COMP90054 – AI Planning for Autonomy

Week 1 Live Lecture

- Where in the world are you located right now?
- **pollev.com/cewin**

- 1 x Recorded lecture, 1 x Live lecture per week
- Tutorials start Week 2
- Piazza discussion forum is now live

Artificial + Intelligence?

- **AI Concepts**: What are we actually talking about?
  - Clarify what the (modern) research field of AI does, and does not, try to do.
- **AI History**: How did this come about?
  - Just a little background to illustrate how we came from 'classical AI' to 'modern AI'.
- **AI Today**: What is the landscape of techniques and applications?
  - Rough overview, and some examples.

What is intelligence?

A. Ability to think . . . ?

B. Simulating the brain . . . ?

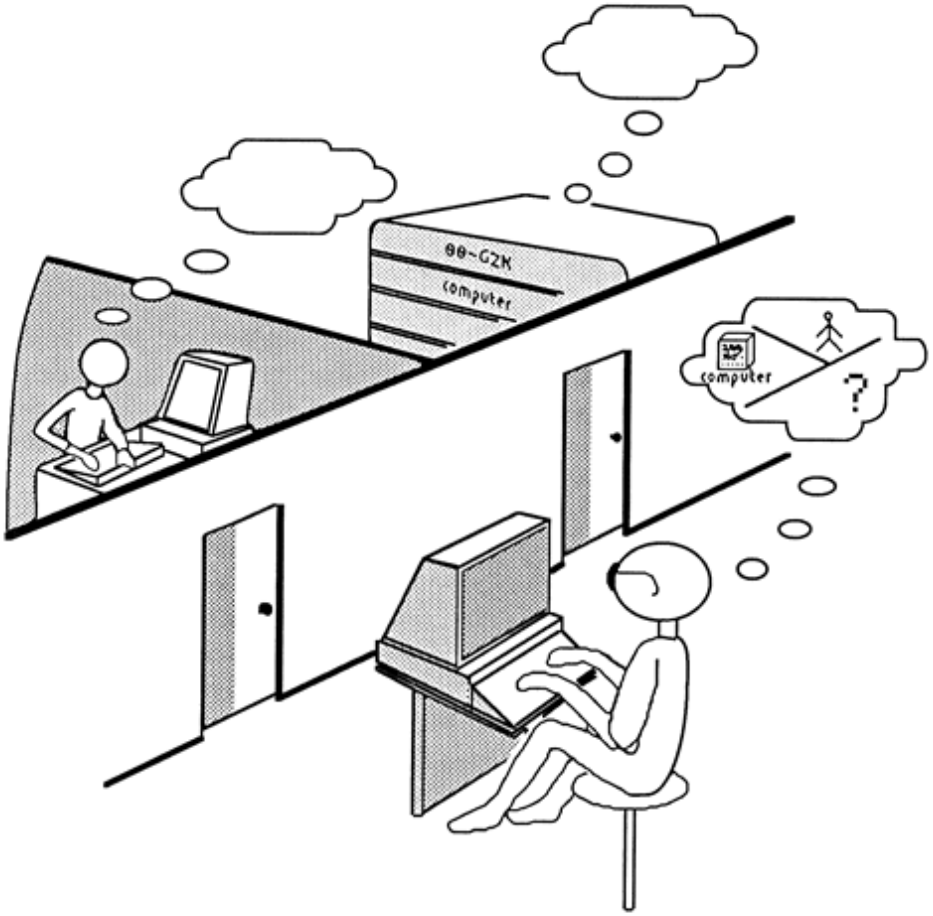
C. Creativity . . . ?

D. Ability to learn . . . ?

E. Being good at maths . . . ?

F. Playing good Chess . . . ?

Acting Humanly with intelligence: Turing Test



- Not reproducible... only a proof of concept?

What is *Artificial* Intelligence?

An engineering standpoint

The science of making machines do things that would require intelligence if done by humans. (M. Minsky)

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Is this an operational definition? Hmm...

- How do we know what human activities require intelligence?
- BTW, what is human intelligence?

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Same problems as with Minsky's definition:

- what is thinking?
- what is mind?

What is *Artificial* Intelligence?

A Rational perspective

The branch of computer science that is concerned with the automation of intelligent behavior. (Luger and Stubblefield)

- **Intelligent behavior**: make ‘good’ (rational) action choices
- Are humans ‘rational’ agents?

The Game:

You have $100 to split between two people:

- Player 1: Makes an offer for how to split the $100 (e.g. $50 each)
- Player 2: Can accept or reject the offer

If Player 2 rejects the offer, both players receive $0.

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- **Intelligent behavior**: make 'good' (rational) action choices
- Are humans 'rational' agents? We often make mistakes; we are not all chess grandmasters even though we may know all the rules of chess. More about human systematic errors (*Thinking, fast and slow - Kahneman*)"

Rational Agents

Agents:

- Perceive the environment through sensors (→percepts).
- Act upon the environment through actuators (→actions).

→ Examples? Humans, animals, robots, software agents (softbots), . . .

Rational Agents . . . do 'the right thing'!

→ Any idea what that means, 'do the right thing'?

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→ Q: What's the performance measure of an autonomous vacuum cleaner? m^2 per hour, Level of cleanliness, Energy usage, . . .

→ What if the vacuum cleaner's sensors are not good enough? click: Robot Re

. . . **TRY to do 'the right thing'!**

→ The hypothetical best case ('the right thing') is often unattainable.

→ The agent might not be able to perceive all relevant information. (Is there dirt under this bed?)

Rationality vs. Omniscience:

- An omniscient agent knows everything about the enviroment, and knows the actual effects of its actions.
- A rational agent just makes the best of what it has at its disposal, maximizing expected performance given its percepts and knowledge.

→ Example? I check the traffic before crossing the street. As I cross, I am hit by a meteorite. Was I lacking rationality?

Mapping your input to the best possible output:

$$\text{Performance measure} \times \text{Percepts} \times \text{Knowledge} \rightarrow \text{Action}$$

What Does AI Do?

→ Artificial intelligence as an idea can be roughly classified along the dimensions thinking vs. acting and humanly vs. rationally.

	Humanly	**Rationally**
Thinking	Systems that think like humans (Cognitive Science)	Systems that think rationally (Logics: Knowledge and Deduction)
Acting	Systems that act like humans (Turing Test)	Systems that act rationally (How to make good action choices)

❀ A central aspect of intelligence (and one possible way to define it) is the ability to act successfully in the world