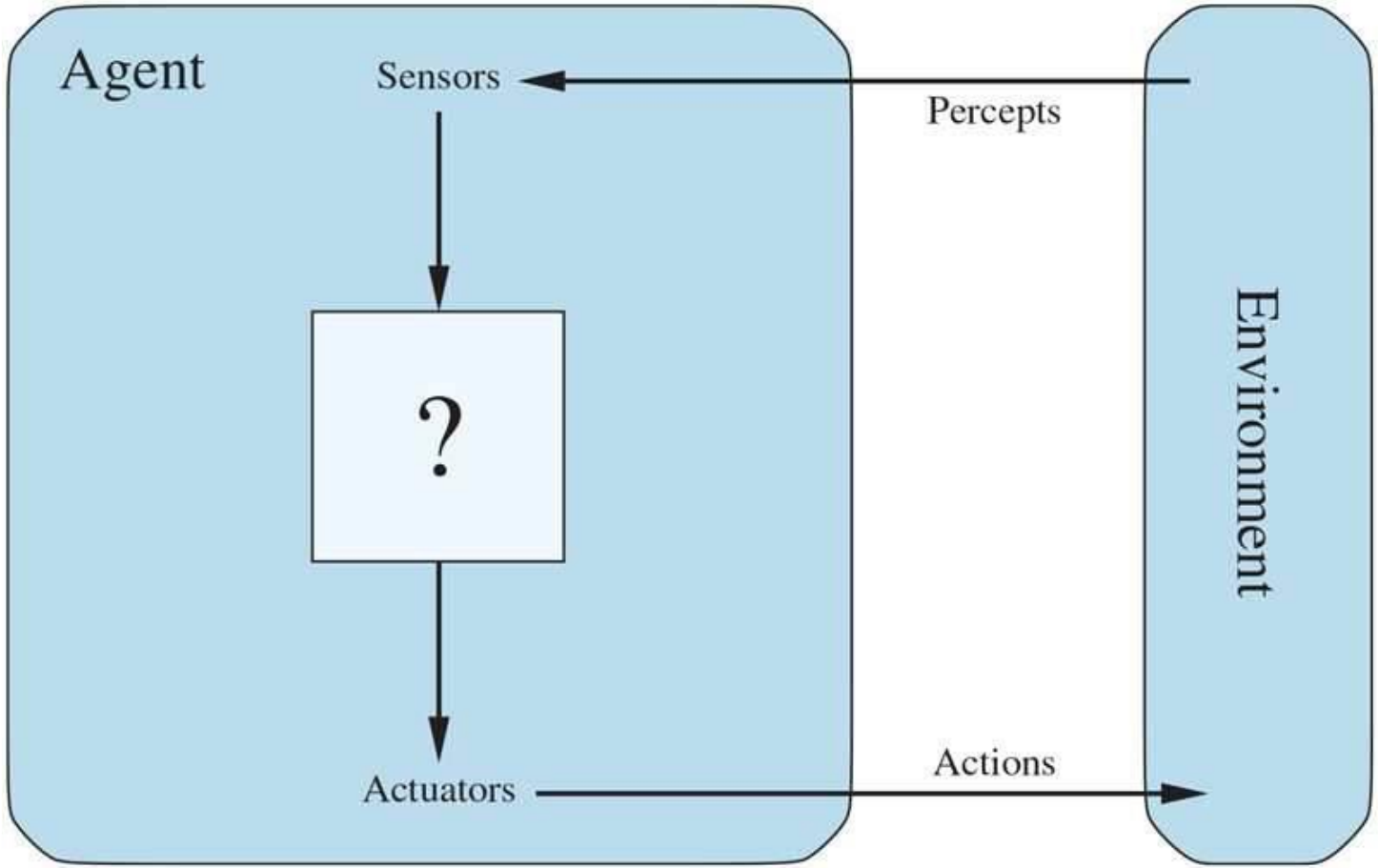
Intelligent Agents

RATIONAL AGENTS

Agent



Agents and Environments

- Percept: Content as agent's sensors are perceiving.
- Percept Sequence: Complete history of everything the agent has ever perceived.

- Agent's action <= built-in knowledge + percept sequence

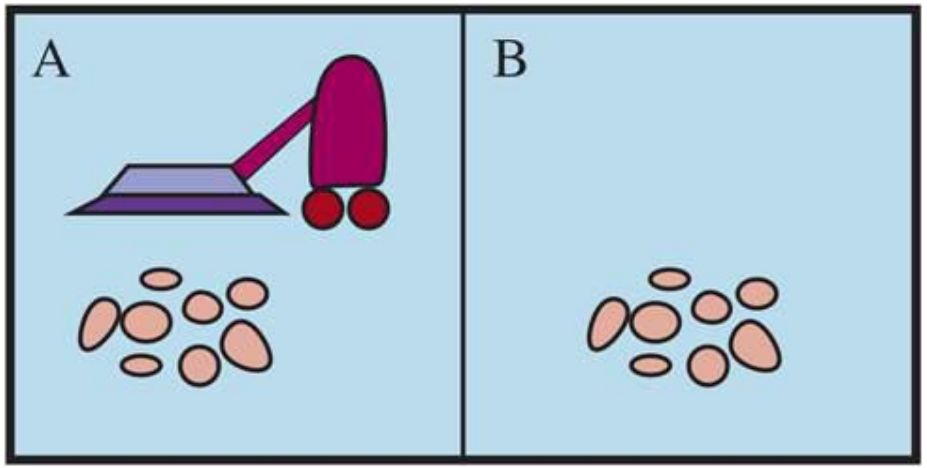
- Agent's behaviour: Agent function that maps any given percept sequence to an action.

Agents and Environments

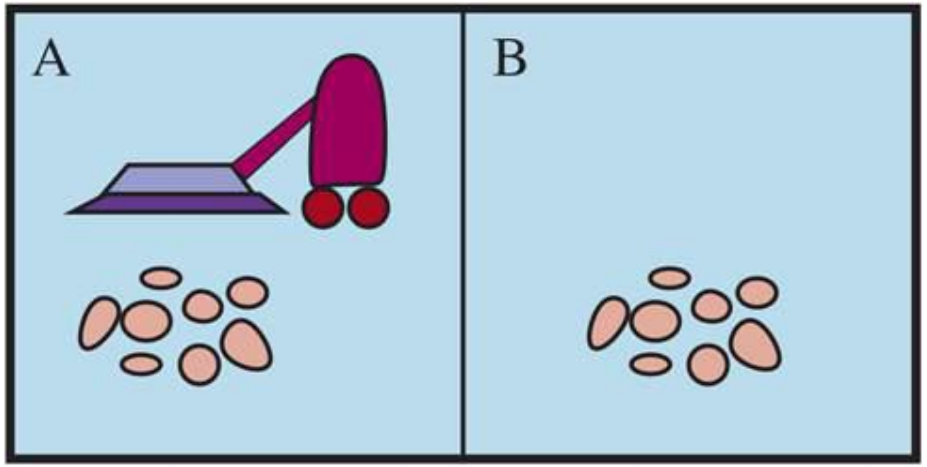
- Agent function: Abstract mathematical description
- Agent Program: Concrete implementation, running within some physical system

Vacuum cleaner world

- Actions:
  - Move to left
  - Move to right
  - Suck up the dirt
  - Do nothing



Vacuum cleaner world



- Simple Agent function:

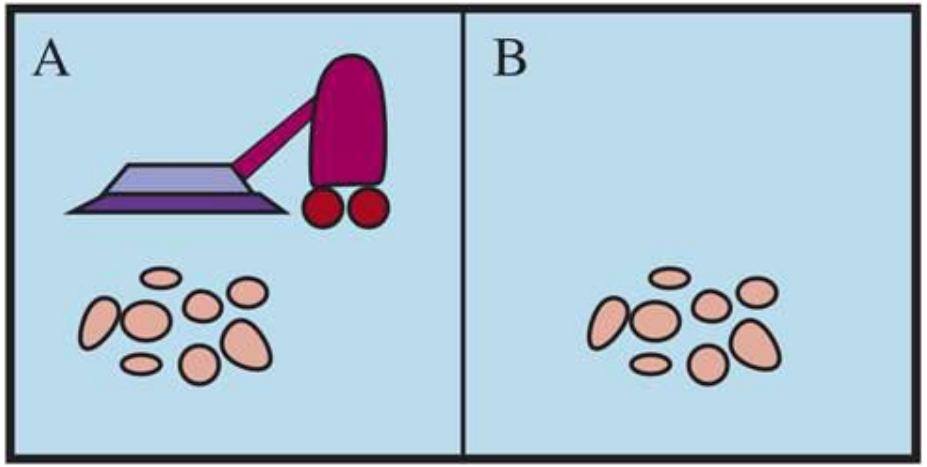
If the current square is dirty

then suck

Otherwise move to the other square.

Percept sequence	Action
[A, Clean]	Right
[A, Dirty]	Suck
[B, Clean]	Left
[B, Dirty]	Suck
[A, Clean], [A, Clean]	Right
[A, Clean], [A, Dirty]	Suck
⋮	⋮
[A, Clean], [A, Clean], [A, Clean]	Right
[A, Clean], [A, Clean], [A, Dirty]	Suck
⋮	⋮

Vacuum cleaner world



- Simple Agent function:

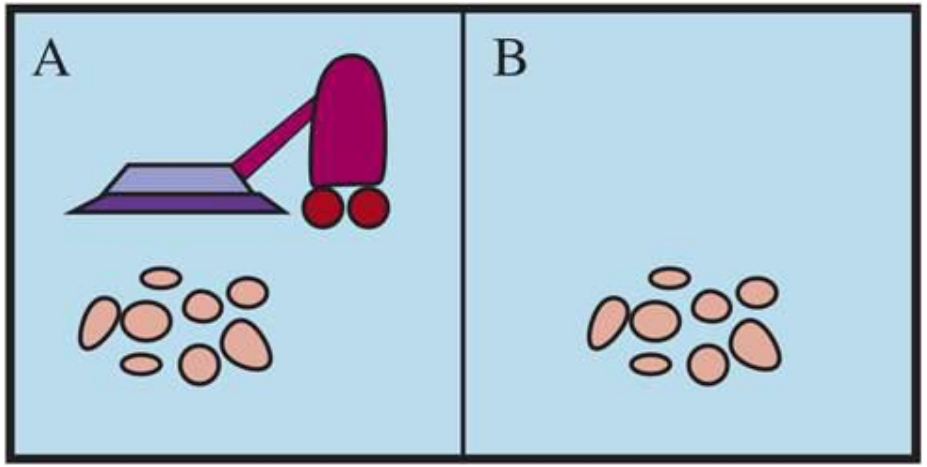
If the current square is dirty

then suck

Otherwise move to the other square.

```
function REFLEX-VACUUM-AGENT([location,status]) returns an action
    if status = Dirty then return Suck
    else if location = A then return Right
    else if location = B then return Left
```

Vacuum cleaner world



- What is the right way to fill out the table?
- What makes an Agent good or bad, intelligent or stupid??

Percept sequence	Action
[A, Clean]	Right
[A, Dirty]	Suck
[B, Clean]	Left
[B, Dirty]	Suck
[A, Clean], [A, Clean]	Right
[A, Clean], [A, Dirty]	Suck
⋮	⋮
[A, Clean], [A, Clean], [A, Clean]	Right
[A, Clean], [A, Clean], [A, Dirty]	Suck
⋮	⋮

Good Behaviour: Concept of Rationality

- Rational agent does the right thing!
- Consequentialism: Evaluating agent's behaviour by its consequences.
- Performance measure: What actually you want rather thinking agent should behave!

- Which is better?
- A reckless life of highs and lows, or a safe but humdrum existence!
- An economy where everyone lives in moderate poverty, or one in which some live in plenty while others are very poor!

Rationality

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

- **Rational agent:** For each possible percept of 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

- The performance measure awards one point for each clean square at each time step, over a "lifetime" of 1000 time steps.
- The "geography" of the environment is known *a priori* (Figure 2.2) but the dirt distribution and the initial location of the agent are not. Clean squares stay clean and sucking cleans the current square. The *Right* and *Left* actions move the agent one square except when this would take the agent outside the environment, in which case the agent remains where it is.
- The only available actions are *Right*, *Left*, and *Suck*.
- The agent correctly perceives its location and whether that location contains dirt.

Omniscience, learning and autonomy

- An omniscient agent knows the actual outcome of its actions and can act accordingly.
- Rationality maximizes expected performance, while Perfection maximizes actual performance.
- Information gathering
- Learn
- Autonomy

Specifying the task environment

- PEAS (Performance, Environment, Actuators, Sensors)