UIT2504 Artificial Intelligence

Rational Agents

C. Aravindan
<AravindanC@ssn.edu.in>

Professor of Computing
SSN College of Engineering

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AI and Rational Agents

Thinking humanly	Thinking rationally
Acting humanly	Acting rationally

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The textbook advocates *"Acting Rationally"*

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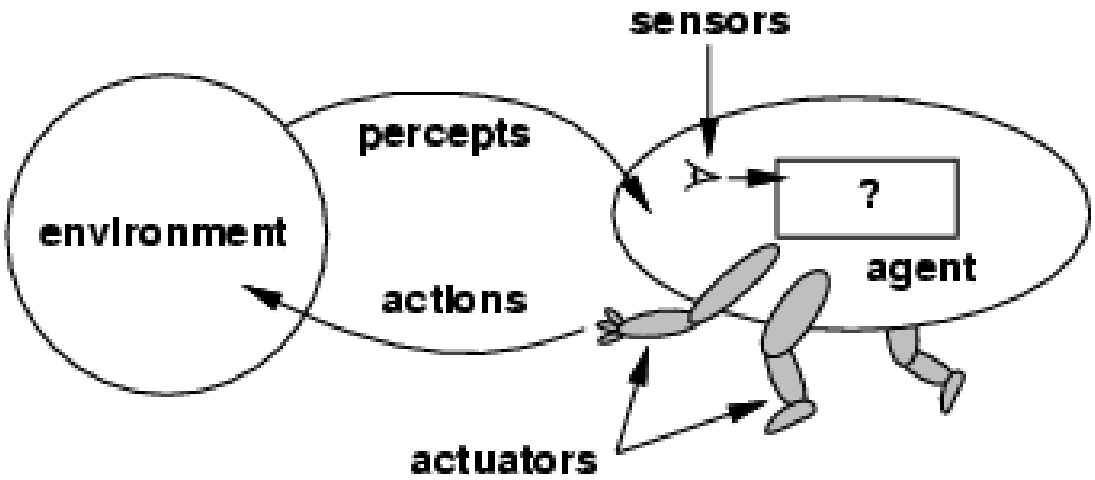
- *Example — Software agent:* keystrokes, mouse clicks, file contents, network packets, etc. for sensors; display, writing files, sending packets, etc. for actuators

Agents



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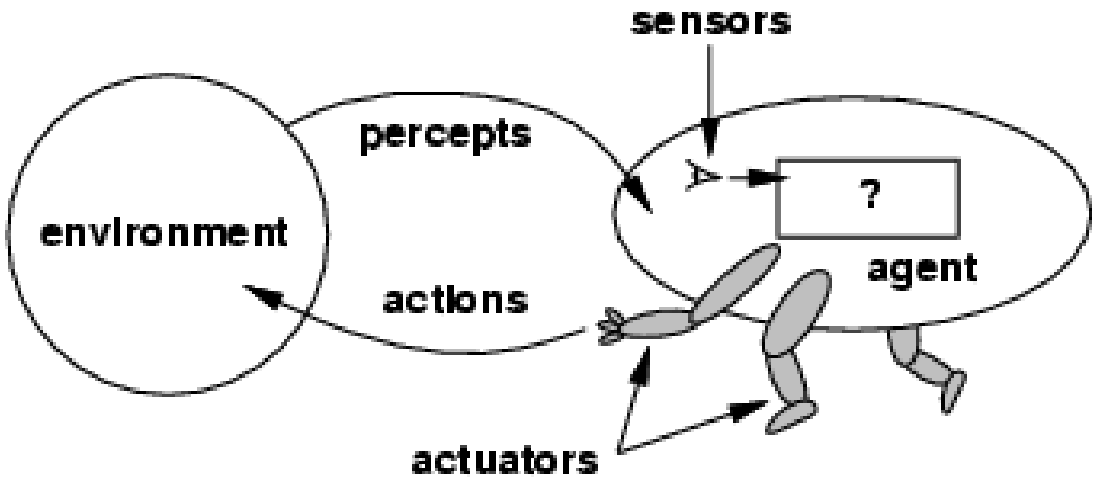

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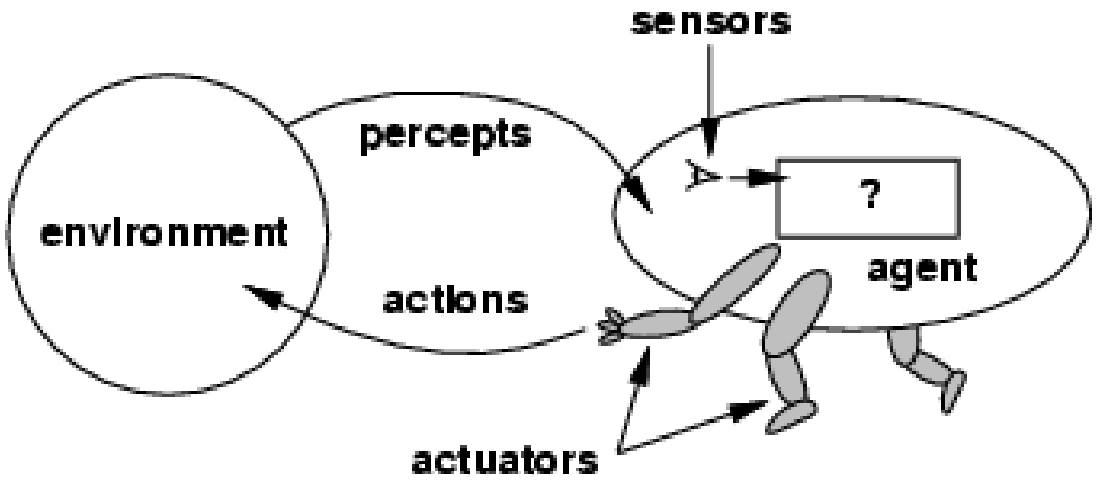

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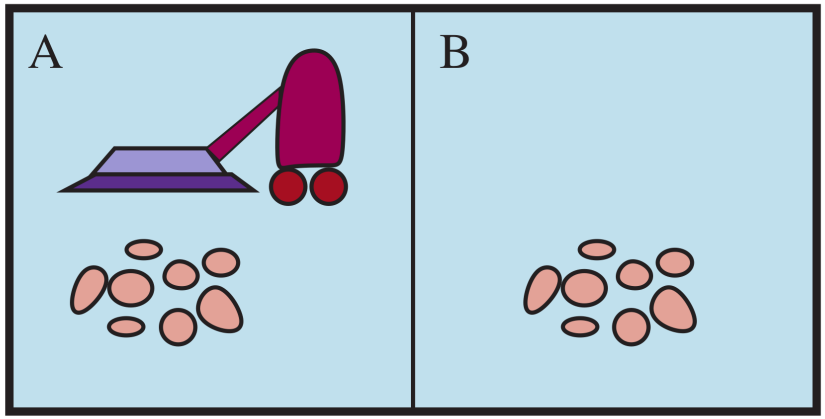
- An agent program runs on some physical architecture to compute f

Vacuum-Cleaner World



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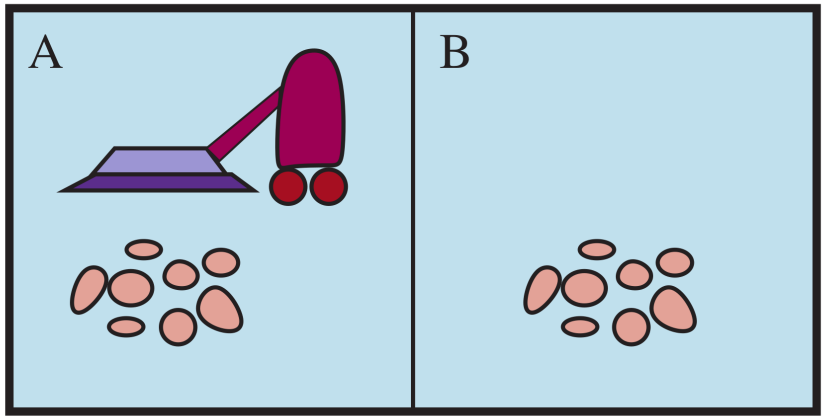

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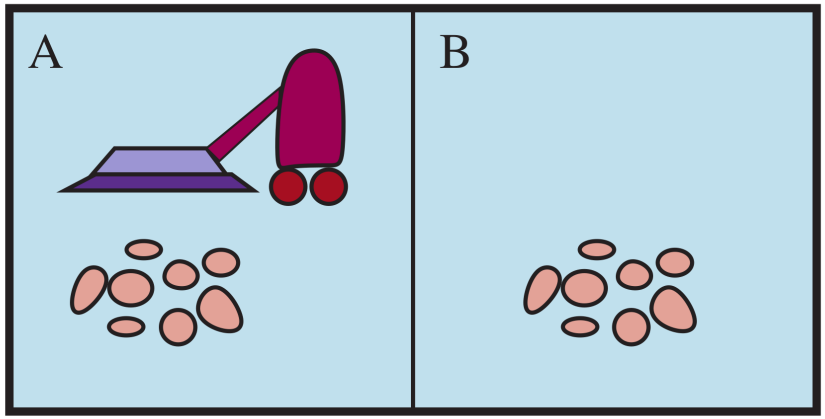

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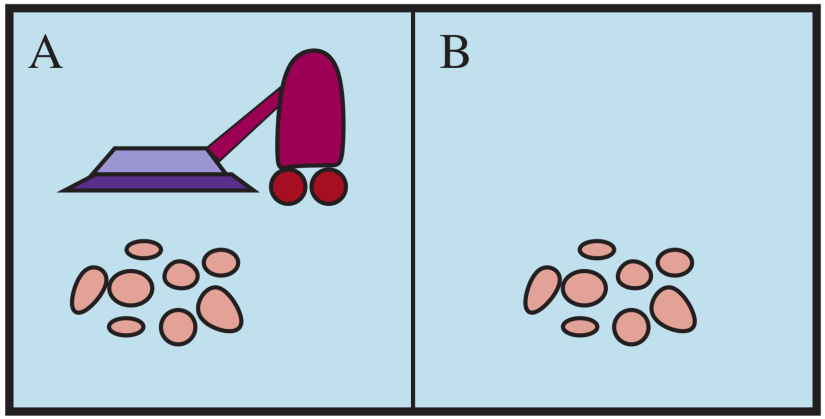

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- Can the agent function be computed by a simple look-up table?

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- Example: For vacuum-cleaner, performance measures could be amount of dirt cleaned up, time taken, electricity consumed, noise generated etc.

Rational Agents

Rational Agents

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.

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- Rational agents should be autonomous

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- Sensors: Understand HTML pages (text, graphics, scripts)

PEAS Formulation

Agent Type	Performance Measure	Environment	Actuators	Sensors
Medical diagnosis system	Healthy patient, reduced costs	Patient, hospital, staff	Display of questions, tests, diagnoses, treatments	Touchscreen/voice entry of symptoms and findings
Satellite image analysis system	Correct categorization of objects, terrain	Orbiting satellite, downlink, weather	Display of scene categorization	High-resolution digital camera
Part-picking robot	Percentage of parts in correct bins	Conveyor belt with parts; bins	Jointed arm and hand	Camera, tactile and joint angle sensors
Refinery controller	Purity, yield, safety	Refinery, raw materials, operators	Valves, pumps, heaters, stirrers, displays	Temperature, pressure, flow, chemical sensors
Interactive English tutor	Student's score on test	Set of students, testing agency	Display of exercises, feedback, speech	Keyboard entry, voice

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- Single agent Vs. multiagent
  - How do we define other agents?
  - Example: Puzzle solver
  - Example: Chess playing agent
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- Episodic Vs. sequential
  - Does the action taken in one time duration (episode) depend on the actions taken in the previous episodes?
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- Known Vs. unknown
  - Does the agent know the "laws of physics" of the environment?

Properties of task environments

Task Environment	Observable	Agents	Deterministic	Episodic	Static	Discrete
Crossword puzzle	Fully	Single	Deterministic	Sequential	Static	Discrete
Chess with a clock	Fully	Multi	Deterministic	Sequential	Semi	Discrete
Poker	Partially	Multi	Stochastic	Sequential	Static	Discrete
Backgammon	Fully	Multi	Stochastic	Sequential	Static	Discrete
Taxi driving	Partially	Multi	Stochastic	Sequential	Dynamic	Continuous
Medical diagnosis	Partially	Single	Stochastic	Sequential	Dynamic	Continuous
Image analysis	Fully	Single	Deterministic	Episodic	Semi	Continuous
Part-picking robot	Partially	Single	Stochastic	Episodic	Dynamic	Continuous
Refinery controller	Partially	Single	Stochastic	Sequential	Dynamic	Continuous
English tutor	Partially	Multi	Stochastic	Sequential	Dynamic	Discrete

Questions?

- Read chapter 2 of the textbook!