• http://idle.slashdot.org/story/11/08/30/1410211/Cornells-Creative-Machines-Lab-Lets-Chatbots-Interact
What is AI?

The science of making machines that:

<table>
<thead>
<tr>
<th>Think like humans</th>
<th>Think rationally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Act like humans</td>
<td>Act rationally</td>
</tr>
</tbody>
</table>
• Tractability (what's possible?)
• AI-Complete/Strong / Weak
• Neat / Scruffy
Not covered/emphasized in this class:

- Expert Systems
- Knowledge Representation
- (NLP)
- (Vision)
- (Robotics)
- (Logic)
- CogSci/Neuro
- Theorem proving
- Game theory
- Data mining
- Artificial General Intelligence
- Multiagent Systems
Natural Language

• Speech technologies
  – Automatic speech recognition (ASR)
  – Text-to-speech synthesis (TTS)
  – Dialog systems

• Language processing technologies
  – Machine translation
  – Information extraction
  – Information retrieval, question answering
  – Text classification, spam filtering, etc…
Vision (Perception)

- Object and character recognition
- Scene segmentation
- Image classification
Robotics

• Robotics
  – Part mech. eng.
  – Part AI
  – Reality much harder than simulations!

• Technologies
  – Vehicles
  – Rescue
  – Soccer!
  – Lots of automation…

• In this class:
  – We ignore mechanical aspects
  – Methods for planning
  – Methods for control

Images from stanfordracing.org, CMU RoboCup, Honda ASIMO sites
Logic

• Logical systems
  – Theorem provers
  – NASA fault diagnosis
  – Question answering

• Methods:
  – Deduction systems
  – Constraint satisfaction
  – Satisfiability solvers (huge advances here!)
We’ll use the term **rational** in a particular way:

- Rational: maximally achieving pre-defined goals
- Rational 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**
Envelope Demo
Envelope Demo

• $X$ and $2X$

• What about $E[$ in other envelope?]
  – $Y = $ in your envelope
  – $Z = $ in other envelope
  – $E[Z|Y] = \frac{1}{2} \times \frac{Y}{2} + \frac{1}{2} \times 2Y = \frac{5}{4} Y$

• But before, thought were equally good

• Assumes all values equally likely
Bayesian / Frequentist

• Bayesian
  – $E[Z|Y]$ is updated based on info
  – Where does your prior come from?

• Frequentist
  – Never played this game before $\rightarrow$ no data!
Board Demo

- Y: 50/50, $20/0
- N: $10

- Y: 50/50, $20k, 0
- N: 10k
- U($20k)

- Y: 50/50, $20/0
- N: $8
MicroMort

• 1:1,000,000
  – Be paid to face?
  – How much pay to avoid?

• Plane crash: 1:1,500,000
• Lighting: 1:1,400,000

• Insurance
Wager Demo

• Flip a fair coin
  – Heads: pay $5
  – Tails: pay $0

• How much would you pay to play?