
CSE 630: Artificial Intelligence I

Chapter 1: Intro to AI

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What would the perfect AI system do?

System that thinks like humans	System that thinks rationally
System that acts like humans	System that acts rationally

“Rational” vs. “Human-like”

“Thinking” vs. “Acting”

Acting Humanly: The Turing Test

- Test designed by Alan Turing in 1950
 - Human interrogator interacts with two subjects (A & B)
 - One human, one machine
 - “Can you tell if A or B is human?”
 - If not, then the machine passes

Acting Humanly: The Turing Test

- What's needed to pass the Turing Test?
 - Natural Language Processing
 - Knowledge Representation
 - Automated Reasoning
 - Machine Learning
 - Natural Language Generation
 - And, for the “Total Turing Test”
 - Speech recognition
 - Speech synthesis
 - Computer Vision
 - Robotics

Acting Humanly: The Turing Test

- What's wrong with the Turing Test?
 - Concerned with output, not process
 - Encourages deception, hackery
 - Not reproducible
 - One person's machine is another's human being
 - Not good for mathematical analysis

Thinking Humanly: Cognitive Modeling

- Understand and reproduce the human thought process
- Related to “cognitive science”
 - Often uses similar computational models
- Difficult to base AI on cognitive modeling
- Many successful AI applications without cognitive modeling

Thinking Rationally: “Laws of Thought”

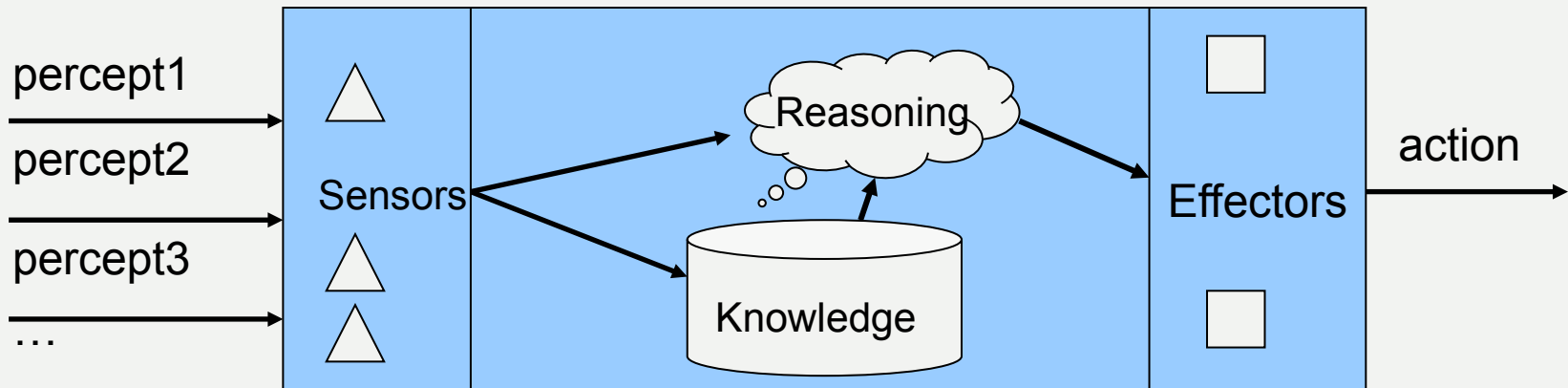
- Prescriptive rather than descriptive
 - What is the “proper” way of reasoning and thinking (Logic)
 - Good for building mechanical reasoners
- Problems:
 - Not everything is easy to formulate logically
 - Large amounts of computation needed to do complete inference

Acting Rationally

- Do the right thing!
 - First hurdle: What is the right thing?
 - Sometimes the right thing is not the same as what a human would do
- Given: Some (limited) information
- Do: Maximize some goal
 - Traffic light: Maximize traffic flow given sensor inputs

Rational Agents

- Agent: Entity that *perceives* and *acts*
 - Rational agents perceive and act rationally
 - Agents try to achieve goals given input perceptions (percepts)
- Functional abstraction: $f: \text{Percept}^* \rightarrow \text{Action}$



Limited Computation

- Sometimes we don't have the resources
 - Run out of time
 - Run out of memory
- Limited rationality: Do the right thing given the constraints

Foundations of AI

- Philosophy (428 BC -)
 - Logic, Knowledge Representation
- Mathematics (c. 800 BC -)
 - Logic, computability, uncertainty
- Economics (1776 -)
 - Maximizing payoff, adversarial problems
- Neuroscience (1861 -)
- Psychology (1879 -)
- Computer Engineering (1940 -)
- Control Theory (1948 -)
- Linguistics (1957 -)

Current AI Applications

- Games
 - IBM “Deep Blue” beat chess grandmaster Gary Kasparov
 - IBM “Watson” playing Jeopardy
 - But computers remain pathetically bad at “Go”
- Chatbots
 - Cleverbot
- Mimicking pet behavior (SONY AIBO)
- Advanced Robotics (Honda’s ASIMO)

Current AI Applications

- Autonomous vehicle routing
 - DARPA Automatic Vehicle Challenge
 - Google's autonomous vehicles
 - Automatic plane collision avoidance
 - Google Maps and in vehicle mapping devices
- Consumer pattern recognition
 - Fraud detection
 - Supermarket tracking
- Spam detection

Current AI Applications

- Telephone-based human-computer interfaces
 - Airlines
 - Customer service routing
- Roomba “intelligent vacuum”
- Machine translation
 - Google Translate

For Next Time

- Read Chapters 1 & 2
- Do Homework 1
 - Due at the start of class Thursday!
- Start Homework 2
 - Programming Assignment
 - Will take more time than Homework 1
- Review Course Notes for:
 - AI Intro – Chapter 1
 - Agents & Rationality – Chapter 2
- BRING QUESTIONS THURSDAY!