CS 4631: Intelligent Robotics and Perception

Course Introduction

Instructor: Tucker Balch
Course Objectives

• Know what it takes to make a robust autonomous robot work:
  – Sense/Think/Act

• Understand the important, approaches, research issues and challenges in autonomous robotics.

• Know how to program an autonomous robot.
Example Videos
How we’re going to do it

• Read
  – Text “Introduction to AI Robotics.”
  – Supplementary papers.

• Program:
  – Simulated robots
  – Real robots

• Talk & think in class
Your Responsibility

- [www.cc.gatech.edu/~tucker/courses/irp](http://www.cc.gatech.edu/~tucker/courses/irp)
  - Read and understand class policies

- **Email list:** [irp@cc.gatech.edu](mailto:irp@cc.gatech.edu)

- Check your mail several times a week
Evaluation

- 2 Exams and Final 40%
- Homework 10%
- Projects and Final Project 50%
- Grading
  - 90-100 A
  - 80-89.99 B
  - 70-79.99 C
  - 60-69.99 D
  - Other F
Final Project
“Intelligent” Robotics

- **Sense/Think/Act**
- **“Al” view**
  - “get the computer (robot) to do things that, for now, people are better at”
  - Symbol systems’ hypothesis — intelligence is concerned with the machinery of manipulating symbols
- **“Reactive” view**
  - “elephants don’t play chess”
  - Chess is easy — moving around is hard
What Can Robots Be Used For?

- Manufacturing
- 3 Ds
  - Dirty
  - Dull
  - Dangerous
- Space
  - Satellites, probes, planetary landers, rovers
- Military
- Agriculture
- Construction
- Entertainment
- Consumer?
History of Intelligent Robotics

• 1940s
  – First remote manipulators for hazardous substances

• 1950s
  – Industrial manipulators: “reprogrammable and multi-functional mechanism designed to move materials, parts, tools…”
  – Closed loop control
History Continued

• 1955 – term “AI” coined
• 1960s manufacturing robots
  – Automatic guided vehicles (AGVs)
  – Precision, repeatability
  – Emphasis on mechanical aspects
• 1970s
  – Planetary landers
  – Machine vision research expands
• 1980s
  – Black factory
  – First intelligent autonomous robots:
    • Shakey, Stanford Cart, etc
History  Continued

• 1990s
  – Symbolic AI/Robotics stalls
  – Reactive/Behavior-based robotics emerges

• 2000s
  – ?
Teleoperation

- **Human controls robot remotely**
  - Hazardous materials
  - Search and rescue
  - Some planetary rovers

- **Considerations**
  - Feedback (video, tactile, smell?)
  - User interfaces (cognitive fatigue, nausea)
  - Time/distance
Telepresence

• Remote embodiment (VR)
• Considerations
  – Greater sensor feedback
  – High bandwidth
Semi-autonomous Control

• “Supervisory” control
• Fusion of human commands and autonomous control
• Delegate some aspects to computer
• Easier to do in the short term
  – Can be “trusted”
  – Predator (first robot to fire a weapon in combat)
Full Autonomous Control
Assignments

• Read Chapter 1 (Weds)
• Read Paper on Web (Fri)