$CS2109_s$ Cheatsheet, by randomwish

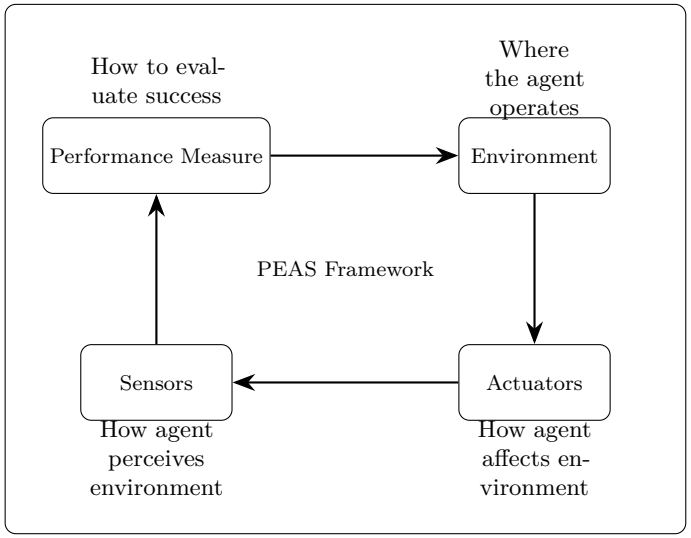
https://github.com/randomwish/schoolNotes

"Traditional" AI

Definition of Intelligent Agents

Consists of a **feedback loop** consisting of **sensors**, **functions**, **actuators** and the actual **environment** (also known as **PEAS**).

- **Performance measure** → used to consider metric to optimise for the right purpose
- **Rational agent** → chooses actions which would maximise performance measure
- **function** → maps from percept histories to actions: $f : [\mathcal{P}^* \to \mathcal{A}]$



Categories of task environments

observability

- fully observable → sensors of agents give it access to complete state of the environment at each point in time
- partially observable → sensors of agent do not have complete information

deterministic

- deterministic → next state of environment is **completely** determined by current state and action executed by agent
- stochastic → state of environment is also determined by **chance** or **randomness**
- strategic → deterministic environment except for the actions of other agents

types of experience for an agent

- episodic environment → experience of agent is divided into atomic episodes, and choice of agent depends **only** on the episode
- sequential environment → experience of agent makes it such that the choice of agent happened in the past

whether environment changes

- static → environment does not change over time
- semi-dynamic → environment does not change with time, but agent's performance does
- dynamic → environment changes over time

number of possibilities

- discrete → a limited number of distinct, clearly defined percepts and actions
- continuous → *continuous* number of positions for an agent to be in

number of agents

- single agent → an agent operating by itself
- multi-agent → a group of agents operating

Types of agents

Simple reflex agent

Only consists of a condition-action rule; akin to a if-else sequence

Model-based agent

agent is able to know its future effect of its actions; has a model of the environment

Goal-based agent

agent is able to **simulate** its future actions to reach its intended goal

Utility-based agent

define the utility/value in being at a given state of the environment

Learning agent

agent interact with environment and from interactions, produce trajectories with a learning model (learnt intuition)

Warning

All agents have PEAS, regardless of their types

Exploration vs Exploitation

- exploration → to learn more about the world
  - downside → could lead to worse outcomes
- exploitation → maximise gain based on current knowledge
  - downside → might not lead to better outcomes