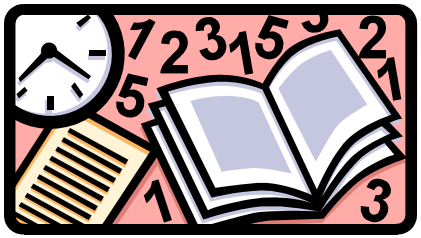
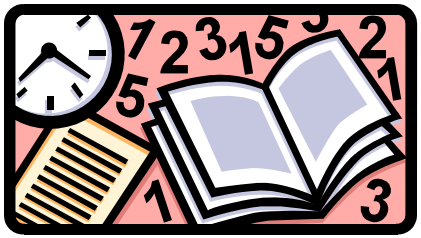


CS360: AI & Robotics

TTh 9:25 am - 10:40 am

Shereen Khoja
shereen@pacificu.edu

Artificial Intelligence

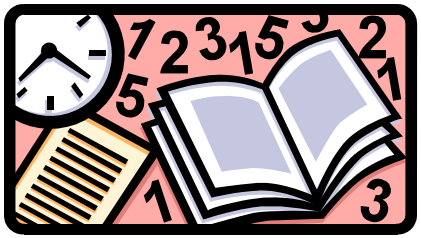


- We call ourselves

Homo sapiens

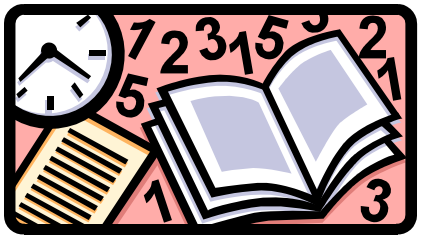
- What does this mean?

What is AI?

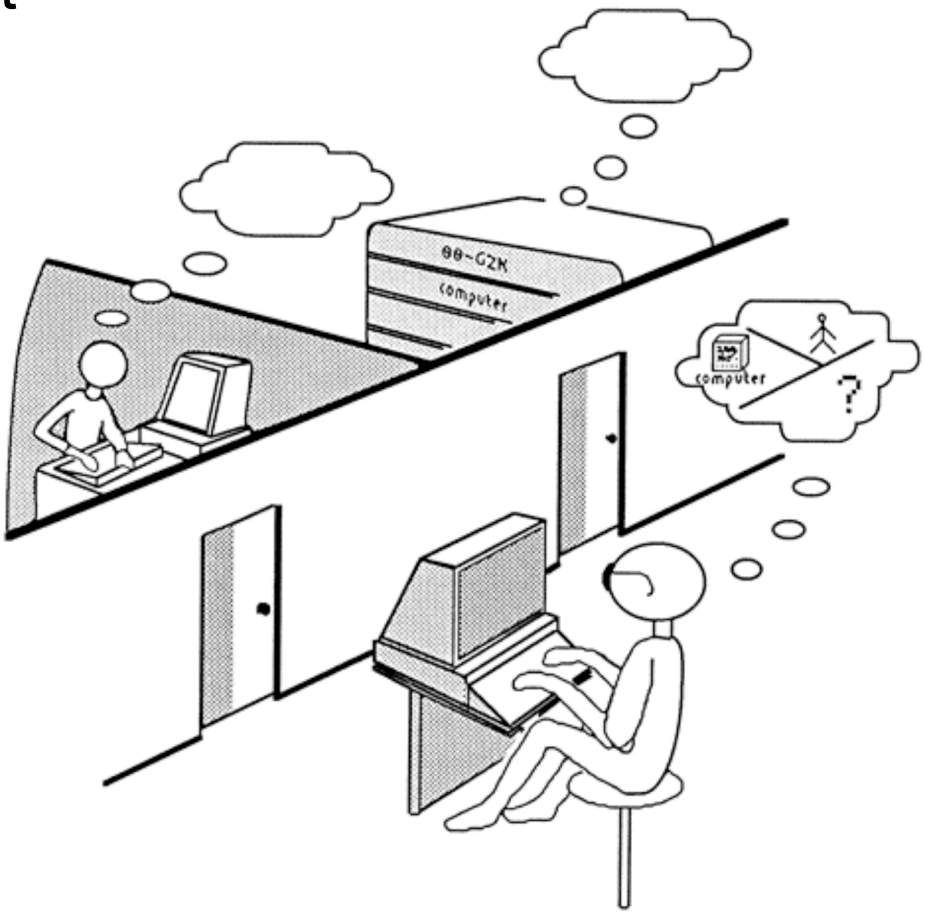


Systems that think like humans	Systems that think rationally
Systems that act like humans	Systems that act rationally

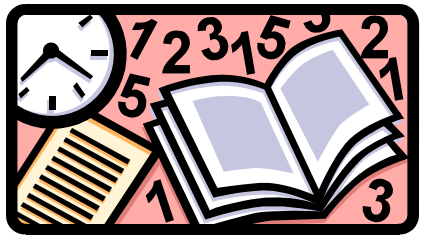
Acting Humanly



- The Turing Test

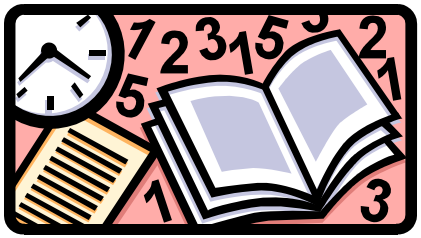


What Things Does a Computer Need to Pass?



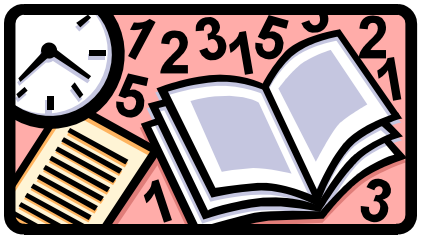
- Natural Language Processing
- Knowledge Representation
- Automated Reasoning
- Machine Learning

Total Turing Test



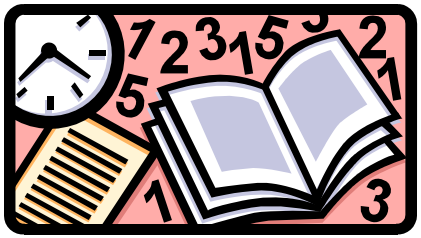
- Computer Vision
- Robotics

Turing Test

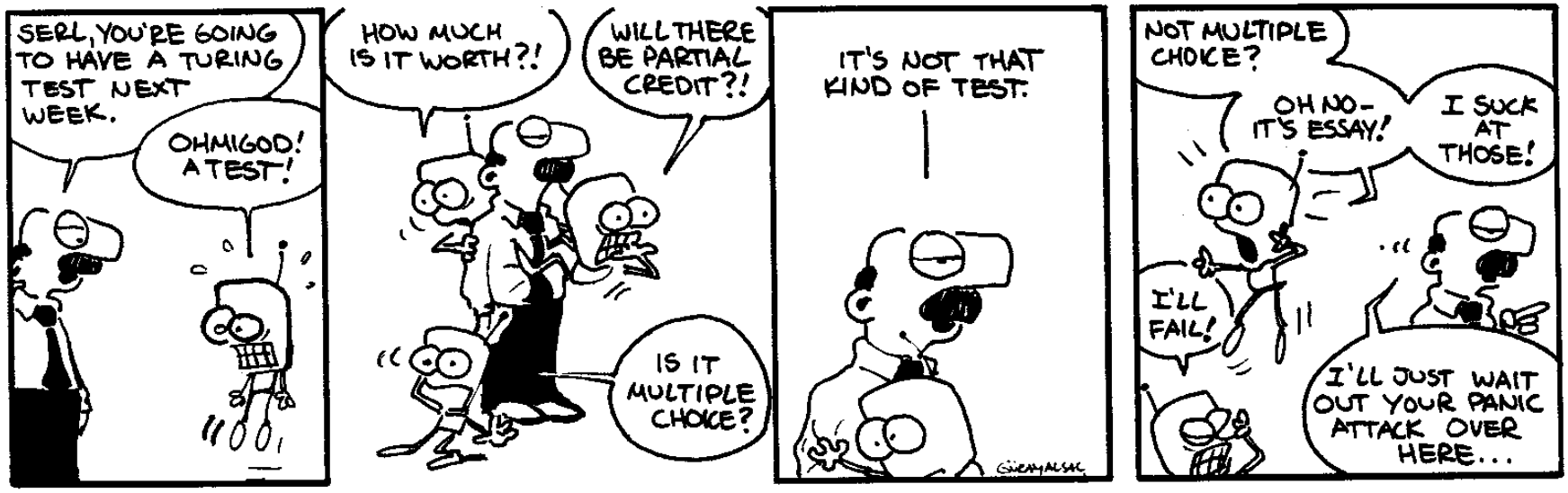


- Still relevant today
- AI researchers devote little effort to achieving the Turing test
- Why?
  - Underlying principles are more important
  - Wright brothers succeeded in flying after they stopped imitating birds

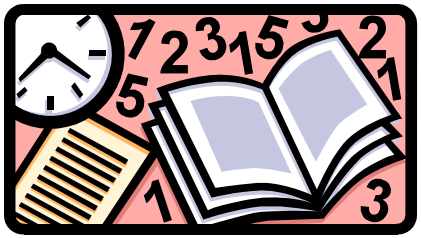
Critics of the Turing Test



- Needlessly constrains machine intelligence to fit a human mold
  - Do we really want a machine that is bad at mathematics?
- Does not test abilities requiring perceptual skill or manual dexterity

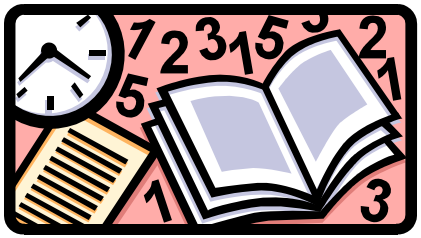

SERL, YOU'RE GOING TO HAVE A TURING TEST NEXT WEEK.
OHMIGOD! A TEST!
HOW MUCH IS IT WORTH?!
WILL THERE BE PARTIAL CREDIT?!
IS IT MULTIPLE CHOICE?
IT'S NOT THAT KIND OF TEST.
NOT MULTIPLE CHOICE?
OH NO- IT'S ESSAY!
I SUCK AT THOSE!
I'LL FAIL!
I'LL JUST WAIT OUT YOUR PANIC ATTACK OVER HERE...

Thinking Humanly



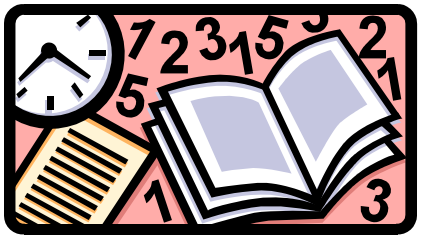
- General Problem Solver (GPS) by Newell and Simon
- Compare the trace of its reasoning steps to traces of human subjects solving the same problems
- Field of Cognitive Science
- Get inside the human mind through
  - Introspection
  - Psychological Experiments

Thinking Rationally



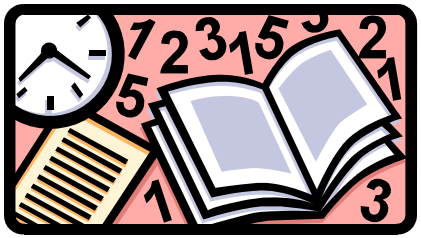
- The ‘laws of thought’ approach
- “Socrates is a man; all men are moral; therefore, Socrates is mortal”
- Two problems:
  - Hard to state informal knowledge in formal terms
  - Problems with a few dozen facts can exhaust the computational resources of a computer

Acting Rationally



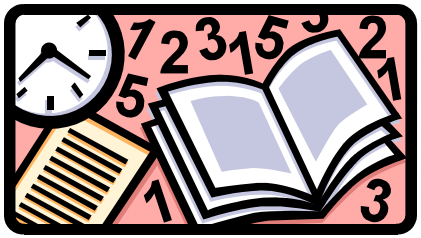
- The rational agent approach
- Agent is different from a program
  - Operating under autonomous control
  - Perceiving their environment
  - Persisting over a long period of time
  - Adapting to change
- Difference between the laws of though approach and this approach
  - There are ways of acting rationally that do not involve logic
  - Recoiling from a hot stove

AI Fundamentals



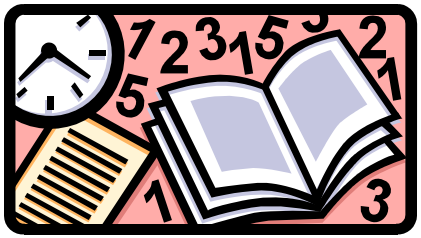
- Two fundamental components of AI
  - Knowledge Representation
  - Search

AI Application Areas



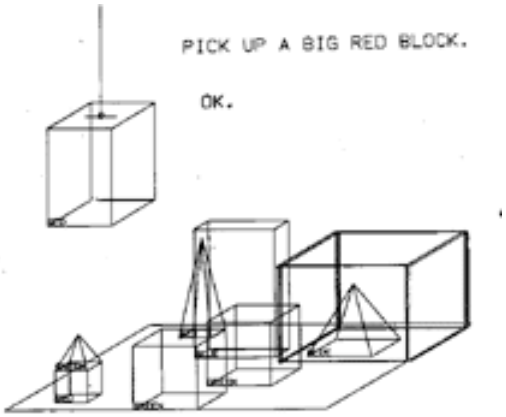
- Game Playing
  - State search for tic-tac-toe
- Automated Reasoning
- Expert Systems
  - Knowledge Engineer
  - DENDRAL – MYCIN
  - Difficulties include:
    - Lack of deep knowledge
    - Lack of flexibility
    - No deep explanations
    - Little learning from experience
    - Difficulties in verification

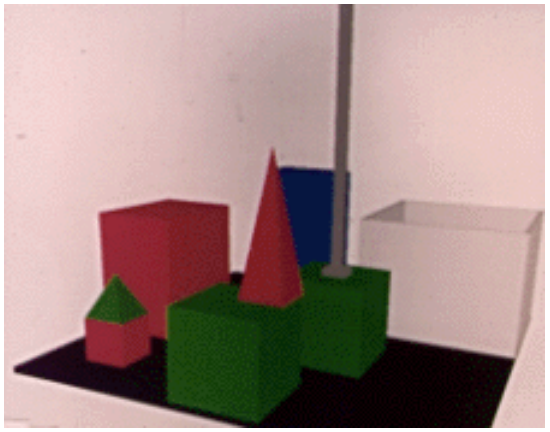
AI Application Areas



- Natural Language Understanding
  - Parsing sentences
  - Knowing discourse and idioms
  - ‘With none down in the top of the ninth and the go-ahead run at second, the manager called his relief from the bull pen’
  - SHRDLU (1973)

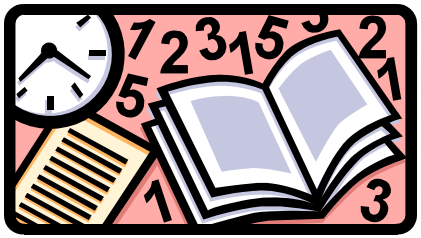
SHRDLU





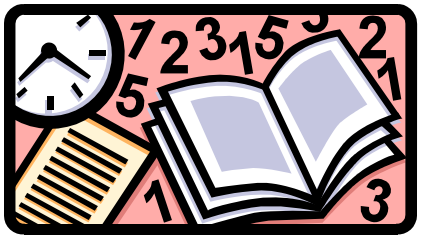
```
Person: PICK UP A BIG RED BLOCK.
Computer: OK. (does it)
Person: GRASP THE PYRAMID.
Computer: I DON'T UNDERSTAND WHICH PYRAMID YOU MEAN.
Person: FIND A BLOCK WHICH IS TALLER THAN THE ONE YOU ARE HOLDING AND PUT IT
INTO THE BOX.
Computer: BY "IT", I ASSUME YOU MEAN THE BLOCK WHICH IS TALLER THAN THE ONE I
AM HOLDING.
Computer: OK. (does it)
Person: WHAT DOES THE BOX CONTAIN?
Computer: THE BLUE PYRAMID AND THE BLUE BLOCK.
Person: WHAT IS THE PYRAMID SUPPORTED BY?
Computer: THE BOX.
```

AI Application Areas



- Planning and Robotics
  - Planning
    - Robots perform tasks with some flexibility and responsiveness
- Machine Learning
  - Playing Chess

AI Programming Languages



- LISP
  - famous proposal for the Darmouth Summer Research Project on Artificial Intelligence by McCarthy -- dated the 31st of August 1955 - contains a research program for McCarthy which is devoted to this question: "During next year and during the Summer Research Project on Artificial Intelligence, I propose to study the relation of language to intelligence ..."

- PROLOG
  - Prolog invented (about 1972) by the AI researcher Alan Colmeraurer
  - early ideas developed at University of MontrËal; then University of Marseilles