

CSC421 Intro to Artificial Intelligence



UNIT 01: Intelligent Agents

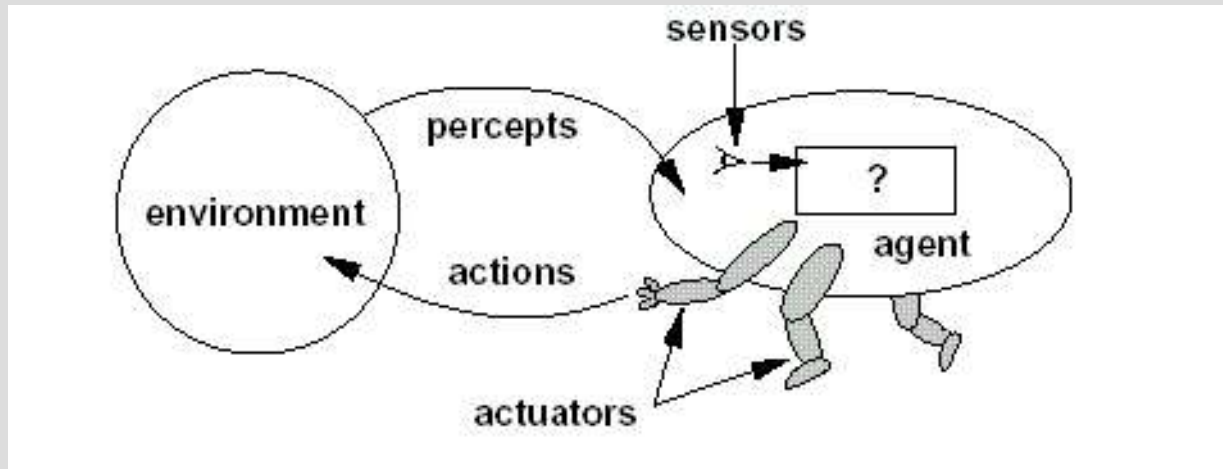
Agents & environments



- Examples of agents ?



Agents & environments



Agents include humans, robots, softbots, thermostats etc

The **agent function** maps from precept history to actions:

$$f: P^* \rightarrow A$$

The **agent program** run on the physical architecture to produce f

The doughnut world



A



B



Precepts: location and contents e.g [A, Doughnut]
Actions : left, right, eat, NoOp

Doughnut Eating Agent (DEA)



Precept Sequence	Action
[A, empty]	Right
[A, doughnut]	Eat
[B, empty]	Left
[B, doughnut]	Eat
[A, empty], [A, empty]	Right
[A, empty], [B, doughnut]	Eat
.....	

What is the “right” function ?
Can it be implemented by a small agent program?

function RELFEX_DEA([location, status]) **returns** an action
if status = *Doughnut* **then return** *Eat*
else if location = *A* **then return** *Right*
else if location = *B* **then return** *Left*

Rationality



- Fixed **performance** measure evaluates the environment sequence
 - One point per square cleaned in time T ?
 - One point per clean square per time step, minus one per move ?
- A **rational** agent chooses whichever action maximizes the **expected** value of the performance measure **given the percept sequence to date**
- **Rational** is not omniscient - percepts may not supply all relevant information

PEAS description



- Performance measure
- Environment
- Actuators
- Sensors

PEAS for



- Doughnut eating agent ?
- Automated taxi ?
- Internet shopping agent ?
- Non-player character in computer game ?
- Chess-playing program ?

Environments



	Solitaire	Backgammon	Internet shopping	Taxi
<u>Observable??</u>				
<u>Deterministic??</u>				
<u>Episodic??</u>				
<u>Static??</u>				
<u>Discrete??</u>				
<u>Single-agent??</u>				

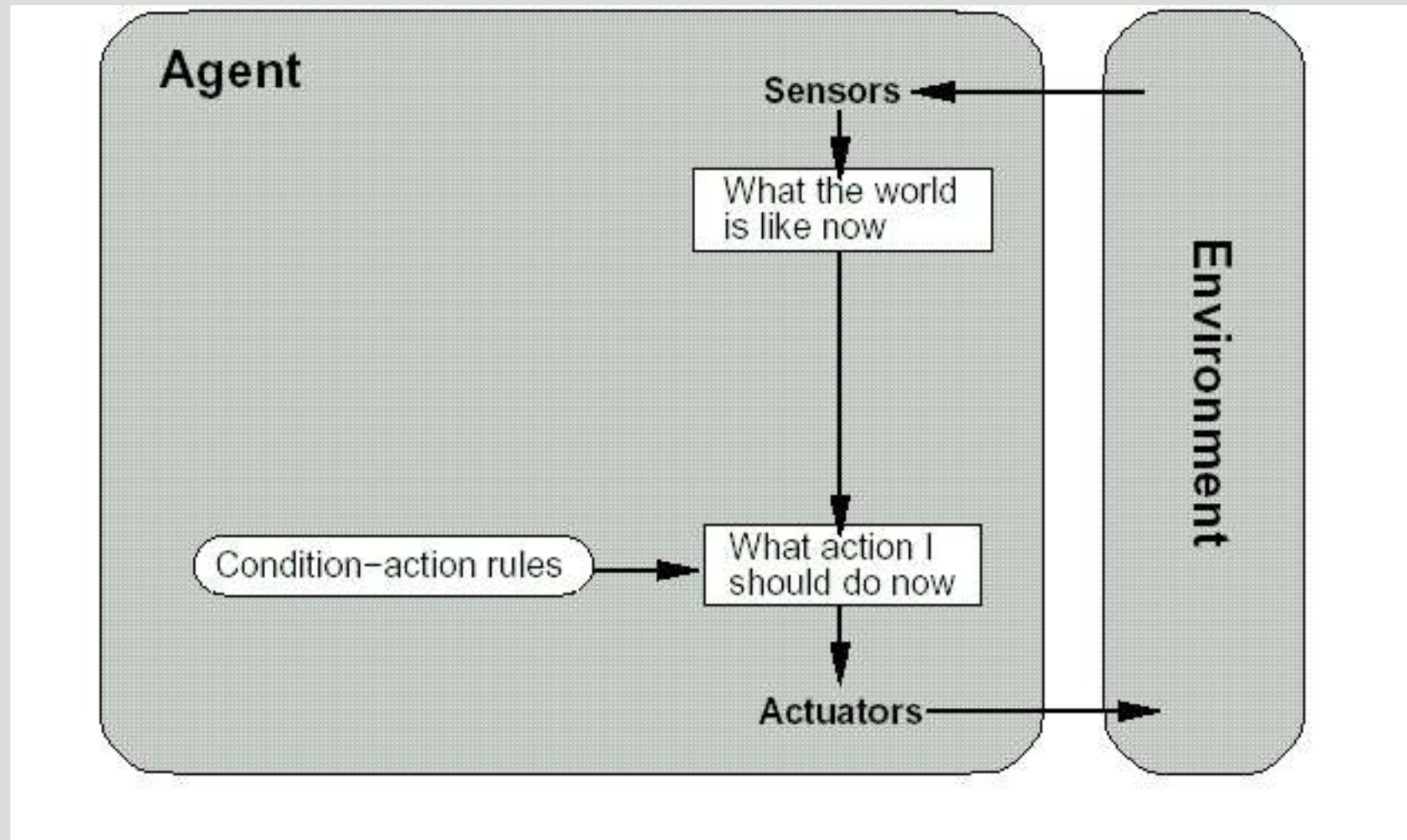
The environment type largely determines the agent design
The real world is (of course) partially observable, stochastic, sequential, dynamic, continuous, multi-agent.

Agent types

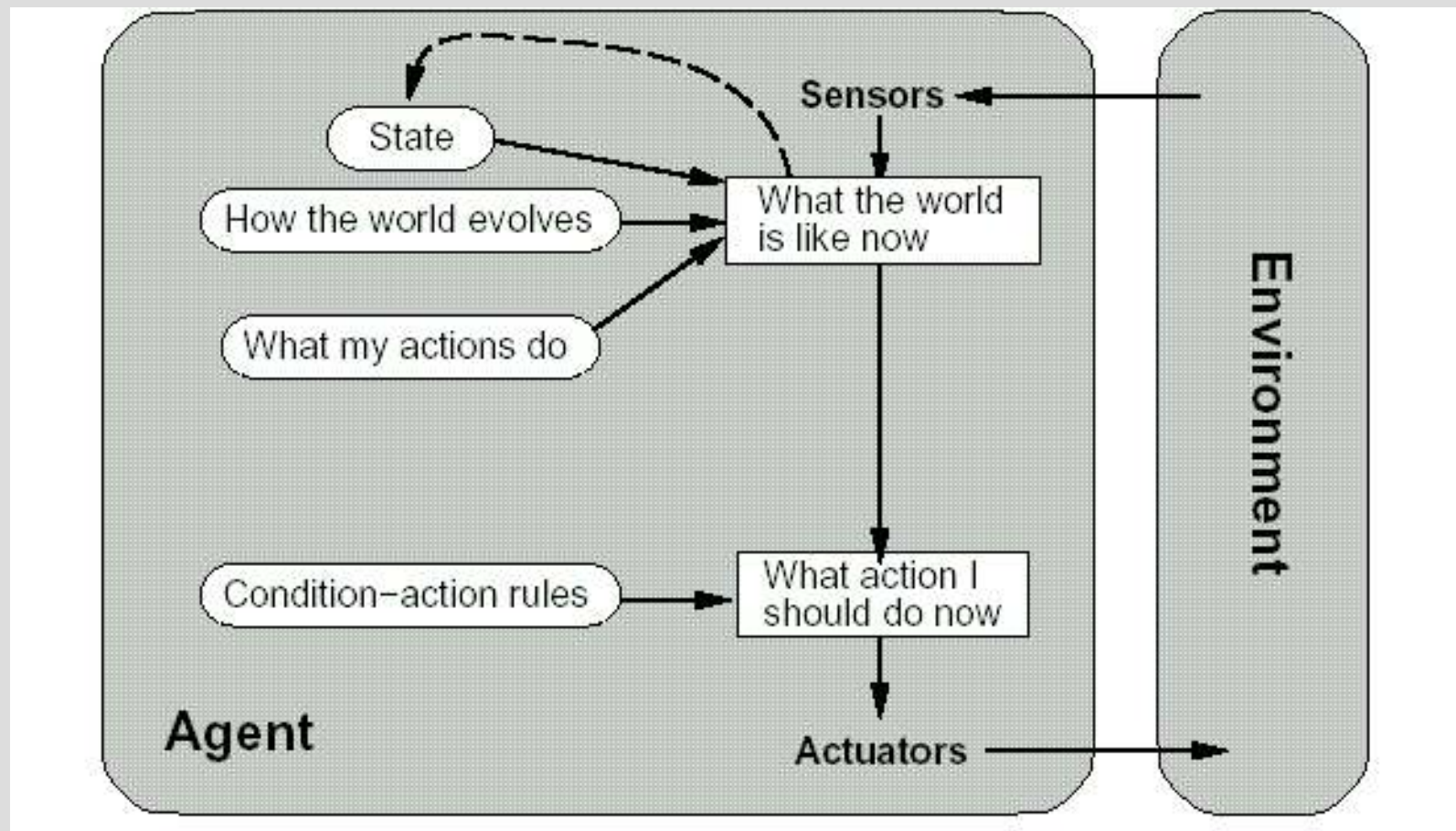


- Four basic types in order of increasing complexity
 - Simple reflex agents
 - Reflex agents with state
 - Goal-based agents
 - Utility-based agents
- All these can be turned into learning agents

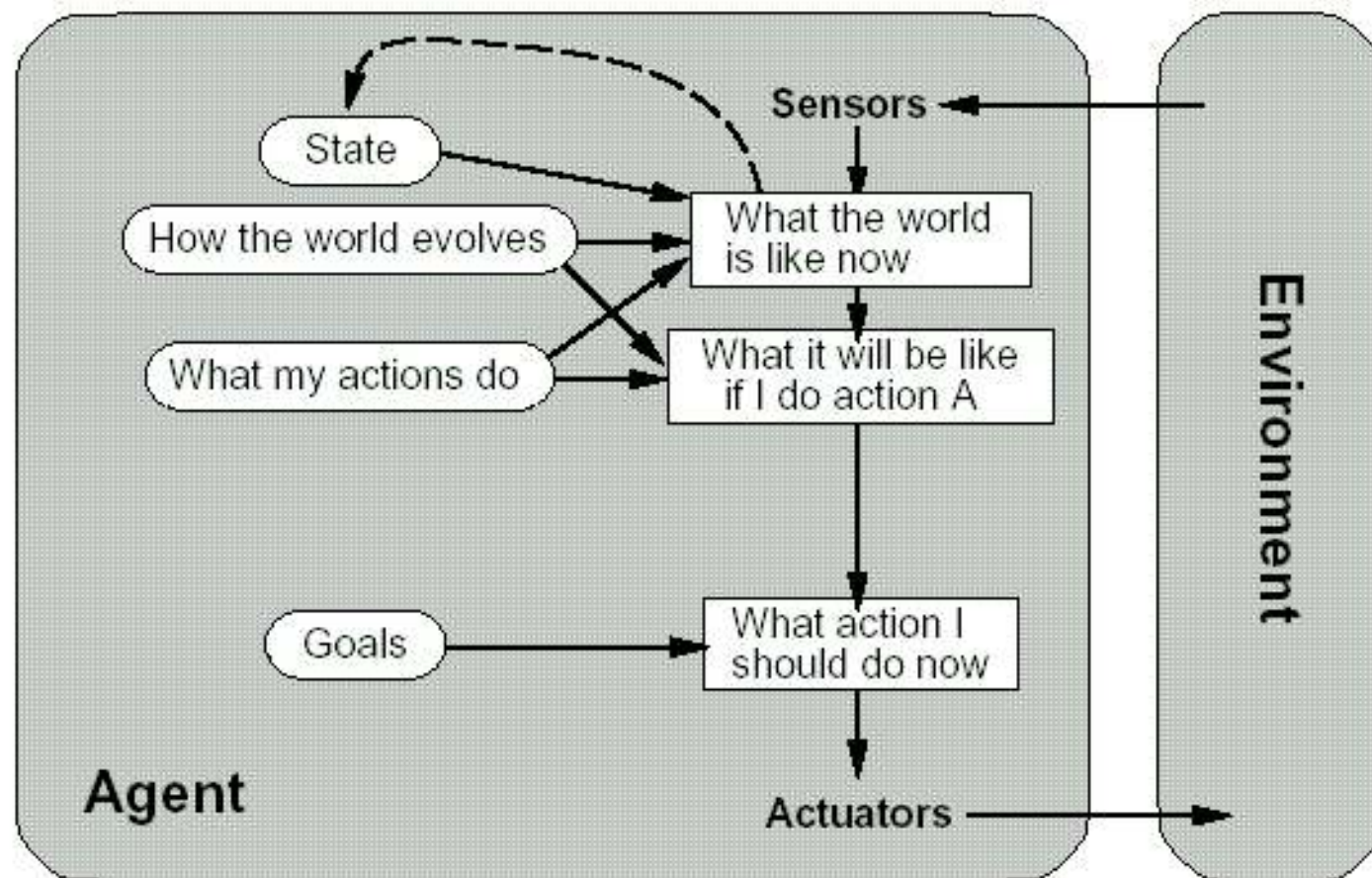
Simple reflex agents



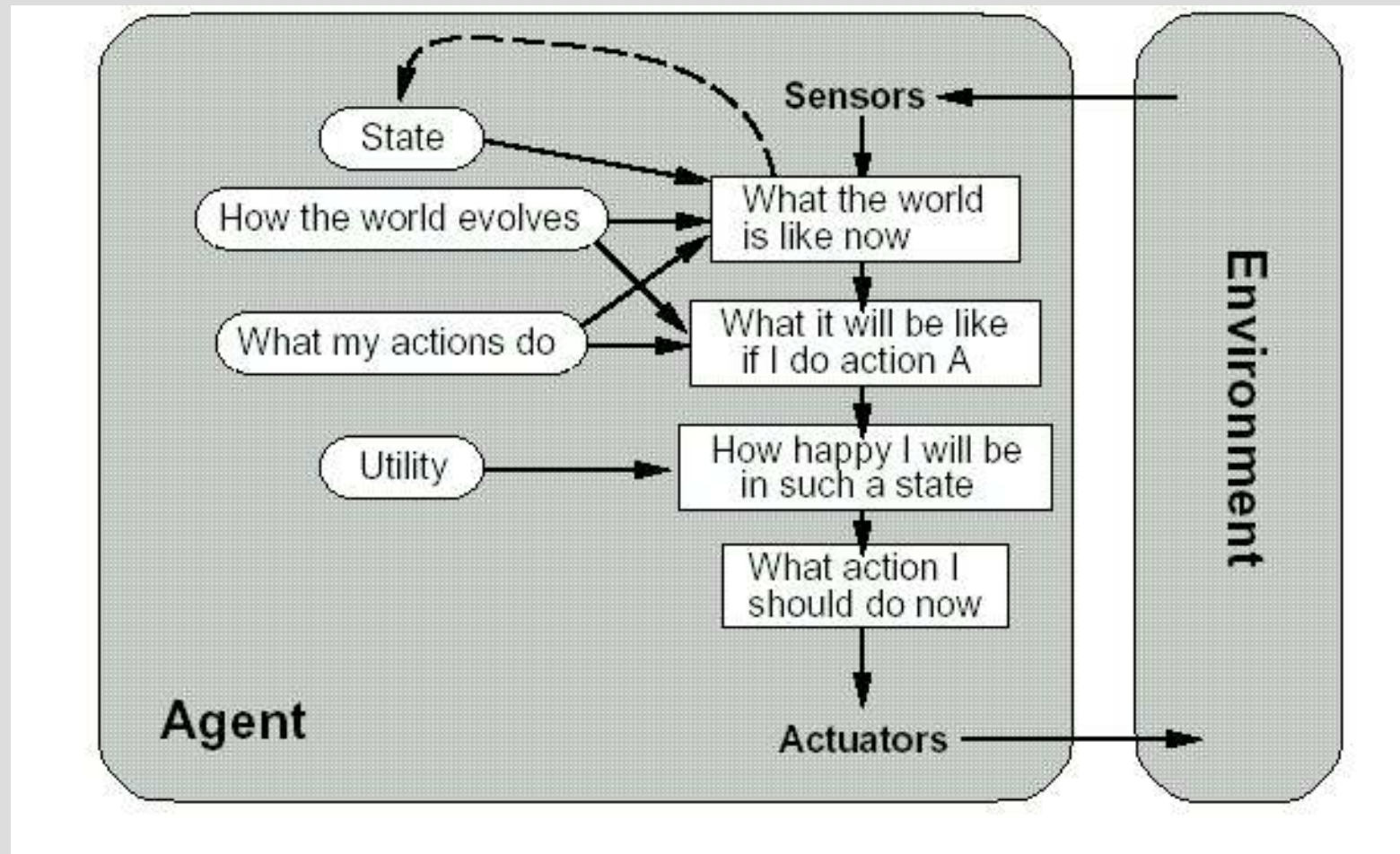
Reflex agents with state



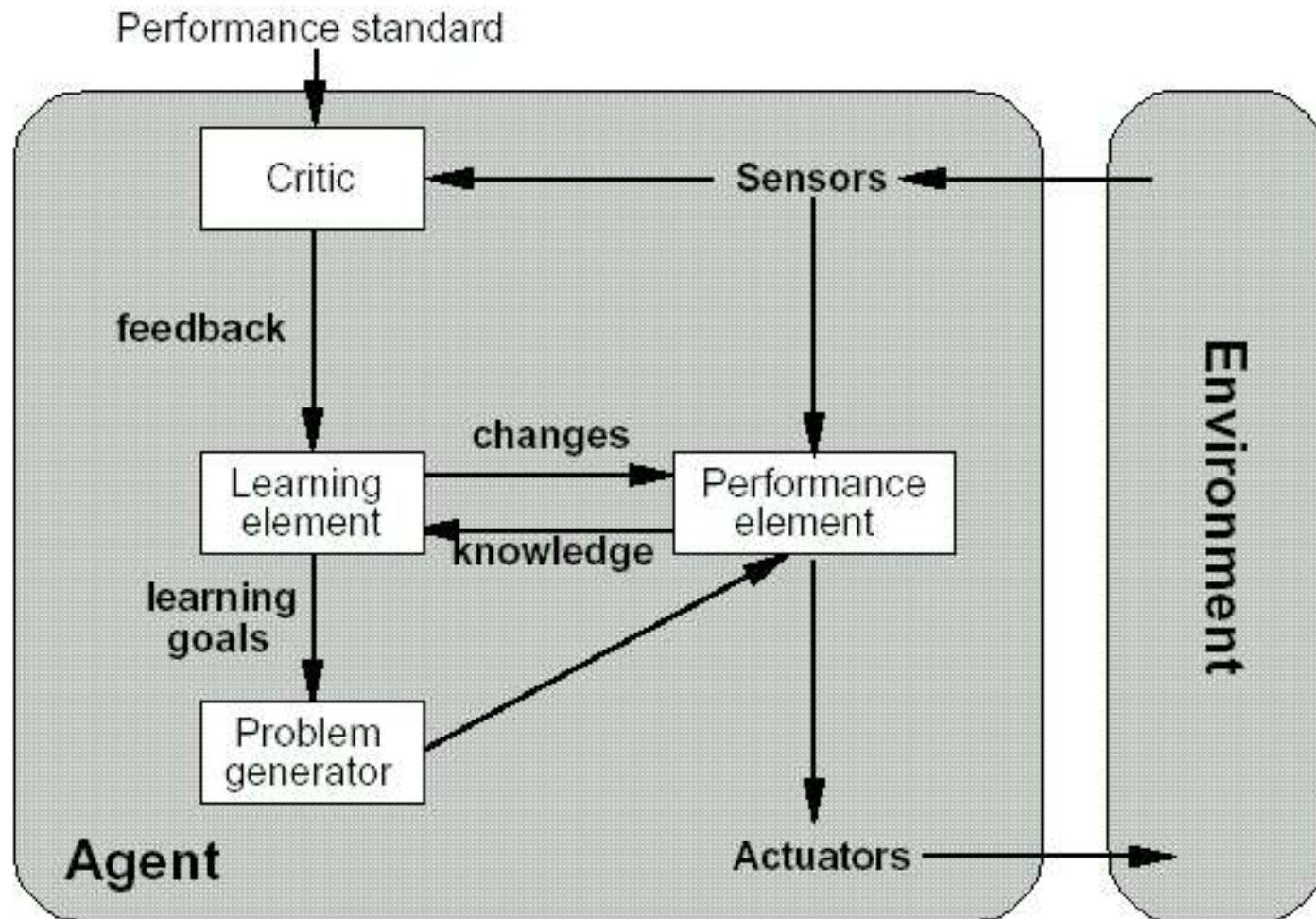
Goal-based agents



Utility-based agents



Learning Agents



Summary I



- Agents interact with **environments** through **actuators** and **sensors**
- The **agent function** describes what the agent does in all circumstances
- The **performance measure** evaluates the environment sequence
- A **rational** agent tries to maximize performance
- **PEAS** descriptions define task environments

Summary II



- Environments
 - Observable ? deterministic ? episodic ? static ?
discrete ? single agent ?
- Agent architectures
 - Reflex
 - Reflex with state
 - Goal-based
 - Utility-based