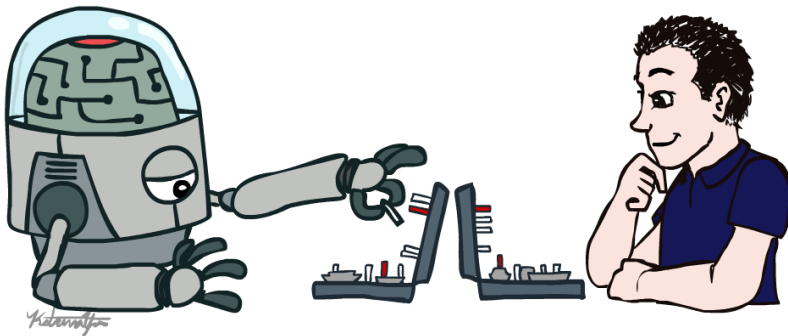


CS 188: Artificial Intelligence

Introduction



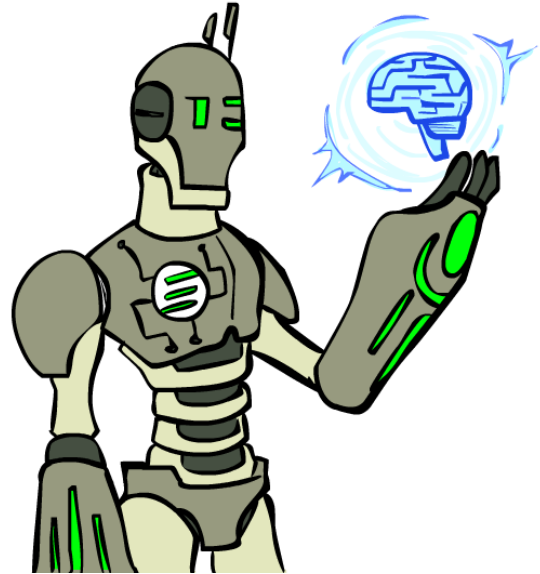
Instructors: Anca Dragan, Pieter Abbeel

University of California, Berkeley

(slides adapted from Dan Klein, Pieter Abbeel)

Today

- What is artificial intelligence?
- Where did it come from / What can AI do?
 - What should we and shouldn't we worry about? What can we do about the things we should worry about?
- What is this course?



This lecture:

- What is it / what are the basics of how it works?
- What are things we should and should not worry about?
 - How might we fix the things we should worry about?

Rational Decisions

We'll use the term **rational** in a very specific, technical way:

- Rational: maximally achieving pre-defined goals
- Rationality only concerns what decisions are made
(not the thought process behind them)
- Goals are expressed in terms of the **utility** of outcomes
- Being rational means **maximizing your expected utility**

A better title for this course would be:

Computational Rationality

1. 效用 .

2. 效用 .

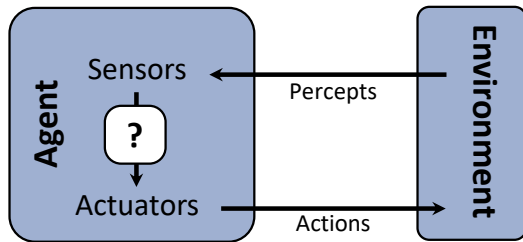
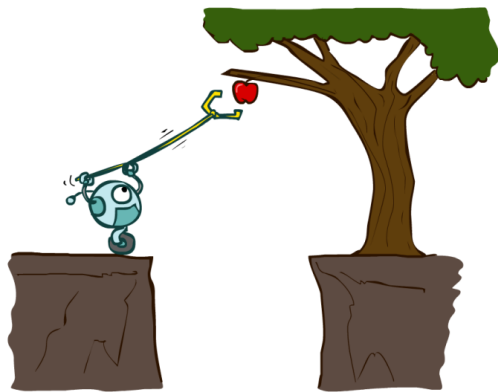
What About the Brain?

- Brains (human minds) are very good at making rational decisions, but not perfect
- Brains aren't as modular as software, so hard to reverse engineer!
- “Brains are to intelligence as wings are to flight”
- Lessons learned from the brain: memory and simulation are key to decision making



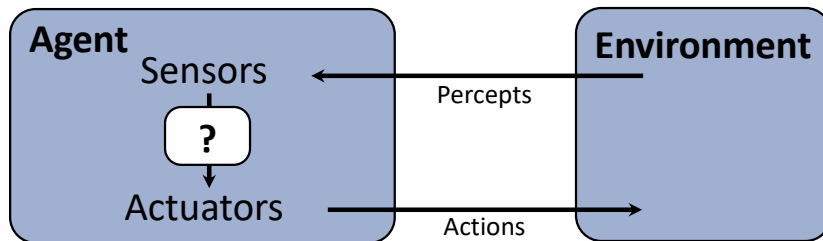
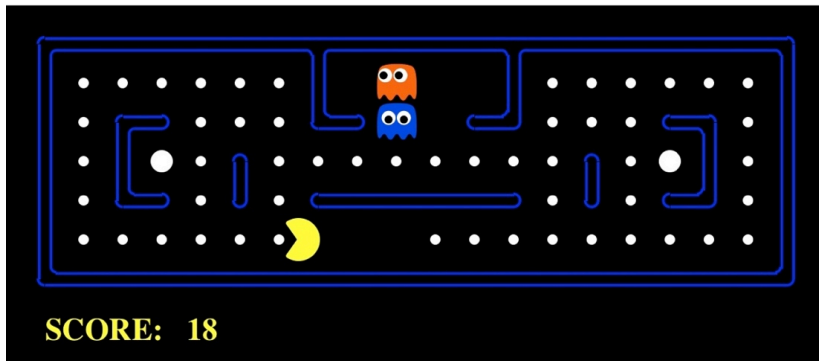
Designing Rational Agents

- An **agent** is an entity that *perceives* and *acts*.
感知和
- A **rational agent** selects actions that maximize its (expected) **utility**.
MAX
- Characteristics of the **percepts**, **environment**, and **action space** dictate techniques for selecting rational actions
(环境) 感知的对象
- **This course is about:**
 - General AI techniques for a variety of problem types
 - Learning to recognize when and how a new problem can be solved with an existing technique



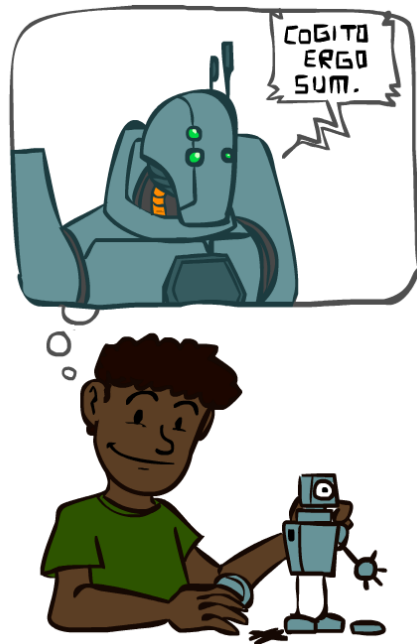
执行器

Pac-Man as an Agent



A (Short) History of AI

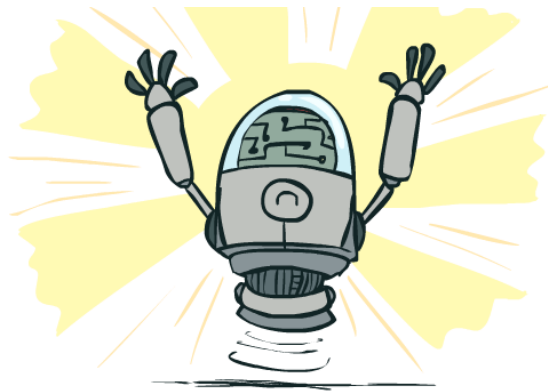
- 1940-1950: Early days
 - 1943: McCulloch & Pitts: Boolean circuit model of brain
 - 1950: Turing's "Computing Machinery and Intelligence"
- 1950—70: Excitement: Look, Ma, no hands!
 - 1950s: Early AI programs, including Samuel's checkers program, Newell & Simon's Logic Theorist, Gelernter's Geometry Engine
 - 1956: Dartmouth meeting: "Artificial Intelligence" adopted
 - 1965: Robinson's complete algorithm for logical reasoning
- 1970—90: Knowledge-based approaches
 - 1969—79: Early development of knowledge-based systems
 - 1980—88: Expert systems industry booms
 - 1988—93: Expert systems industry busts: "AI Winter"
- 1990—: Statistical approaches
 - Resurgence of probability, focus on uncertainty
 - General increase in technical depth
 - Agents and learning systems... "AI Spring"?
- 2000—: Where are we now?



What Can AI Do?

Quiz: Which of the following can be done at present?

- ✓ Play a decent game of Jeopardy?
- ✓ Win against any human at chess?
- ✓ Win against the best humans at Go?
- ✓ Play a decent game of tennis?
- ✓ Grab a particular cup and put it on a shelf?
- ✗ Unload any dishwasher in any home?
- 🤖 Drive safely along the highway?
- ✗ Drive safely along Telegraph Avenue?
- ✓ Buy a week's worth of groceries on the web?
- ✗ Buy a week's worth of groceries at Berkeley Bowl?
- 🤖 Discover and prove a new mathematical theorem?
- ✗ Perform a surgical operation?
- ✗ Unload a know dishwasher in collaboration with a person?
- ✓ Translate spoken Chinese into spoken English in real time?
- ✗ Write an intentionally funny story?



Robotics

Demo 1: ROBOTICS – soccer.avi

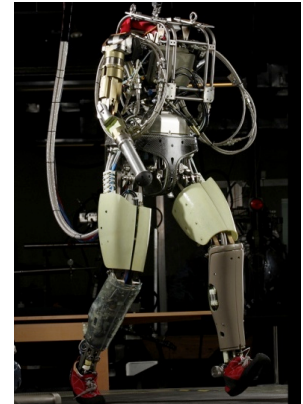
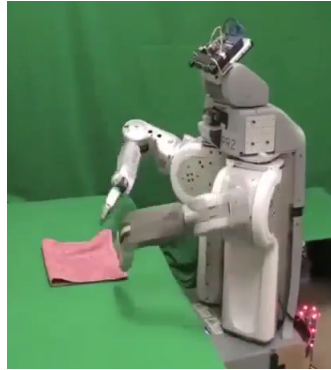
Demo 4: ROBOTICS – laundry.avi

Demo 2: ROBOTICS – soccer2.avi

Demo 5: ROBOTICS – petman.avi

Demo 3: ROBOTICS – gcar.avi

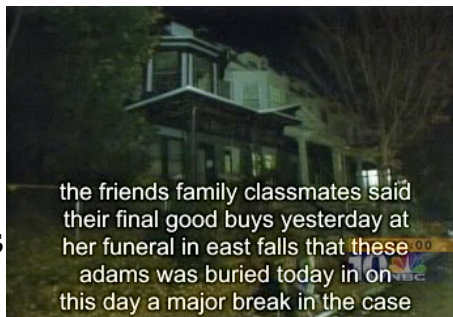
- Robotics
 - Part mech. eng.
 - Part AI
 - Reality much harder than simulations!
- Technologies
 - Vehicles
 - Rescue
 - Help in the home
 - Lots of automation...
- In this class:
 - We ignore mechanical aspects
 - Methods for planning
 - Methods for control



Images from UC Berkeley, Boston Dynamics, RoboCup, Google

Natural Language

- Speech technologies (e.g. Siri)
 - Automatic speech recognition (ASR)
 - Text-to-speech synthesis (TTS)
 - Dialog systems
- Language processing technologies
 - Question answering
 - Machine translation



- Web search
- Text classification, spam filtering, etc...

Topics

限制, 约束

- Constraint satisfaction, e.g. scheduling
- Search, planning, reinforcement learning, e.g. routing, robot navigation
- Probabilistic inference, e.g. robot localization
- A bit of supervised machine learning, e.g. spam detection

Should I take 188?

- Yes, if you want to know how to design rational agents!
 - 188 also teaches you a different way of thinking.
- Disclaimer: If you're interested in making yourself more competitive for AI jobs, 189 and 182 are actually much better fits.