

Introduction to Artificial Intelligence

CSE 415

Winter 2006

Administrative Details

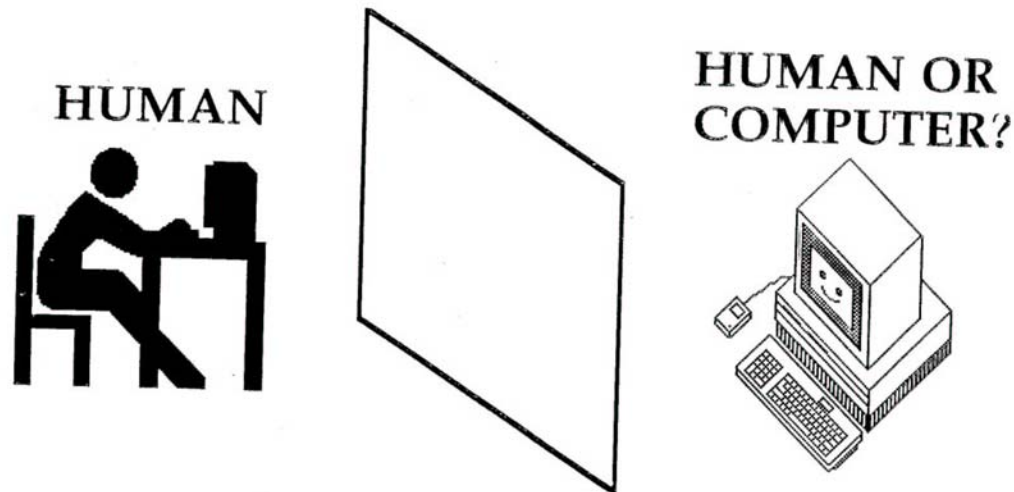
- Instructor: Prof. Linda Shapiro, 634 CSE, shapiro@cs.washington.edu
- TA: Tyler Robison, trobison@cs
- Course Home Page:
www.cs.washington.edu/415
- Text: Artificial Intelligence A Modern Approach (2nd edition), Russell and Norvig
- Final Exam: Thursday, March 16, 8:30am

What is intelligence?

- What capabilities should a machine have for us to call it intelligent?

Turing's Test

- If the human cannot tell whether the responses from the other side of a wall are coming from a human or computer, then the computer is intelligent.



Performance vs. Humanlike

- What is more important: how the program performs or how well it mimics a human?
- Can you get a computer to do something that you don't know how to do? Like what?
- What about creativity?

Mundane Tasks

- Perception
 - Vision
 - Speech
- Natural Language
 - Understanding
 - Generation
 - Translation
- Reasoning
- Robot Control

Formal Tasks

- Games
 - Chess
 - Checkers
 - Kalah, Othello
- Mathematics
 - Logic
 - Geometry
 - Calculus
 - Proving properties of programs

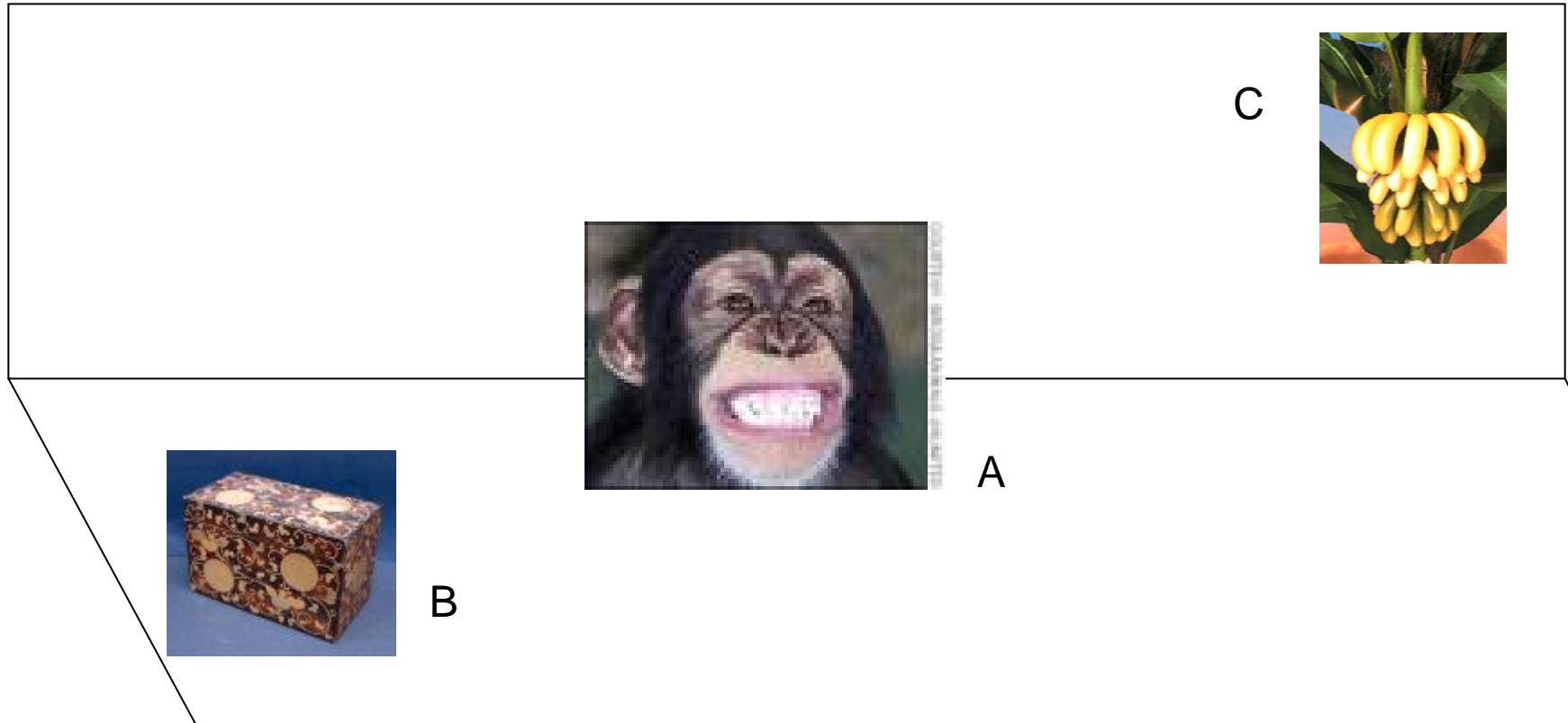
Expert Tasks

- Engineering
 - Design
 - Fault Finding
 - Manufacturing planning
- Medical
 - Diagnosis
 - Medical Image Analysis
- Financial
 - Stock market predictions

What is an intelligent agent?

- What is an agent?
- What does **rational** mean?
- Are humans always rational?
- Can a computer always do the right thing?
- What can we substitute for the right thing?
- What kinds of agents already exist today?

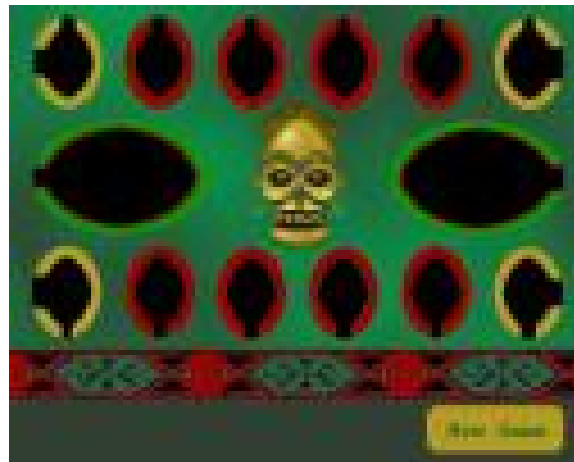
Problem Solving



Find a sequence of operations to produce the desired situation from the initial situation.

Game Playing

- **Given:**
 - An initial position in the game
 - The rules of the game
 - The criteria for winning the game
- **WIN!**



Theorem Proving

- **Given:**

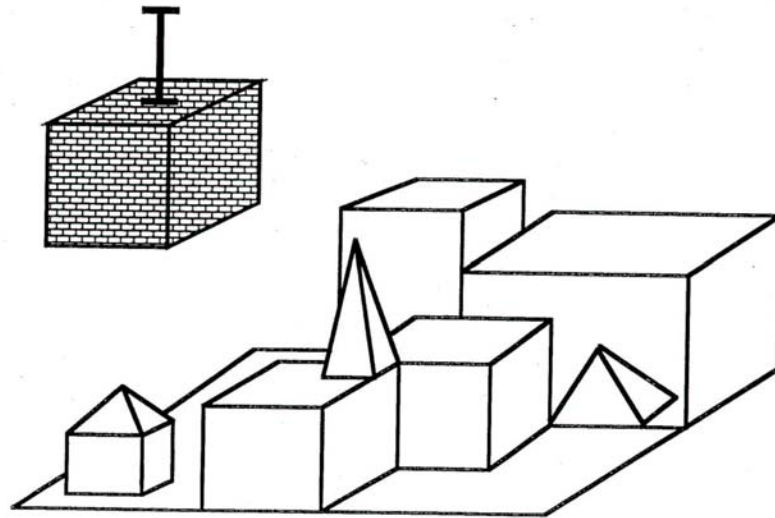
- $\forall x (\text{human}(x) \rightarrow \text{animal}(x))$
- $\forall x (\text{animal}(x) \rightarrow (\text{eats}(x) \ \& \ \text{drinks}(x)))$

- **Prove:**

- $\forall x (\text{human}(x) \rightarrow \text{eats}(x))$

Natural Language Understanding

- Pick up a big red block.
- OK.



Expert Systems

“I’d like to buy a DEC VAX computer with 8MG of main memory, two 300MB disks, and a 1600 BPI tape drive.”

Today’s Response: “You gotta be kidding.”

XCON: “1 XVW756 CPU, 2 XVM128A memory boards, 1 XDQ780C disk controller, 1 XDT780V disk drive, 1 XTQ780T tape controller, 1 XTT981Q tape drive, 1 XBT560M mass bus”

Computer Vision with Machine Learning

Given: Some images and their corresponding descriptions



{trees, grass, cherry trees}



{cheetah, trunk}



{mountains, sky}



{beach, sky, trees, water}

...

To solve: What object classes are present in new images



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Stuart Russell's "Potted History of AI"

- 1943 McCulloch & Pitts: Boolean circuit model of the brain
- 1950 Turing's "Computing Machinery and Intelligence"
- 1952-69 **Look Ma, no hands**
- 1950s Early AI programs: Logic Theorist, Checker Player, Geometry
- 1956 Term "**Artificial Intelligence**" adopted
- 1965 Robinson's complete algorithm for logical reasoning
- 1966-74 AI discovers computational complexity; **neural nets go**
- 1969-79 Early development of knowledge-based "**expert systems**"
- 1980-88 **Expert systems boom**
- 1988-93 **Expert systems bust: "AI Winter"**
- 1985-95 **Neural networks return**
- 1988- **AI and Statistics together**
- 1995- **Agents, agents everywhere**