Artificial Intelligence

Intelligent Agents

Agents and environments

- **Agent:** An **agent** is anything that can be viewed as:
  - perceiving its environment through **sensors** and
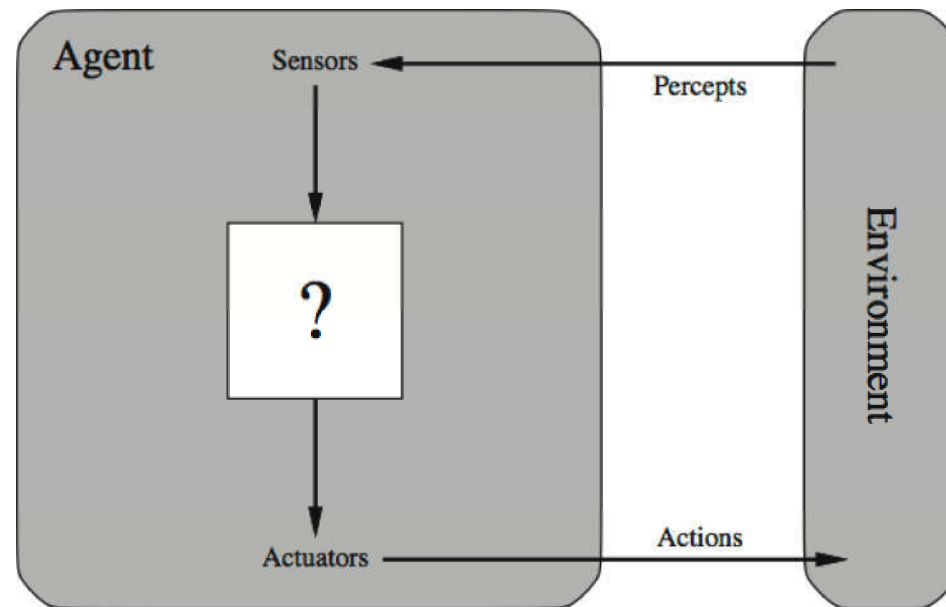 - acting upon that environment through **actuators**.

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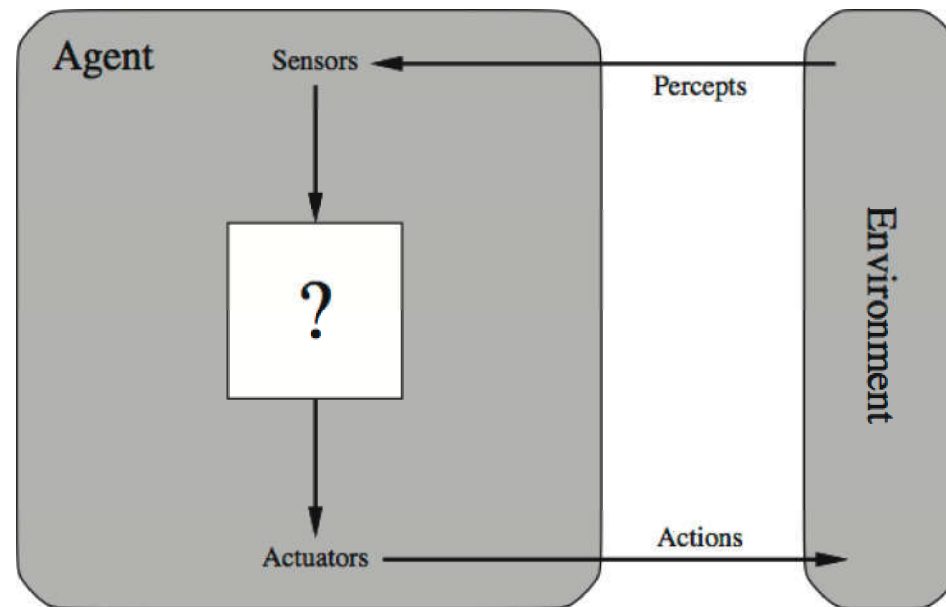- An agent program runs in cycles of: (1)perceive, (2)think, and (3)act.

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- **Agent = Architecture + Program**

Agents and environments

- **Human agent:**
  - Sensors: eyes, ears, and other organs.
  - Actuators: hands, legs, mouth, and other body parts.

- **Robotic agent:**
  - Sensors: Cameras and infrared range finders.
  - Actuators: Various motors.

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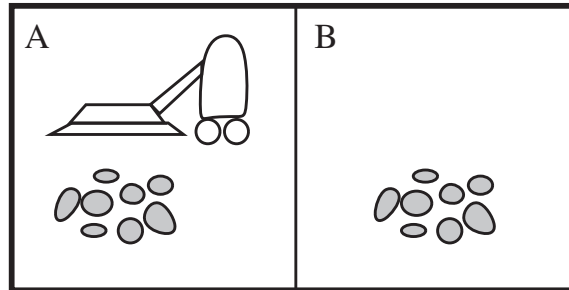 - Actuators: hands, legs, mouth, and other body parts.

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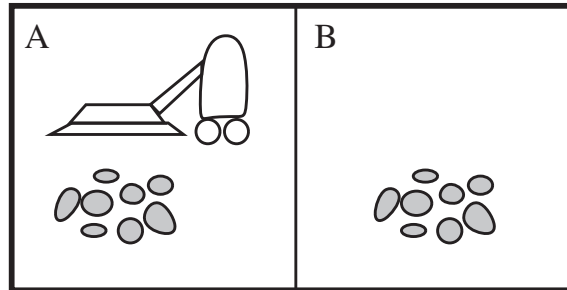
- **Agents everywhere!**
  - Thermostat
  - Cell phone
  - Vacuum cleaner
  - Robot
  - Alexa Echo
  - Self-driving car
  - Human
  - etc.

Vacuum cleaner

- Percepts: location and contents e.g., [A, Dirty]
- Actions: Left, Right, Suck, NoOp
- Agent function: mapping from percepts to actions.

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Percept	Action
[A, clean]	Right
[A, dirty]	Suck
[B, clean]	Left
[B, dirty]	Suck

Well-behaved agents

Rational Agent:

"For each possible percept sequence, a rational agent should select an action that is expected to maximize its **performance measure**, *given the evidence provided by the percept sequence and whatever built-in knowledge the agent has."*

Rationality

- Rationality is relative to a **performance measure**.

- Judge rationality based on:

  - The performance measure that defines the criterion of success.
  - The agent prior knowledge of the environment.
  - The possible actions that the agent can perform.
  - The agent's percept sequence to date.

PEAS

- When we define a rational agent, we group these properties under **PEAS**, the problem specification for the task environment.
- The rational agent we want to design for this task environment is the solution.

- PEAS stands for:

  - **P**erformance

  - **E**nvironment

  - **A**ctuators

  - **S**ensors

PEAS

What is PEAS for a self-driving car?

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- **S**ensors: Camera, sonar, GPS, Speedometer, odometer, accelerometer, engine sensors, keyboard.

PEAS

How about a vacuum cleaner?

iRobot Roomba series

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- **S**ensors: camera, dirt detection sensor, cliff sensor, bump sensors, infrared wall sensors.