Lecture Overview

- What is Artificial Intelligence?
- Agents acting in an environment

What is Artificial Intelligence?

- Artificial Intelligence is the synthesis and analysis of computational agents that act intelligently.
- An agent is something that acts in an environment.
- An agent acts intelligently if:
  - its actions are appropriate for its goals and circumstances
  - it is flexible to changing environments and goals
  - it learns from experience
  - it makes appropriate choices given perceptual and computational limitations

Computational Agents

- A computational agent is an agent whose decisions about its actions can be explained in terms of computation.
- The decisions can be broken down into primitive *operations* that can be implemented in a physical device.

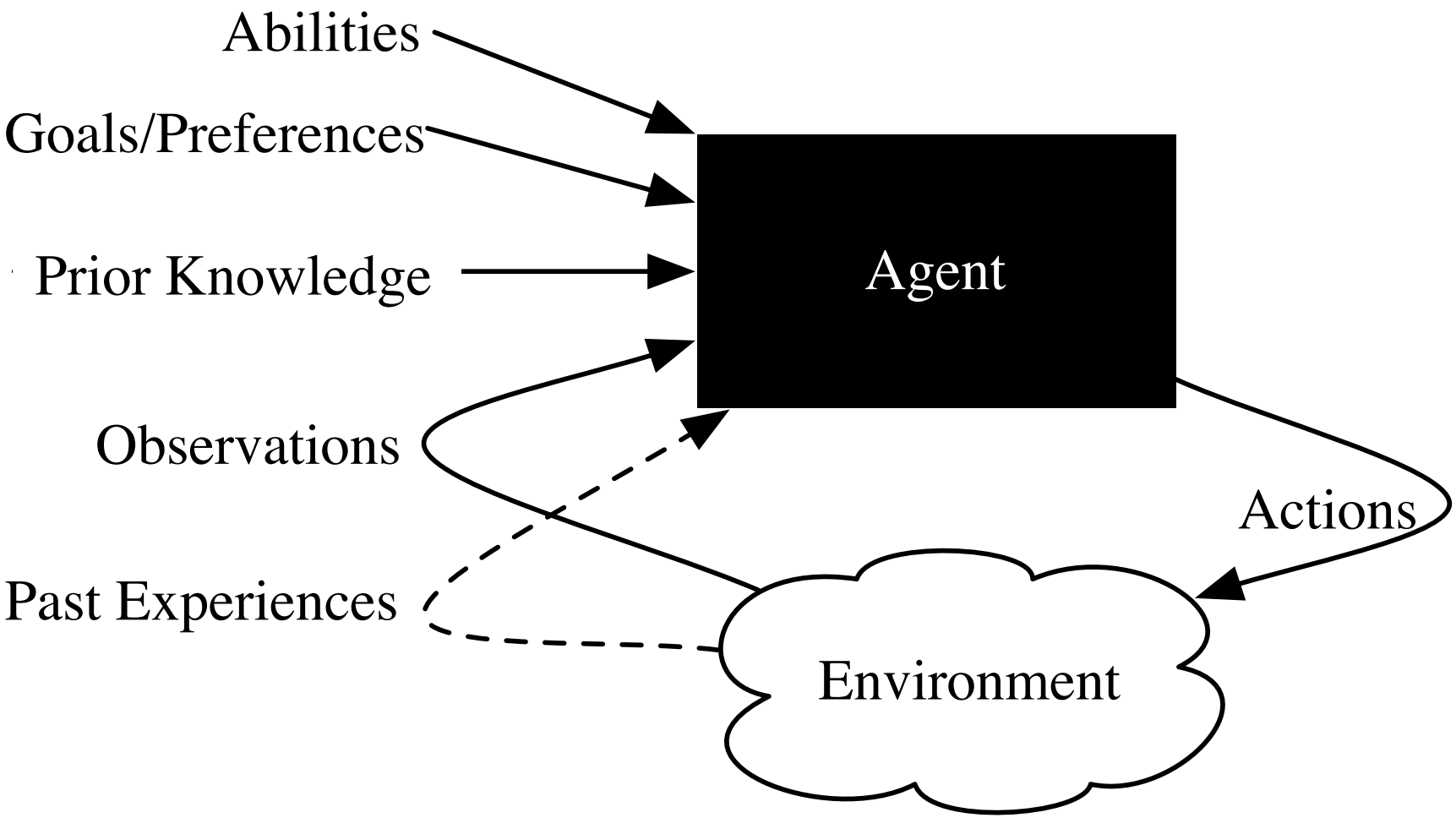
Artificial and Natural Intelligence

- For any phenomenon, you can distinguish real versus fake, where the fake is non-real.
- You can also distinguish natural versus artificial; natural means occurring in nature and artificial means made by people.
- Example:
  - A tsunami is a large wave in an ocean caused by an earthquake or a landslide. Natural tsunamis occur from time to time. You could imagine an artificial tsunami that was made by people, for example, by exploding a bomb in the ocean, yet which is still a real tsunami. One could also imagine fake tsunamis: either artificial, using computer graphics, or natural, for example, a mirage that looks like a tsunami but is not one.

Goals of Artificial Intelligence

- Scientific goal: to understand the principles that make intelligent behavior possible in natural or artificial systems.
  - analyze natural and artificial agents
  - formulate and test hypotheses about what it takes to construct intelligent agents
  - design, build, and experiment with computational systems that perform tasks that require intelligence
- Engineering goal: design useful, intelligent artifacts.
- Analogy between studying flying machines and thinking machines.

Agents acting in an environment



Example agent: robot

- abilities: movement, grippers, speech, facial expressions,...
- observations: vision, sonar, sound, speech recognition, gesture recognition,...
- goals: deliver food, rescue people, score goals, explore,...
- past experiences: effect of steering, slipperiness, how people move,...
- prior knowledge: what is important feature, categories of objects, what a sensor tell us,...

Example agent: teacher

- abilities: present new concept, drill, give test, explain concept,...
- observations: test results, facial expressions, errors, focus,...
- goals: particular knowledge, skills, inquisitiveness, social skills,...
- past experiences: prior test results, effects of teaching strategies, ...
- prior knowledge: subject material, teaching strategies,...

Example agent: medical doctor

- abilities: operate, test, prescribe drugs, explain instructions,...
- observations: verbal symptoms, test results, visual appearance...
- goals: remove disease, relieve pain, increase life expectancy, reduce costs,...
- past experiences: treatment outcomes, effects of drugs, test results given symptoms...
- prior knowledge: possible diseases, symptoms, possible causal relationships...

Example agent: user interface

- abilities: present information, ask user, find another information source, filter information, interrupt,...
- observations: users request, information retrieved, user feedback, facial expressions...
- goals: present information, maximize useful information, minimize irrelevant information, privacy,...
- past experiences: effect of presentation modes, reliability of information sources,...
- prior knowledge: information sources, presentation modalities...