Lecture 02: Linear Algebra and Differential Equations Review

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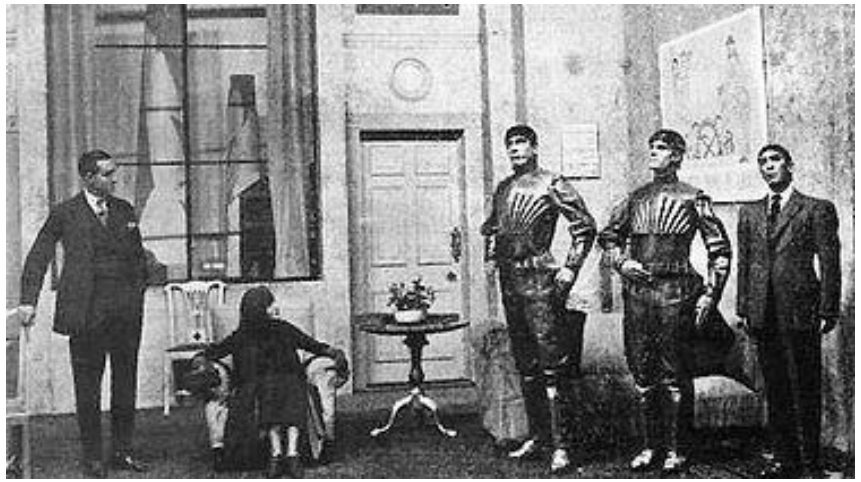
Where does the word *robot* come from?

- The term *robot* was first used in a play published by the Karel Čapek in 1921
  - Plays off the Czech word *robota*, meaning servitude
- R.U.R. (Rossum's Universal Robots) was a satire, robots were manufactured beings that performed all unpleasant manual labor
- The term robot has replaced the popular use of the word automation and/or android; however, the robots in the play are not mechanical devices, but artificial biological organisms that may be mistaken for humans



Administrivia

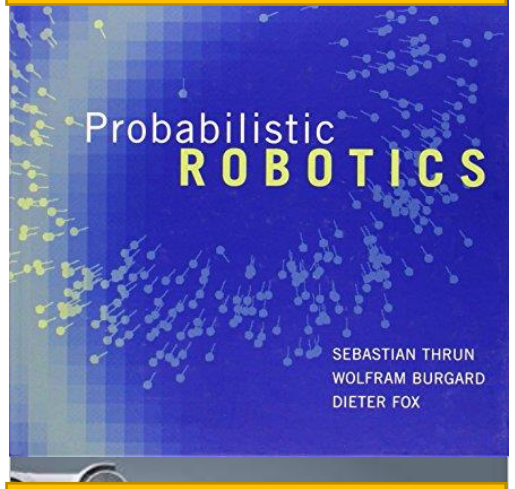
- Lectures will alternative between live and zoom lectures
- Homework 1 will be released this weekend
  - Due Friday 9/3 at 8pm
- Homework Parties will be on Fridays 4-6pm in ECEB 2013
  - Zoom info will be posted soon
  - Starting next week!
- Project Update 0 will be due 9/11 at midnight

Course Components

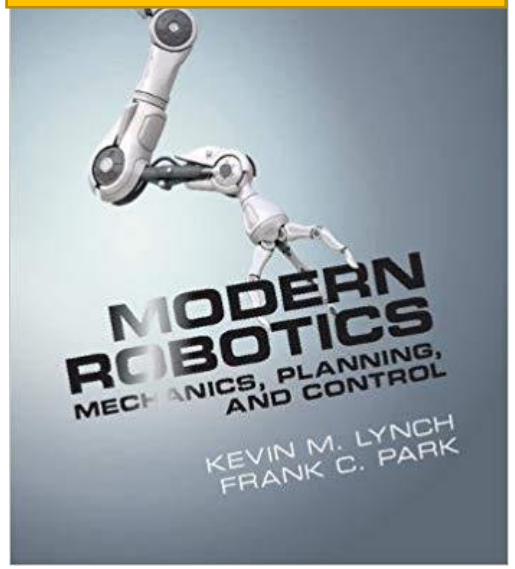
- 5% Participation
- 20% Homework
- 35% Exams (17.5% each)
- 20% Group Project
- 20% Laboratory

+ Extra Credit

Suggested:



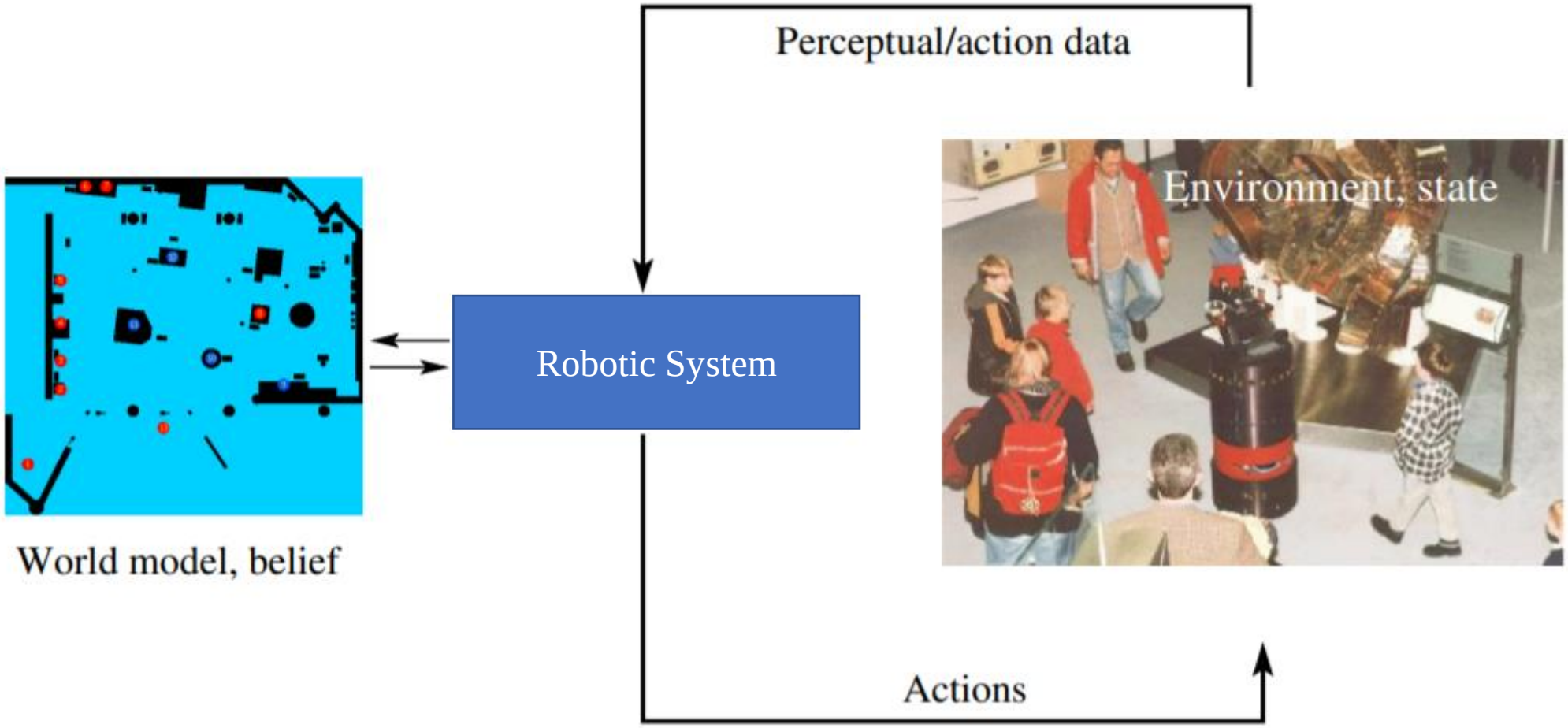
Required:



Project Logistics

- Create your own Pick and Place Challenge / Mock Competition!
  - “Pick and Place” is a canonical task for robot manipulators: tasks often consist of objects in the world that must be detected, located, grasped / picked, moved to a desired position, and placed
- This project will be completed in simulation – your first challenge is to choose a robot simulator and create your environment
  - You are free to explore simulation options (e.g., Gazebo, Webot, CARLA), but we encourage you to use Gazebo, an open-source simulator that integrates with ROS
  - We will provide a simple Gazebo simulation that mirrors the labs
- Note that the course staff will help you with the conceptual design of your system and with the fundamentals, but will not provide debugging support
- There will be four project updates (see Project tab on website), a final presentation, and a final report
  - Update 0 Deliverables: Form a team and tell us about a task you’d like your robot to perform

Robot States and the Environment



Robot States and the Environment

- **State** represents the environment as well as the robot, for example:
  - location of walls or objects
  - *pose of the robot*
- **Environment interaction** comes in the form of
  - Sensor measurements
  - Control actions
- **Internal representation (or belief)** of the state of the world
  - In general, the state (or the world) cannot be measured directly
  - Perception is the process by which the robot uses its sensors to obtain information about the state of the environment

Now back to review notes!

Inspiration from Lukas Luft and Wolfram Burgard

Diff. Eq. Notes from Roy Dong