EGN 4060c: Introduction to Robotics

Lecture 2:

Overview; Autonomy and Teleoperation

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Prerequisites

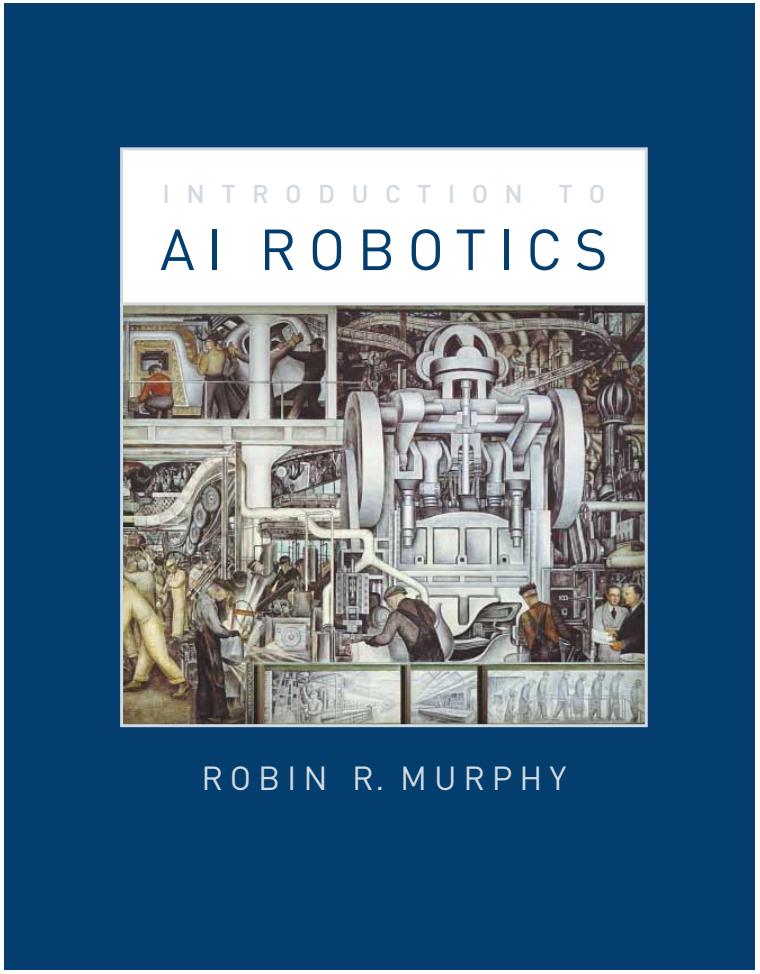
- Prerequisites have changed many times in order to accommodate students coming in from several different majors.
- COP 3223 (C Language) or COP 3330 (Object Oriented Programming)
- EEL 3657 (Linear Control Systems) or EEL 4742C (Embedded Systems) or COP 3503C (Computer Science II) or EGN 3321 (Dynamics) (co-requisite)

Intelligent Robotic Systems

- This is a required course for this minor along with EEL 4660 Robotic Systems (to be offered Spring 2015)
- Programming language: COP 3223 or EGN 3211
- Select 4 courses from:
  - Computer Science (computer vision, AI, algorithms): CAP 4053, CAP 4453, CAP 4630, CAP5415, CAP 5512, CAP 5610, COP 3503C.
  - Electrical/Computer Engineering (control, machine learning, pattern recognition): EEL 3567, EEL 4612C, EEL 4750, EEL 4818H, EEL 4872, EEL 5669, EEL 5173, EEL 5513, EEL 5625, EEL 5630, EEL 5820, EEL 5825, EGN 3321
  - Mechanical Engineering (kinematics, dynamics, MEMS): EML 3217, EML 3262, EML 4225, EML 4312C, EML 4313, EML 4264, EML 4804C, EML 5311, EML 5290

Book

- Purchasing the book is optional
- Sections of the book will be made available online, along with other recommended readings.
- Second source: Computational Principles of Mobile Robotics
- This week reading: chapter 1



Java Tutorial: Tomorrow

- Optional but recommended for students who don't feel confident in their Java programming skills
- Tomorrow night in HEC 356 from 6-8pm
- Please bring your laptop since Astrid will be having you work through some examples.

Labs

- Lab 1: Assembling the Robot

(no programming)

- Lab 2: Robot Movement and Odometry
- Lab 3: Path Planning
- Lab 4: Reinforcement Learning
- Lab 5: Line Following
- Final Project: Student Choice

Teams

- Today's class will end early to give you time to form teams.
- Please make sure all your team members are in the same lab section.
- Each team needs one member with a laptop that can run and compile Java.
- **Tip:** it is useful to have one person who is a confident programmer on each team.
- Sync your team code through a shared dropbox
  - http://www.getdropbox.com

Tips on Lab

- Be patient, methodical, and organized.
- Communicate with your partners frequently via email.
- Work on your code between weeks 1 and 2 of each lab.
- Common issues in lab: network connection drops, low batteries, stupid Java compilation errors
- Spend time working on your report.
- Experience in lab is a microcosm of what working with teams in industry is like.

Schedule

- Aug 27: Robotics Research assignment
- Sept 1: Labor Day (no class)
- Sept 17: Lab 2 report
- Oct 1: Lab 3 report
- Oct 8: Midterm exam
- Oct 15: Lab 4 report
- Oct 22: Project proposal
- Oct 29: Lab 5 report
- Nov 24/26: Final Project presentations
- Dec 1: Final project report; Exam review
- Dec 3: Final exam 1:00-3:50pm

Homework 1: Robotics Research

- Due Aug 27th submitted through webcourses
- Writeup on current robotic research (1-2 pages) to be done as an individual assignment
- Find a research group on the web
- Read their web page, look at their videos, browse some of their papers.
- Describe their robot platform, what problem they are trying to solve, applications for the technology
- The assignment will be graded on research content, writing style, and references.
- You are allowed images/schematics as part of your writeup.
- Please cite all sources (including images) that you use.
- 6 pts (2 on research content, 2 on writing style, 2 on references)
- Please make sure to submit something online because the university is using this assignment to gauge student participation for financial aid purposes.

Elements of a Robot

- What are three software components that you think every robot should have?

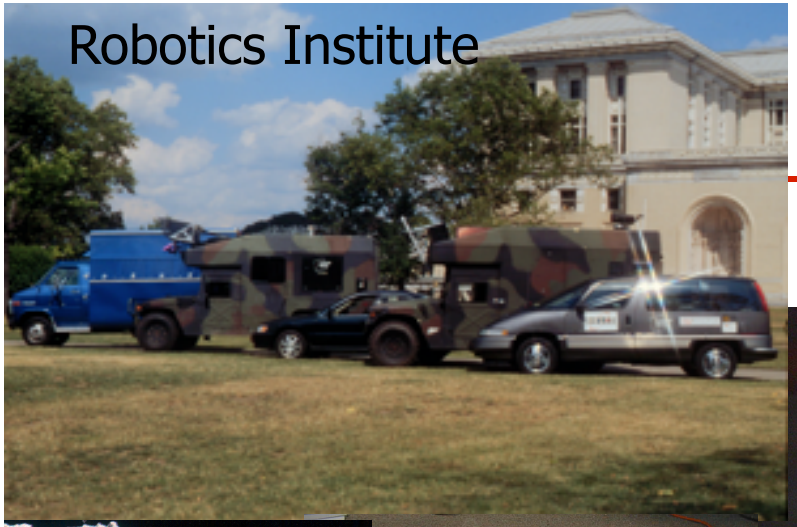
Course Topics

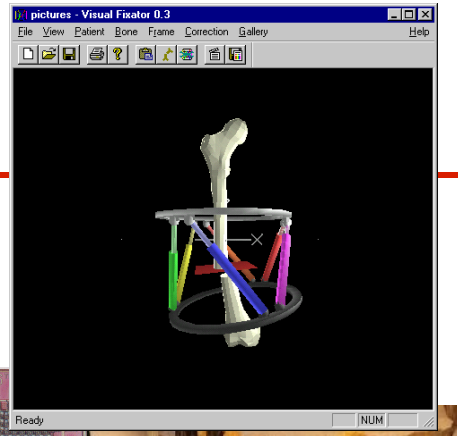
- Robot Architectures
- Path Planning
- Reactive systems/Control
- Sensing/Computer Vision
- Machine Learning
- Localization and mapping
- Cooperative Robotics
- Human-Robot Interaction
- Manipulation
- Locomotion
- Future directions: humanoid robotics

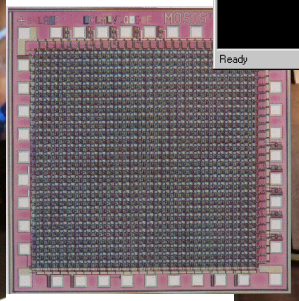
What you will learn:

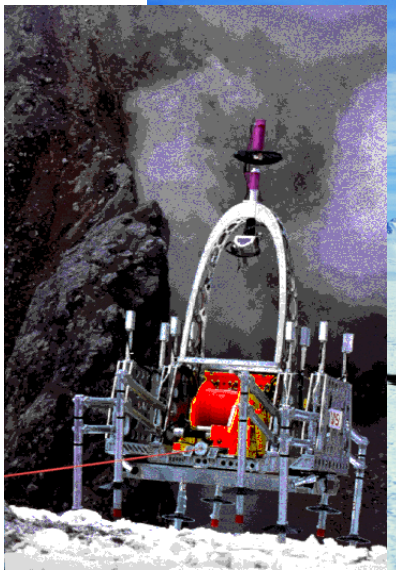
- What problems are hard/ unsolved
- A cookbook of useful techniques
  that people have used to solve common robotics problems
  The most useful robotics algorithms

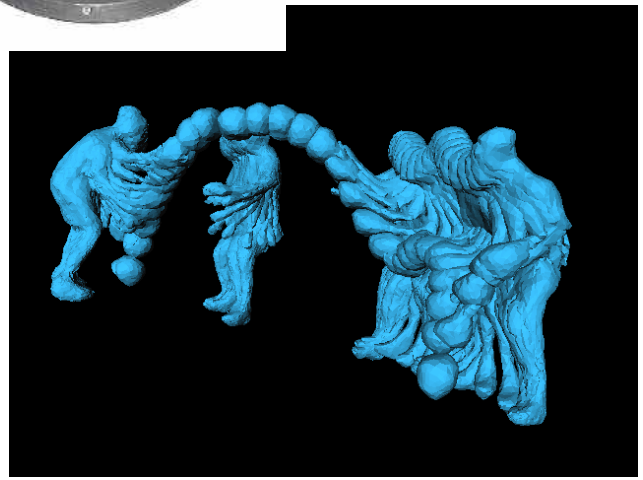
Robotics Institute











Next time:

- Introduction to the first lab
- Discussion of robotic architectures