robot Control Loop





Finite State Machine

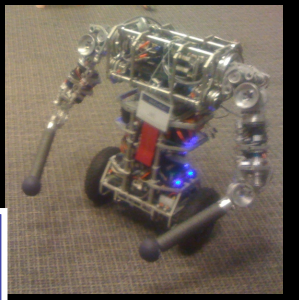
Path Planning



Create

Nao

uBot



objective

G

Decision Making

$x_d[t]$

Motion Control

u[t]

Physics (Plant)

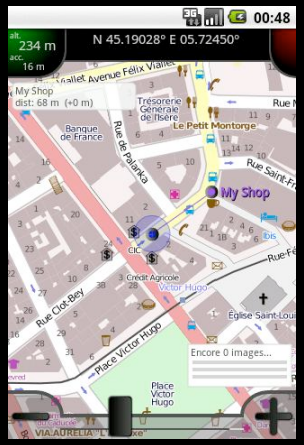
$\hat{x}[t]$

x[t+1]

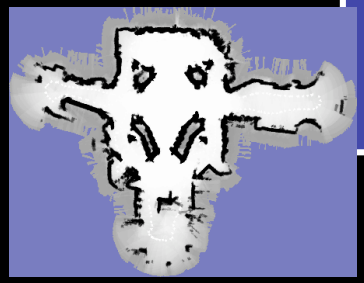
y[t]

Perception

Sensing



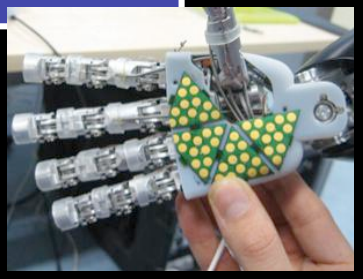
Localization



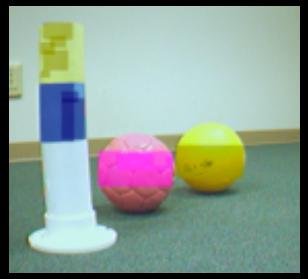
Mapping

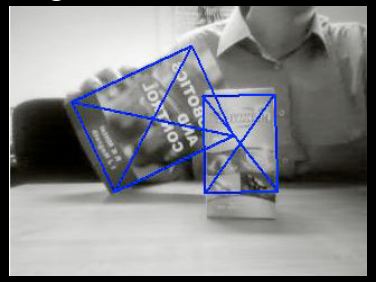
Visual

Tactile

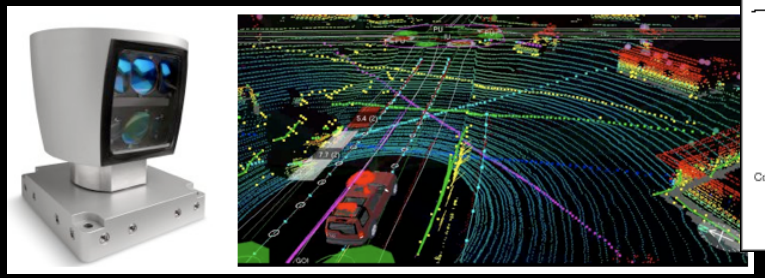


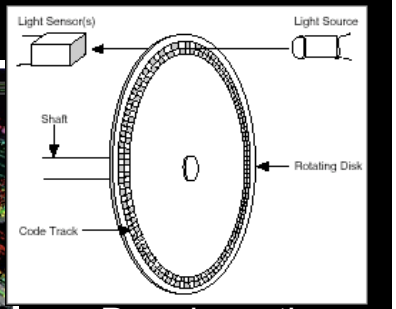
Object recognition





Depth imaging



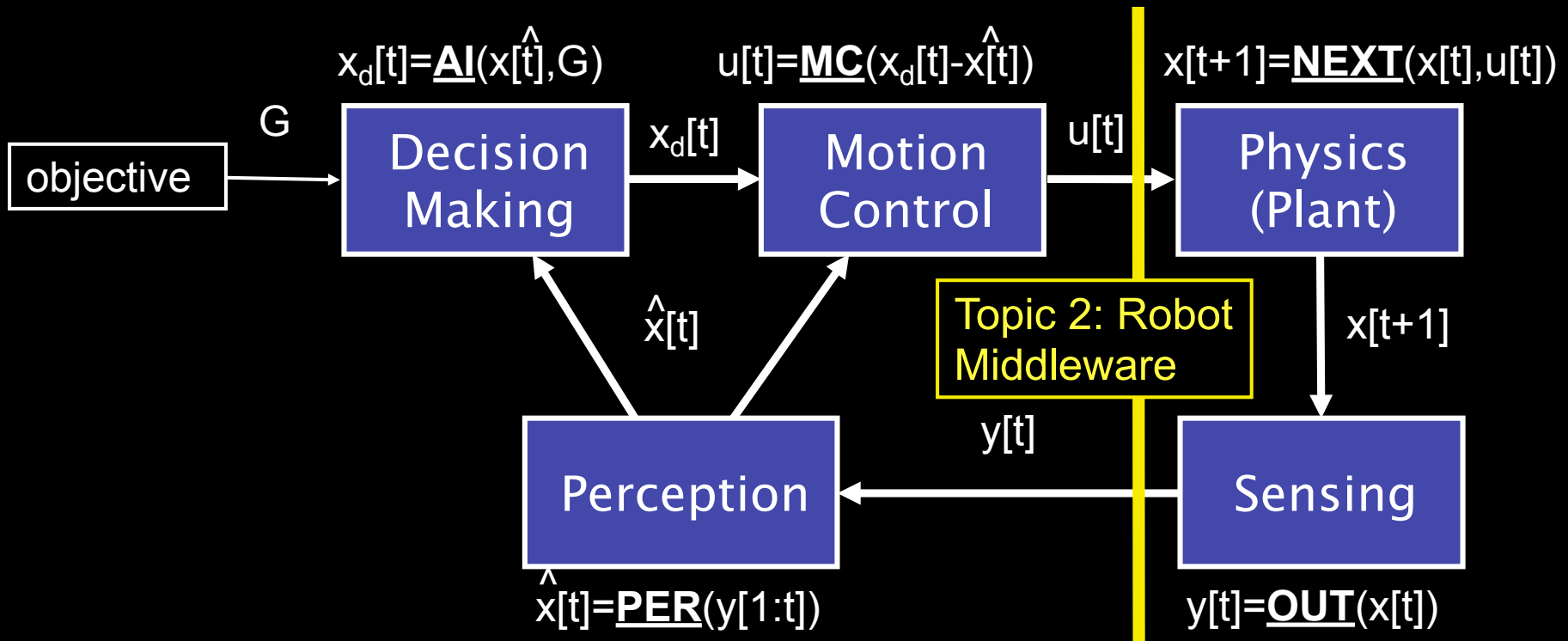


Proprioception

Robot Ethics

- Where does responsibility for the robot lie?
- How are robots motivated?
- Where are humans in the control loop?
- Differentiating "science fact" from "science fiction"

The Robot Control Loop



Computation

The majority of this course

Embodiment

EN1930Z "Robot Design"

Topic 3: Kinematics and Dynamics