Introduction Artificial Intelligence

Artificial Intelligent Agent Types

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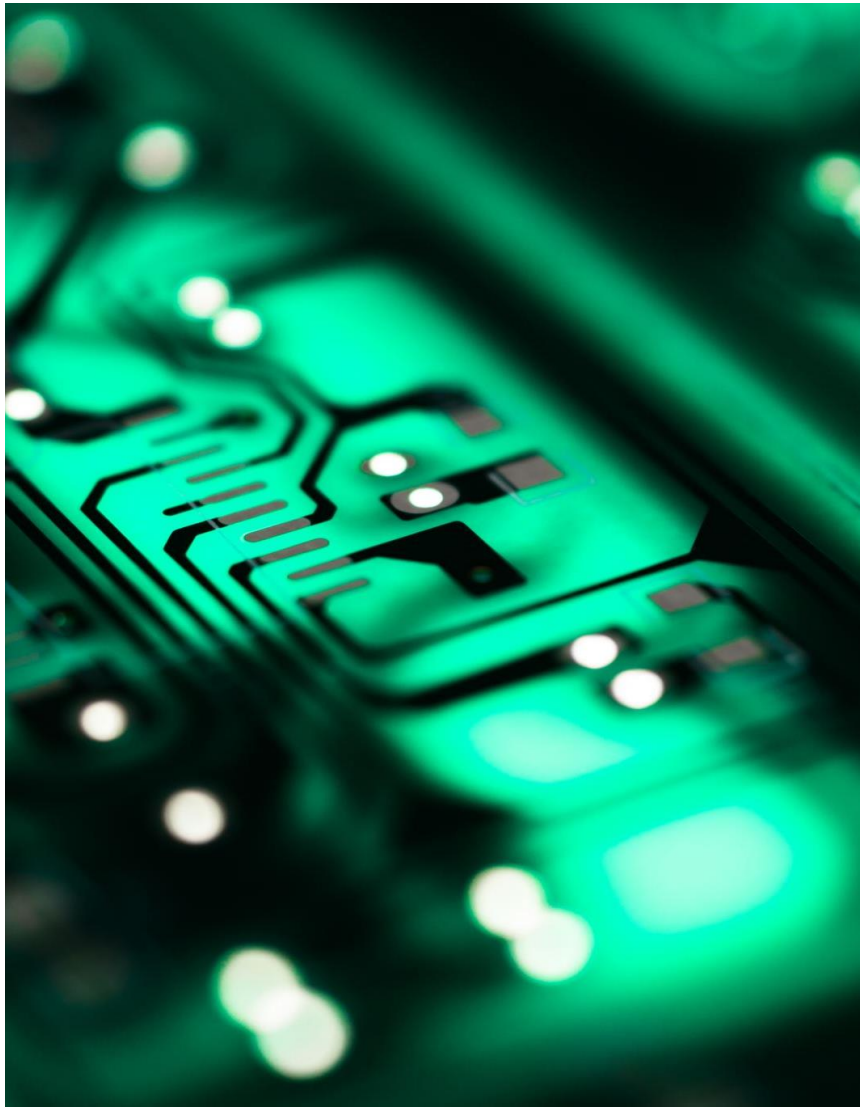


Agent implementation

- The job of AI is to design agent programs

  Agent = architecture + program

- Agent program implements agent function
  - mapping percepts to actions

- All agent programs can have the same skeleton:
  - **Input =** current percepts
  - **Output =** action

  - **Program=** manipulates input to produce output

Agent types

- **Four basic types:**

1. Simple reflex agents
2. Model-based reflex agents
3. Goal-based agents
4. Utility-based agents

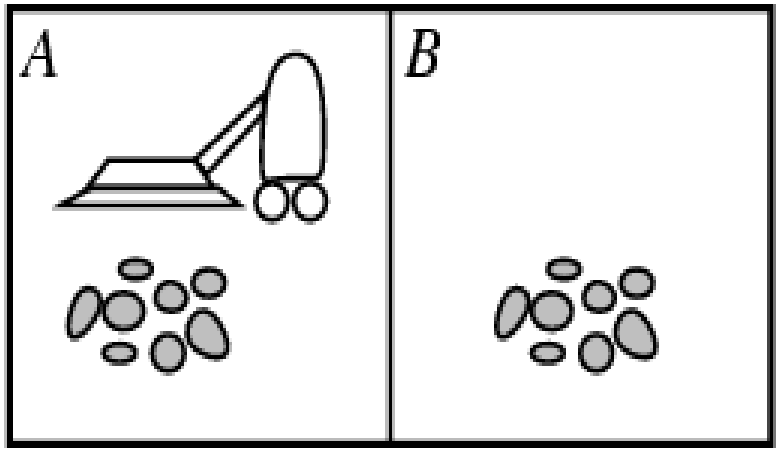
Simple reflex agent

- Select actions on the basis of the **current percept** ignoring the rest of the percept history

- **Example: simple reflex vacuum cleaner agent**

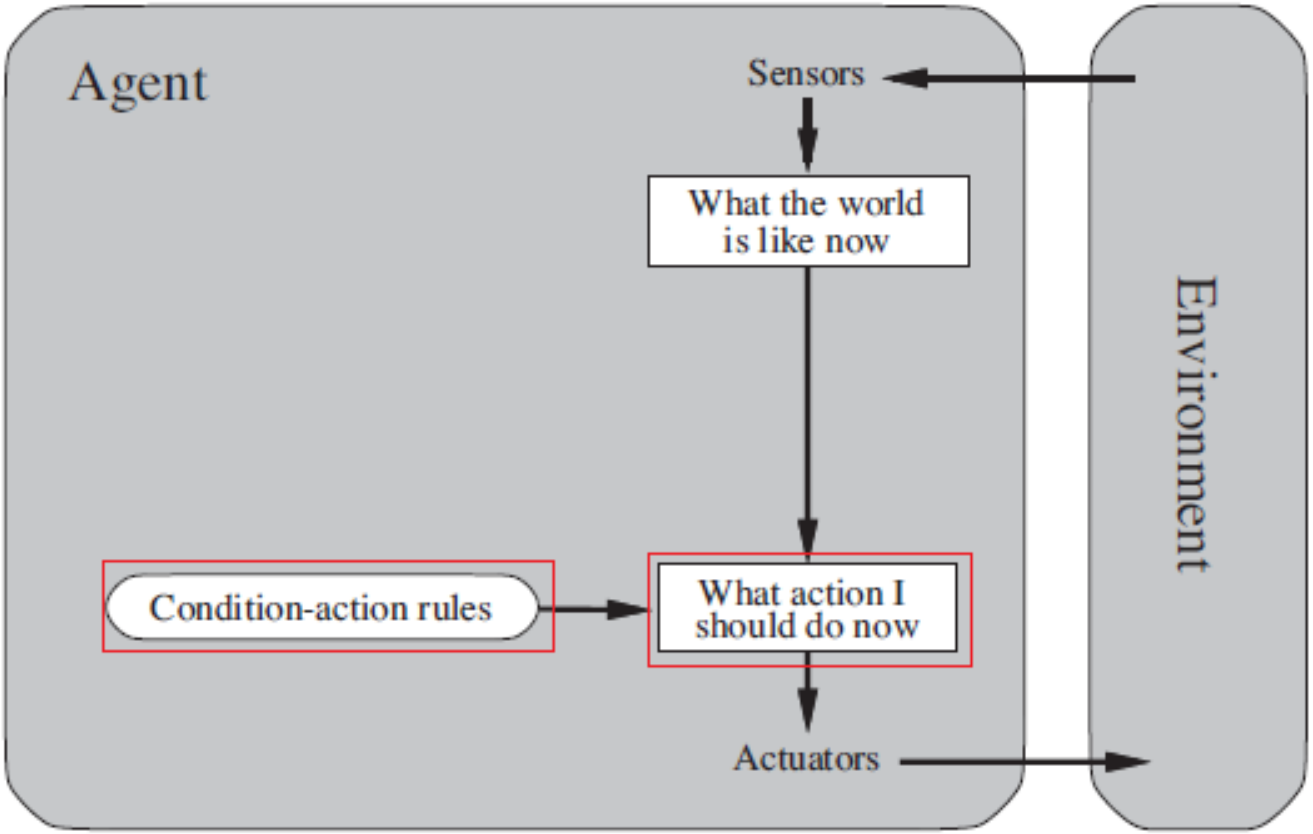
function REFLEX-VACUUM-AGENT([*location, status]) returns action*

if *status == Dirty then*
    return Suck
else if *location == A then*
    return Right
else if *location == B then*
    return Left



- **Condition-action-rule**
  - if *car-in-front-is-braking* then initiate-braking

Simple reflex agents



Simple reflex agent

- Simple, but they turn out to be of very limited intelligence.

- The agent will work only if the correct decision can be made on the basis of the current percept
  - *the environment must be fully observable*

- They will work only if the environment is fully observable.
- Infinite loops are often unavoidable for them in partially observable environments.
- e.g. the vacuum agent without a location sensor.

Model-based reflex agent

- The most effective way to handle partial observability is for the agent to

"keep track of the part of the world it can't see now – maintain some sort of internal state that depends on the percept history."

This knowledge about "how the world works" is called a model of the world.

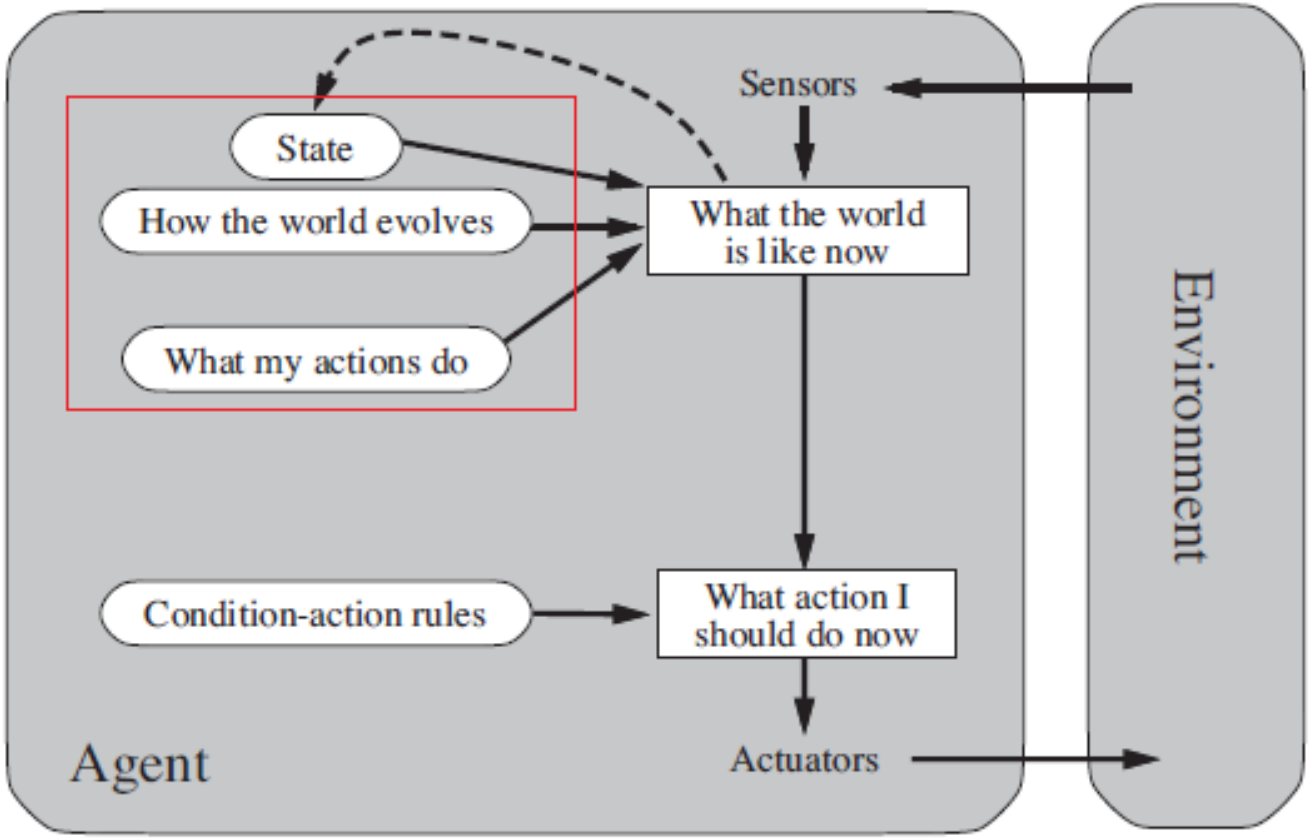
Model-based reflex agent

- The agent should keep track of the part of the world it can't see now.

- The agent should maintain some sort of internal state that depends on the percept history.

- Updating the internal state information regularly requires two kinds of knowledge to be encoded in the agent program
  - Information about how the world evolves itself.
  - Information about how the agent's own actions affect the world.

Model-based reflex agents



Goal-based agent

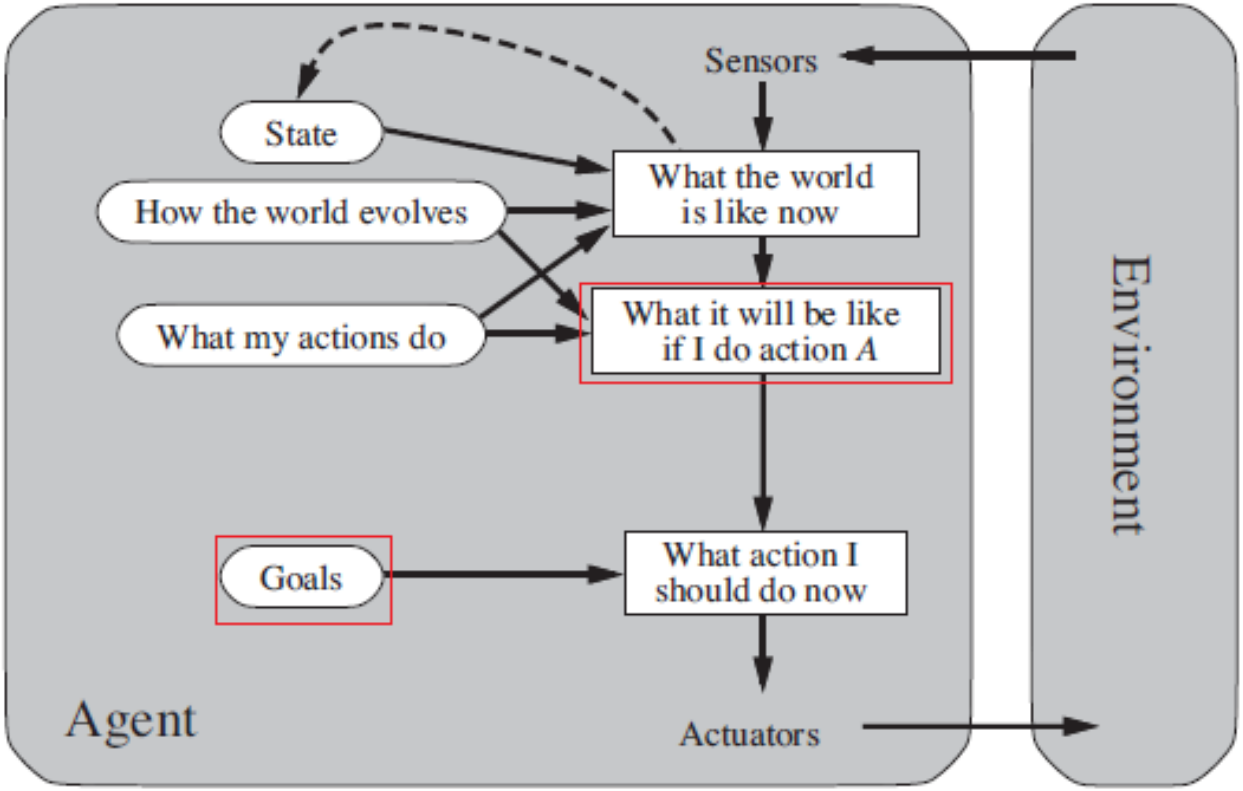
- Knowing about the current state of the environment is not always enough to decide what to do (e.g. *decision at a road junction*).

- The agent needs some sort of goal information that describes situations that are desirable.

- The agent program can combine this with information about the results of possible actions in order to choose actions that achieve the goal.

- Usually requires search and planning.

Goal-based agents



Goal-based vs. Reflex agent

- Goal-based agent appears less efficient, but it is more flexible because the knowledge that supports its decision is represented explicitly and can be modified.
- The goal-based agent's behaviour can easily be changed.
- The reflex agent's rules must be changed for a new situation - rewrite many condition-action rules.
- Goal-based agent takes future into account.

Utility-based agent

- Goals alone are not really enough to generate high quality behaviour in most environments.
  - *What if multiple roads lead to the destination from a junction?*
  - *Which road would be better – safe, cheap, fast...*

- If a state A is preferred over a state B, then A has a higher utility.

- A utility function maps a state onto a real number which describes the associated degree of happiness /satisfaction
- Happy-unhappy vs how much happy.

Utility-based agents