Lecture overview

- What is artificial intelligence?
- Agents acting in an environment

Learning objectives: at the end of the class, you should be able to

- describe what an intelligent agent is
- identify the goals of Artificial Intelligence
- classify the inputs and the outputs of various agents

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

Examples of agents

- **Organisations** Microsoft, Al Qaeda, Government of Canada, UBC, CS Dept,...
- **People** teacher, physician, stock trader, engineer, researcher, travel agent, farmer, waiter...
- **Computers/devices** thermostat, user interface, airplane controller, network controller, game, advising system, tutoring system, diagnostic assistant, robot, Google car, Mars rover...
- **Animals** dog, mouse, bird, insect, worm, bacterium, bacteria...
- book(?), sentence(?), word(?), letter(?)
  Can a book or article *do* things?
  Convince? Argue? Inspire? Cause people to act differently?

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.
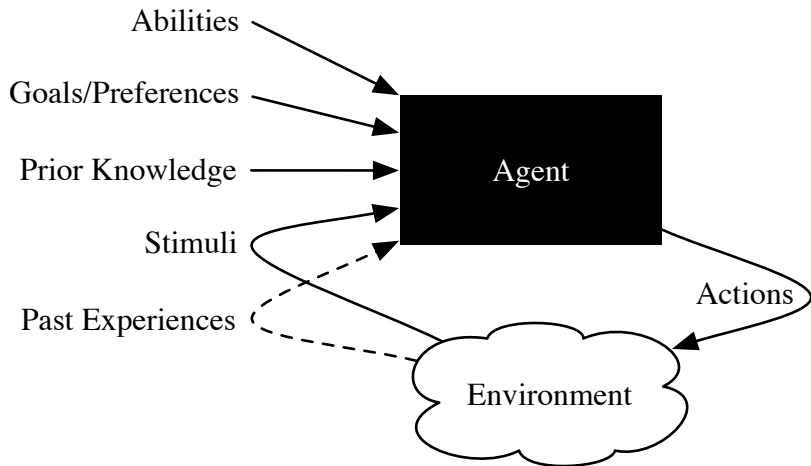
- Abilities — the set of possible actions it can perform
- Goals/Preferences — what it wants, its desires, its values,...
- Prior Knowledge — what it comes into being knowing, what it doesn't get from experience,...
- History of stimuli
  - ▶ (current) stimuli — what it receives from environment now (observations, percepts)
  - ▶ past experiences — what it has received in the past

Example agent: autonomous car

- abilities: steer, accelerate, brake
- goals: safety, get to destination, timeliness . . .
- prior knowledge: street maps, what signs mean, what to stop for . . .
- stimuli: vision, laser, GPS, voice commands . . .
- past experiences: how breaking and steering affects direction and speed. . .

Example agent: robot

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

Example agent: teacher

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

Example agent: thermostat for heater

- abilities: turn heater on or off
- goals: conformable temperature, save fuel, save money
- prior knowledge: 24 hour cycle, weekends
- stimuli: temperature, set temperature, who is home, outside temperature
- past experiences: when people come and go, who likes what temperature

Example agent: medical doctor

- abilities:
- goals:
- prior knowledge:
- stimuli:
- past experiences:

Example agent: Apple Inc.

- abilities:
- goals:
- prior knowledge:
- stimuli:
- past experiences:

Other Agents

- user interface
- bee
- smart home
- . . .

- abilities:
- goals:
- prior knowledge:
- stimuli:
- past experiences:

Example agent:

- abilities:
- goals:
- prior knowledge:
- stimuli:
- past experiences:

Agents acting in an environment