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
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.
Agents acting in an environment: inputs and output

- Abilities
- Goals/Preferences
- Prior Knowledge
- Stimuli
- Past Experiences

Agent

Environment

Actions
Inputs to an agent

- **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

- Abilities
- Goals/Preferences
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Environment

Agent

Actions