Intelligent Agents
Acting rationally: rational agent

**Agent**: entity that perceives and acts

**Rational behavior**: choose behavior that maximize goal achievement, given the available information
Agent-Based AI

Agent

Sensors

What the world is like now

Condition-action rules

What action I should do now

Actuators

Environment
Example: Vacuum Cleaner World

What are the **actions**? What are the **percepts**?
Kinds of Agents: Simple Reflex Agent
Agent Design

- What can the agent do?
  - Range of actions

- What is the environment? (Input: percepts)
  - How is it interpreted?

- What does the agent know?
  - History of previous inputs and actions (how far back?)
  - Properties of environment: world knowledge
  - Knowledge of its own goals and preferences
  - Strategies for behavior

- How does the agent choose to act?
  - Mapping from percept sequence -> action called an agent function
Before we design an intelligent agent, we must specify its “task environment”:

PEAS:
- Performance measure
- Environment
- Actuators
- Sensors

Can you identify them for: Conversational Character, Medical diagnosis system, or NPC in FPS game?
Example: Agent = Conversational Character

Performance measure:

Environment:

Actuators:

Sensors:
Example: Agent = Medical diagnosis system

Performance measure:

Environment:

Actuators:

Sensors:
Example: Agent = NPC in an FPS game

Performance measure:

Environment:

Actuators:

Sensors:
Environment types

- **Fully observable** (vs. **partially observable**): An agent's sensors give it access to the complete state of the environment at each point in time.

- **Deterministic** (vs. **stochastic**): The next state of the environment is completely determined by the current state and the action executed by the agent. (If the environment is deterministic except for the actions of other agents, then the environment is **strategic**)

- **Episodic** (vs. **sequential**): An agent’s action is divided into atomic episodes. Decisions do not depend on previous decisions/actions.
Environment types

- **Static** (vs. **dynamic**): The environment is unchanged while an agent is deliberating. (The environment is **semidynamic** if the environment itself does not change with the passage of time but the agent's performance score does)

- **Discrete** (vs. **continuous**): A limited number of distinct, clearly defined percepts and actions.

- **Single agent** (vs. **multi-agent**): An agent operating by itself in an environment. Does the other agent interfere with my performance measure?
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<th>Task Environm.</th>
<th>Observable</th>
<th>Deterministic/ stochastic</th>
<th>Episodic/ Sequential</th>
<th>Static/ Dynamic</th>
<th>Discrete/ Continuous</th>
<th>Agents</th>
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Kinds of Agents: Model-Based Agent
Kinds of Agents: Goal-Based Agent
Kinds of Agents: Utility-Based Agent
Kinds of Agents: Learning Agent
Is this the best or most optimal agent given any problem?