

Review

- Logistics
 - MidTerm Date: Mar 6, 2020
 - Carmen?
 - Piazza?
 - Anonymous Feedback Form?
- What is AI
 - Chap 1 in R & N

Agent

- **Agent** is anything that **perceives** its environment through **sensors** and **acts** upon that environment through **effectors**.

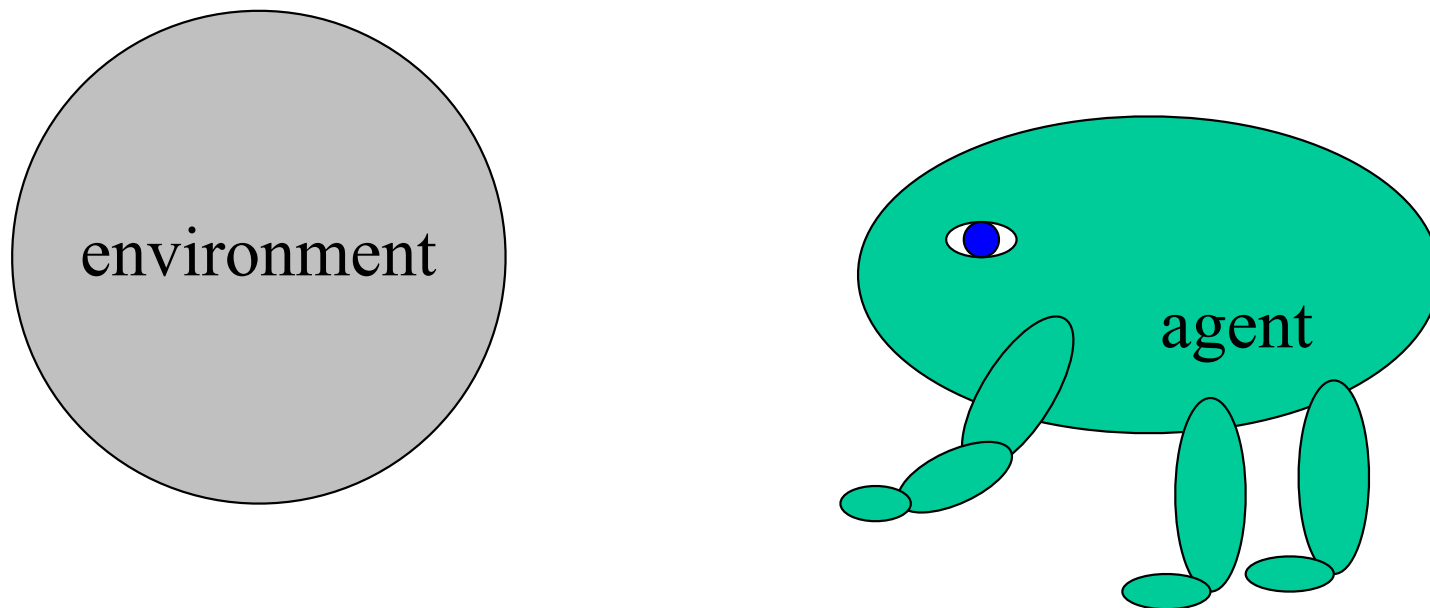
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- Humans
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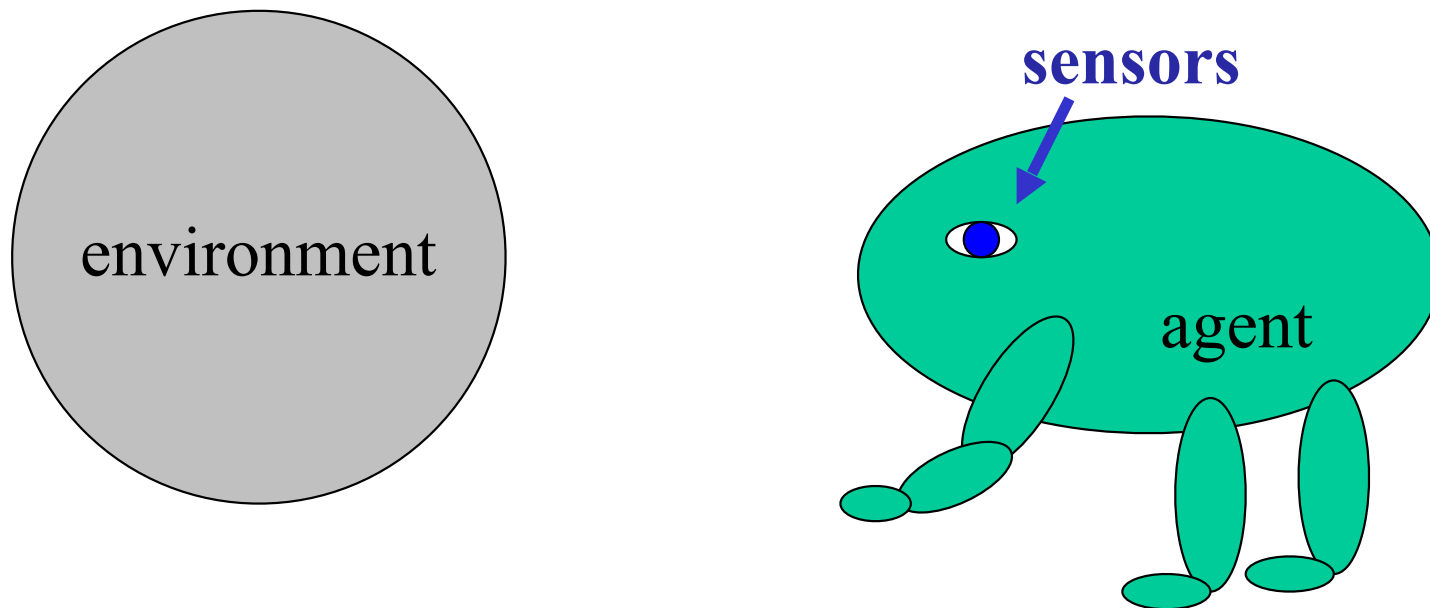
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- Robots
 - Sensors: cameras, microphones, etc.
 - Effectors: various motors

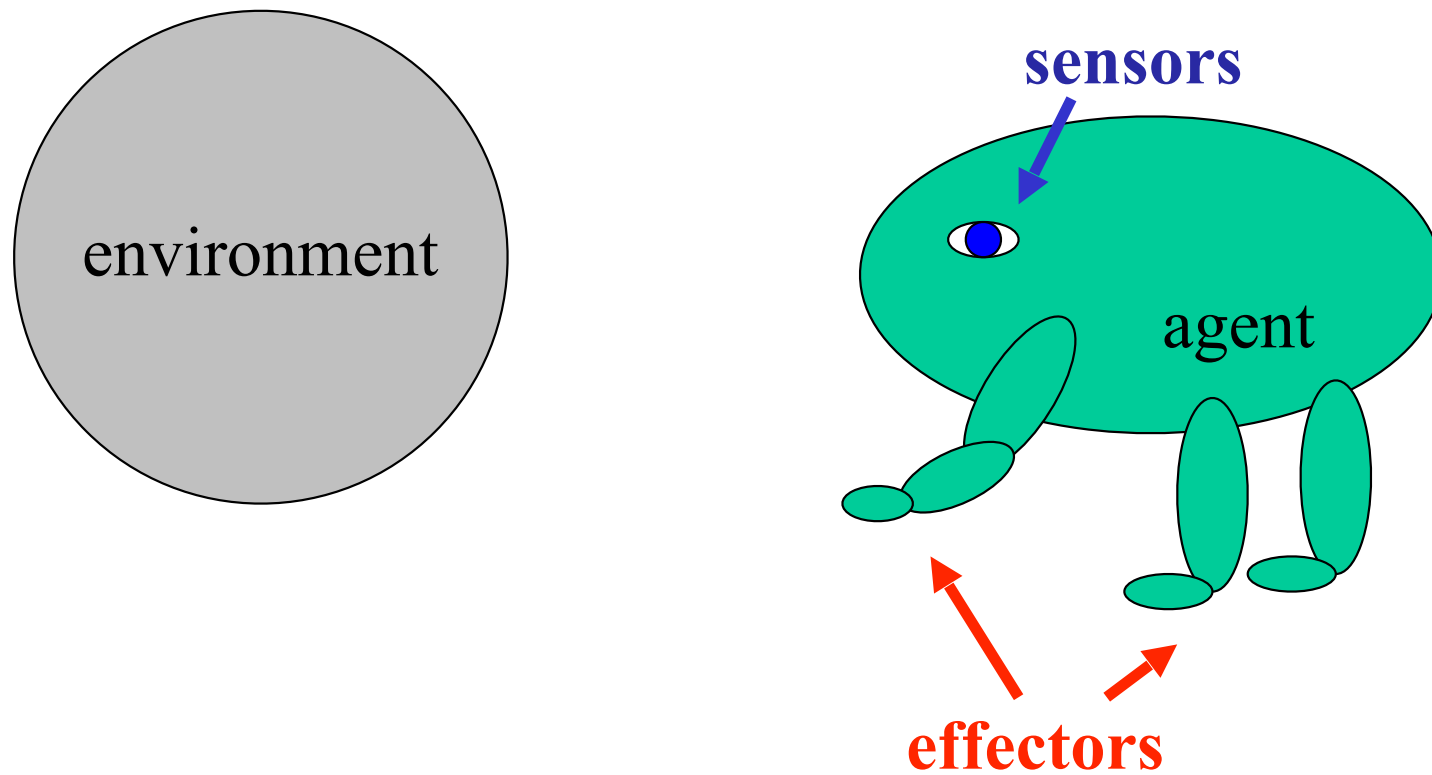
Generic Agent



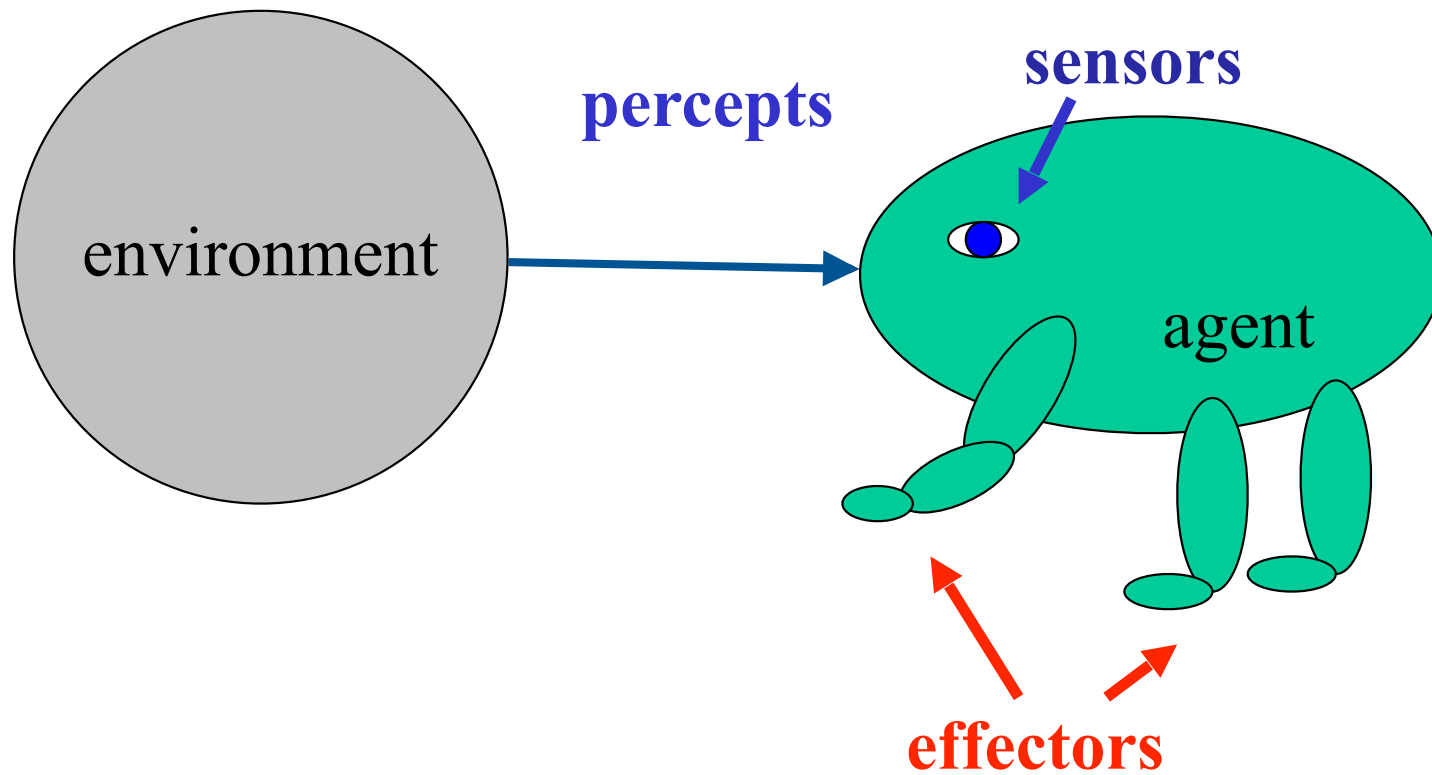
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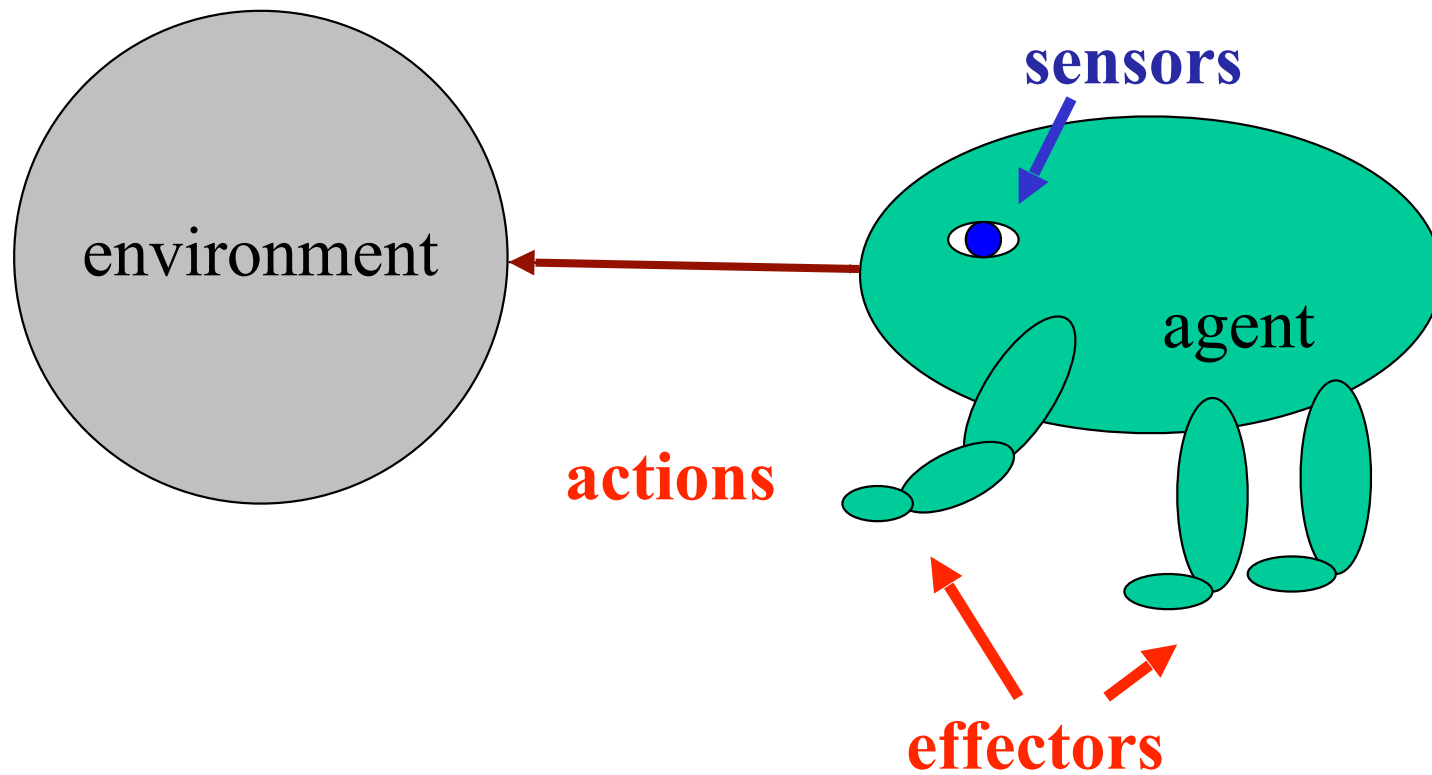
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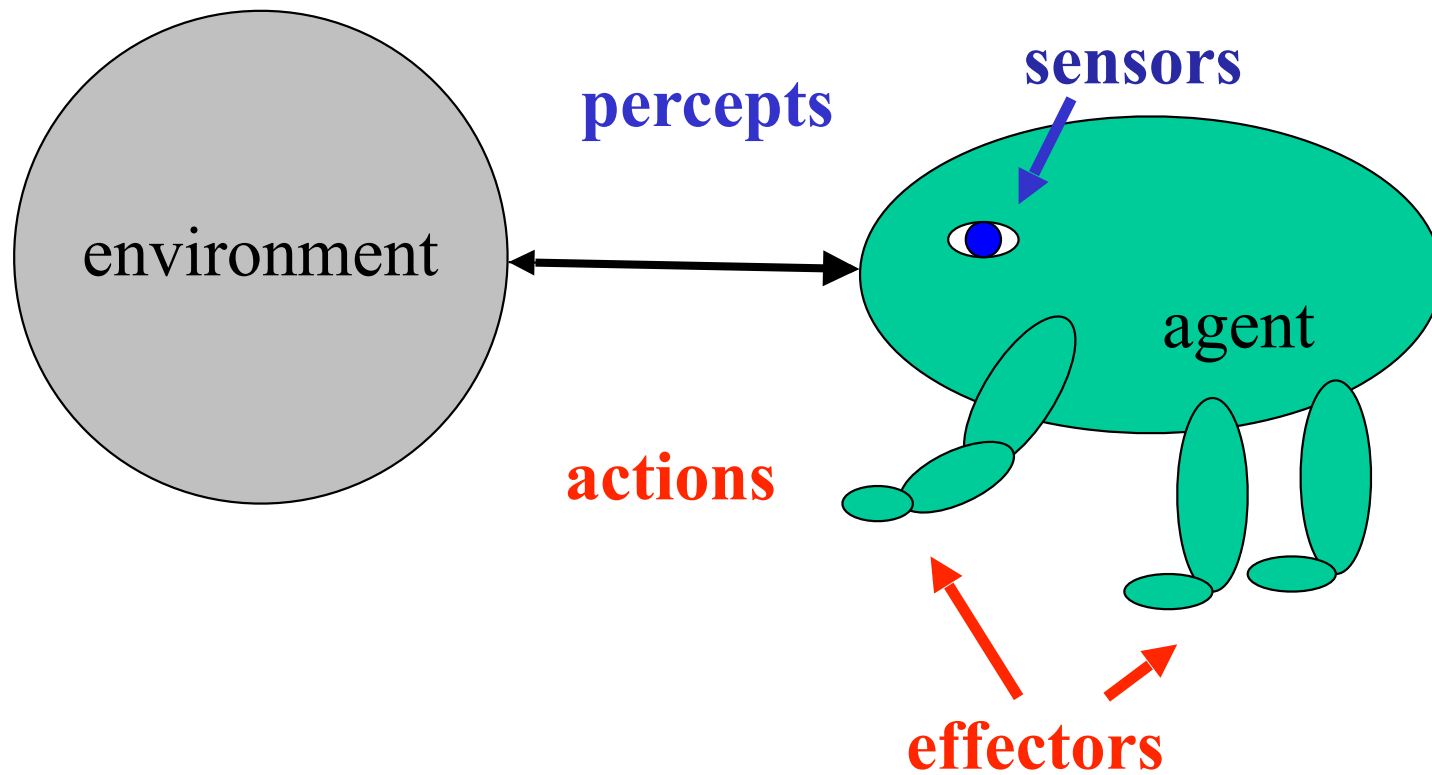
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Agent Percepts

- Percept
 - Agent's perceptual inputs at any given instant

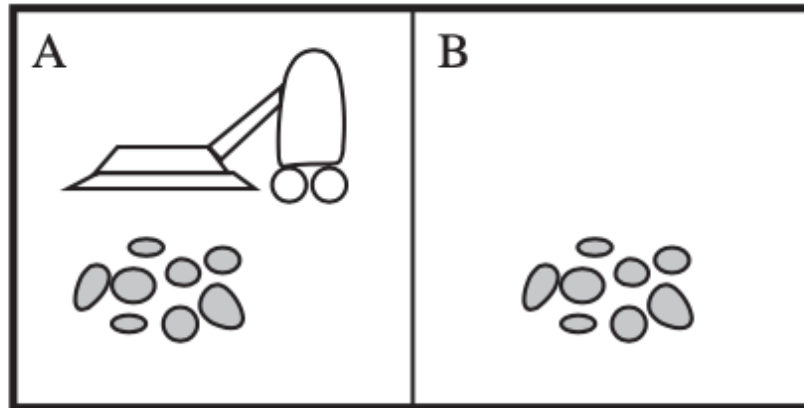
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- Percept “sequence”
 - Complete history of everything agent has perceived

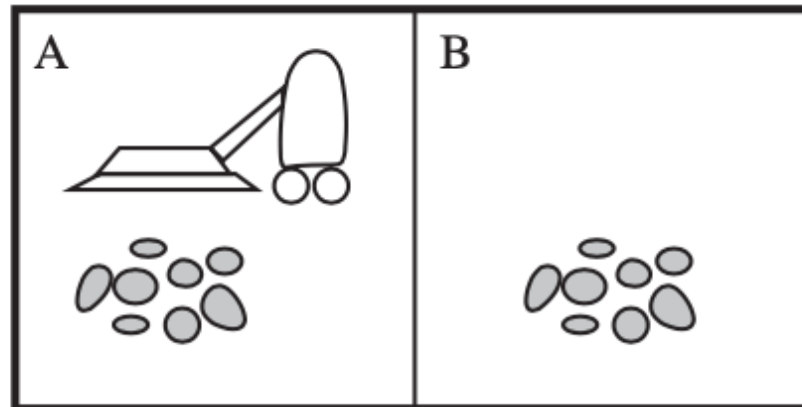
Agent Percepts

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 - Agent's perceptual inputs at any given instant
- Percept “sequence”
 - Complete history of everything agent has perceived
- Agent's choice of action can depend on entire percept sequence

Agent Percepts

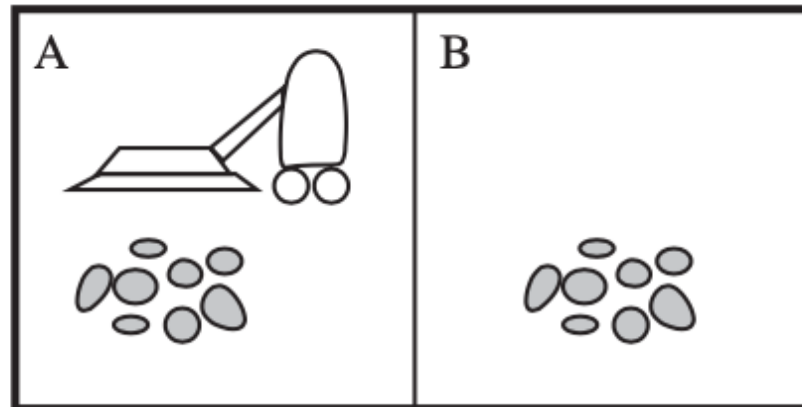


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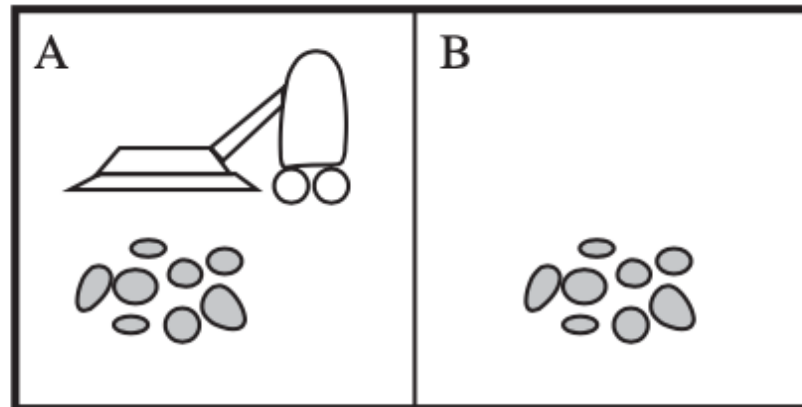
Percept sequence	Action
<i>[A, Clean]</i>	<i>Right</i>
<i>[A, Dirty]</i>	<i>Suck</i>
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 - Specifying which action to take in response to any given percept sequence
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 - Abstract mathematical description
- Agent program
 - Implements the agent function for an agent
 - Runs on the agent architecture

Mapping of Percepts to Actions

- Table of actions in response to each possible percept sequence
 - Simple table representation can be huge
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Mapping of Percepts to Actions

- Table of actions in response to each possible percept sequence
 - Simple table representation can be huge
 - Takes too long to build the table
- Define a specification of the mapping
 - Example: `sqrt()`
 - enumerate of all possible mappings
 - use Newton's method

Good Behavior: The Rational Agent

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 - Given what you have seen/know
 - Need a way to measure success: performance measure

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 - BUG: Could maximize by cleaning-up, dumping, cleaning-up, etc!
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- When to evaluate is also important
 - Timespan (shift, day, month, etc.)

Rationality Depends on...

- The **performance measure** that defines degree of success
- Everything the agent has perceived so far
 - The **percept sequence**
- What the agent **knows about the environment**
- The **actions** that the agent can perform

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This leads to...

Ideal Rational Agent

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 - do whatever action is **expected**
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 - do whatever action is **expected**
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- **Does actions in correct order**

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 - Considered safe crossing street, but then hit from above...
 - Can “explore” to gather more information

Autonomy

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Autonomy

- A rational agent should be autonomous
- Autonomous behavior
 - Behavior is determined by its own experience
- Non-autonomous behavior
 - If no use of percepts (use only built-in knowledge), then system has no autonomy
 - A clock

Nature of Environments

- Must specify the setting for intelligent agent design
- Task environments
 - The “problems” to which rational agents are the “solutions”
- Multiple flavors of task environments
 - Directly affects the design of the agent
- PEAS description
 - (P)erformance Measure
 - (E)nvironment
 - (A)ctators
 - (S)ensors

PEAS Description

- Consider an “automated taxi driver”
 - Performance Measure?

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 - **Sensors?**
 - Cameras, microphone, sonar, speedometer, GPS, odometer, accelerometer, engine sensors, keyboard

Other PEAS Examples

<i>Agent Type</i>	<i>Perf. Measure</i>	<i>Environment</i>	<i>Actuators</i>	<i>Sensors</i>
Medical diagnosis system				
Part-picking robot				
Interactive English tutor				

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<i>Agent Type</i>	<i>Perf. Measure</i>	<i>Environment</i>	<i>Actuators</i>	<i>Sensors</i>
Medical diagnosis system	Healthy patient, minimize costs/ lawsuits	Patient, hospital, staff	Display questions, tests, diagnoses, treatments, referrals	Keyboard entry of symptoms, findings, patient's answers
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Part-picking robot	Percentage of parts in correct bins	Conveyor belt with parts, bins	Jointed arm and hand	Camera, joint angle sensors
Interactive English tutor	Maximize student's score on test	Set of students, testing agency	Display exercises, suggestions, corrections	Keyboard entry/ Microphone

Quiz-1

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- Single Agent vs. multi-agent
 - Solving a puzzle is single agent
 - Chess is competitive multi-agent environment

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	Crossword puzzle	Taxi Driving
Observability		
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Discrete vs Continuous	Discrete	
Single vs Multi Agent	Single	

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Episodic vs Sequential	Sequential	Sequential
Static vs Dynamic	Static	Dynamic
Discrete vs Continuous	Discrete	Continuous
Single vs Multi Agent	Single	Multi

Environment Examples

	Vaccum Cleaner
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QuestionS