Random Administrivia

- In CMC 306 on Monday for LISP lab

Artificial Intelligence: Introduction

- What IS artificial intelligence?
- Examples of intelligent behavior:

Definitions of AI

- There are as many definitions as there are practitioners.

- How would you define it? What is important for a system to be intelligent?

Four main approaches to AI

- Systems that act like humans
- Systems that think like humans
- Systems that think rationally
- Systems that act rationally

Approach #1: Acting Humanly

- AI is: "The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil)

- Ultimately to be tested by the Turing Test

The Turing Test

- Demonstrations of software
  - Eliza: http://www-ai.ijs.si/eliza/eliza.html (1965)
  - Alice: http://www.alicebot.org/ (Loebner Prize 2000-2001 winner)
  - Transcript: http://www.nik.com.au/alice/

In practice

- Needs:
  - Natural language processing
  - Knowledge representation
  - Automated reasoning
  - Machine learning
- Too general a problem – unsolved in the general case
- Intelligence takes many forms, which are not necessarily best tested this way
- Is it actually intelligent? (Chinese room)

Approach #2: Thinking Humanly

- AI is: "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning…" (Bellman)
- Goal is to build systems that function internally in some way similar to human mind

Workings of the human mind

- Computer game players typically work much differently than human players
- Cognitive science tries to model human mind based on experimentation
- Cognitive modeling approach to AI: act intelligently while internally mimicking to human mind

Approach #3: Thinking rationally

- AI is: using logic to make complex decisions
- I.e., how can knowledge be represented logically, and how can a system draw deductions?
- Uncertain knowledge? Informal knowledge?
- "I think I love you."

Approach #4: Acting rationally

- AI is: "…concerned with the automation of intelligent behavior" (Luger and Stubblefield)
- The intelligent agent approach
- An agent is something that perceives and acts
- Emphasis is on behavior

Acting rationally: emphasis of most AI today

- Why?
- In solving actual problems, it's what really matters
- Behavior is more scientifically testable than thought
- More general: rather than imitating humans trying to solve hard problems, just try to solve hard problems

Recap on the difference in approaches

- Thought vs. behavior
- Human vs. rational

Early AI History

- Birth: McCulloch and Pitts, simulated neurons, 1943

- "AI": Dartmouth workshop, 1956

- Early successes: General Problem Solver (1957), Lisp (1958)

- Predictions that AI would eventually do almost anything

The Dark Ages

- Mid 60s – Mid 70s
- AI failed to deliver
- Minsky and Papert's Perceptrons

The Crawl Back

- 1970s: knowledge based AI
- 1980s: some commercial systems
- Rumelhart and McClelland's Parallel Distributed Processing

Modern Success Story

- Machine learning / data mining
- Intelligent agents ('bots)
- Game playing (Deep Blue / Fritz)
- Robotics
- Natural language processing (Babelfish)

More History of AI

- It's in text and very cool, read it
- Sections 1.2-1.3

What we'll be doing

- LISP Programming
- Intelligent agents
- Search methods, and how they relate to game playing (e.g. chess)
- Logic and reasoning
  - Propositional logic

What we'll be doing

- Uncertain knowledge and reasoning
  - Probability, Bayes rule
- Machine learning
  - Neural networks, decision trees, computationally learning theory, reinforcement learning

$$in_i = \sum_j W_{j,i} a_j = \mathbf{W}_i \cdot \mathbf{a}_j$$

What we won't be doing in class (but you can for project)

- Natural language processing (Jeff's class)

- Computer vision (Jack's image processing class)

- Computers that will take over the planet

The Lisp Programming Language

- Developed by John McCarthy at MIT
- Second oldest high level language still in use (next to FORTRAN)
- LISP = LISt Processing
- Common Lisp is today's standard
- One of the most popular languages for AI