Agents

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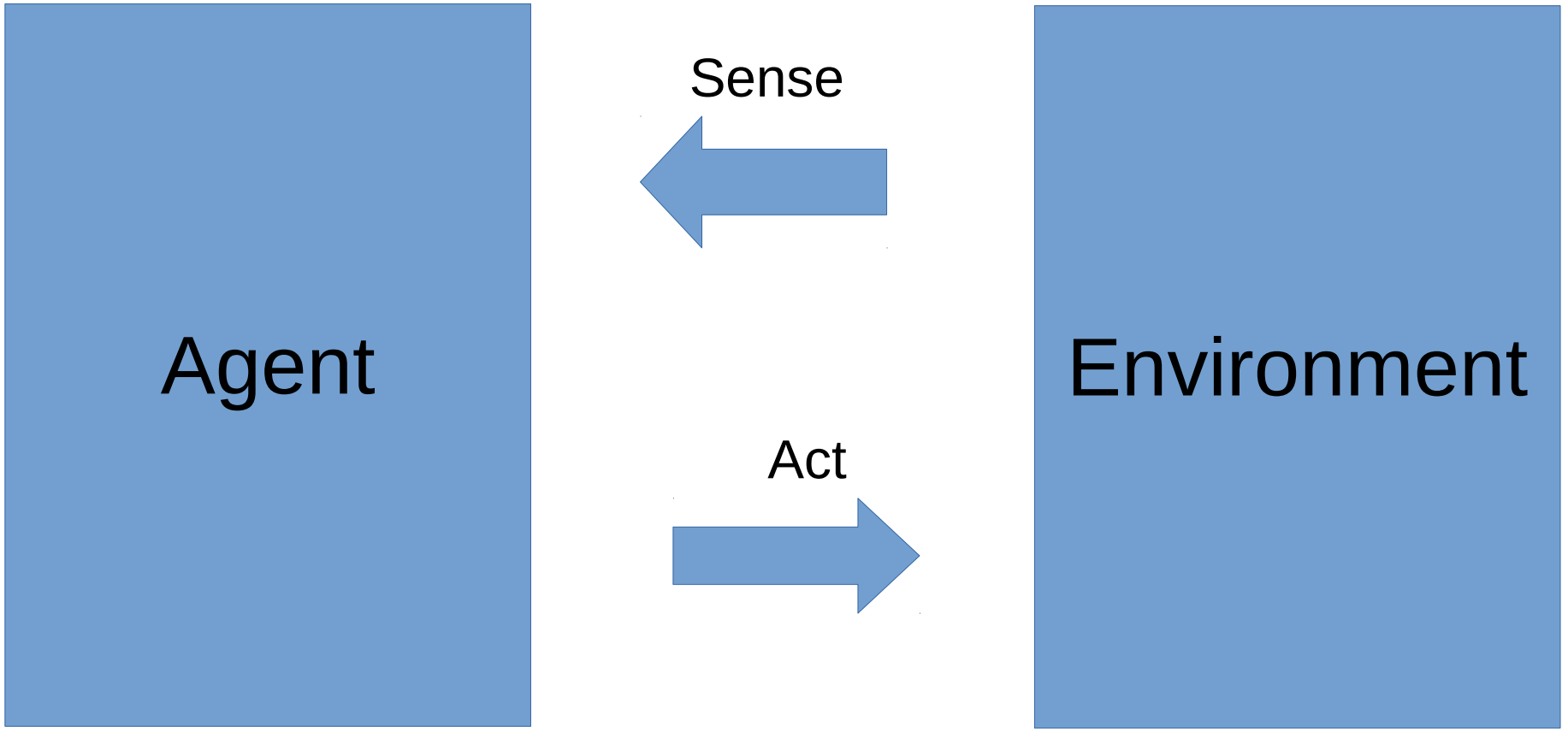
Northeastern University

Some material used from:
1. Russell/Norvig, AIMA
2. Stacy Marsella, CS4100
3. Seif El-Nasr, CS4100

What is an Agent?



What is an Agent?

Agent

Sense

Act

Environment

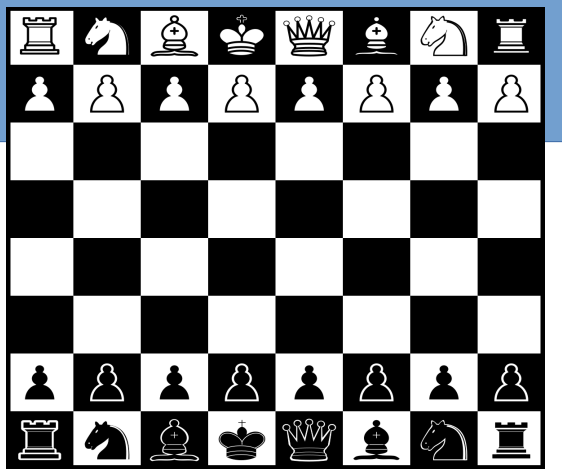
What is an Agent?

Agent

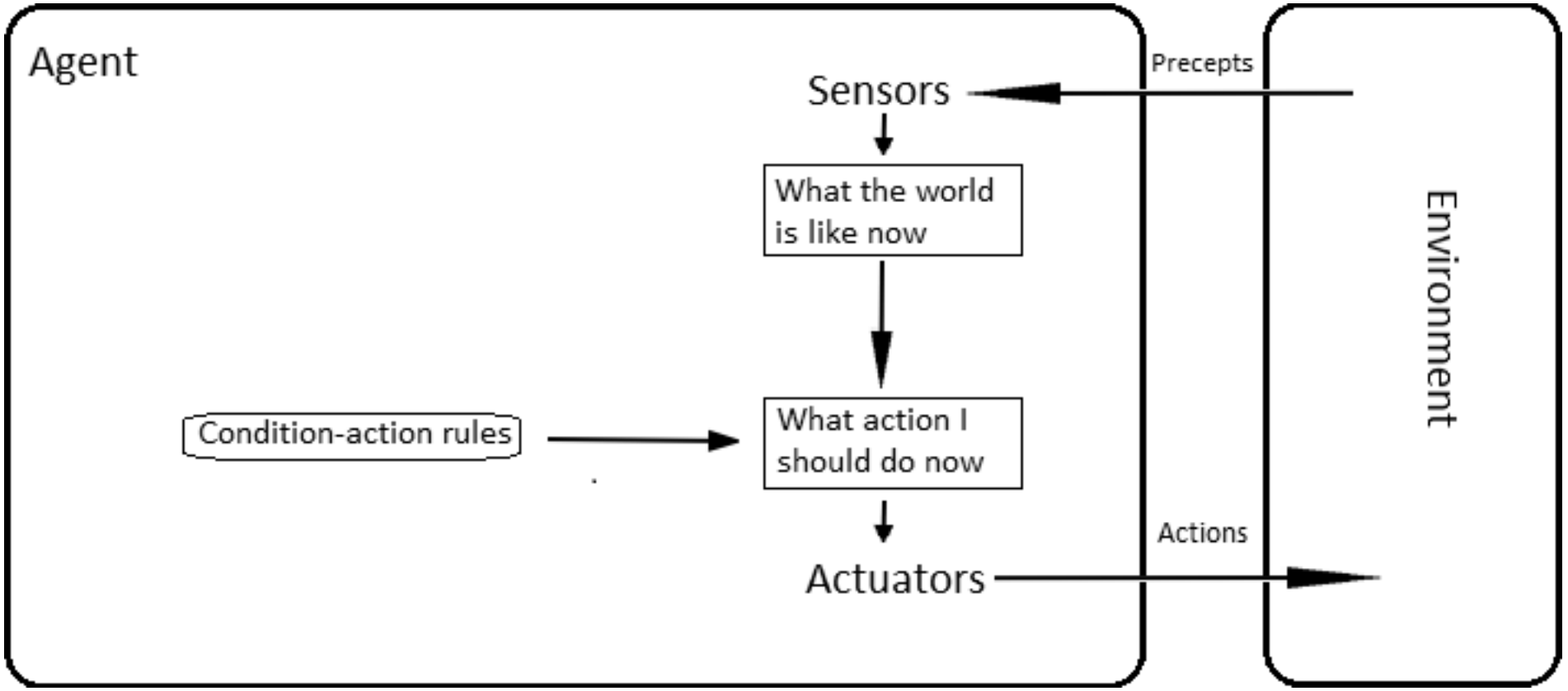
Sense

Act

Environment



Types of Agents



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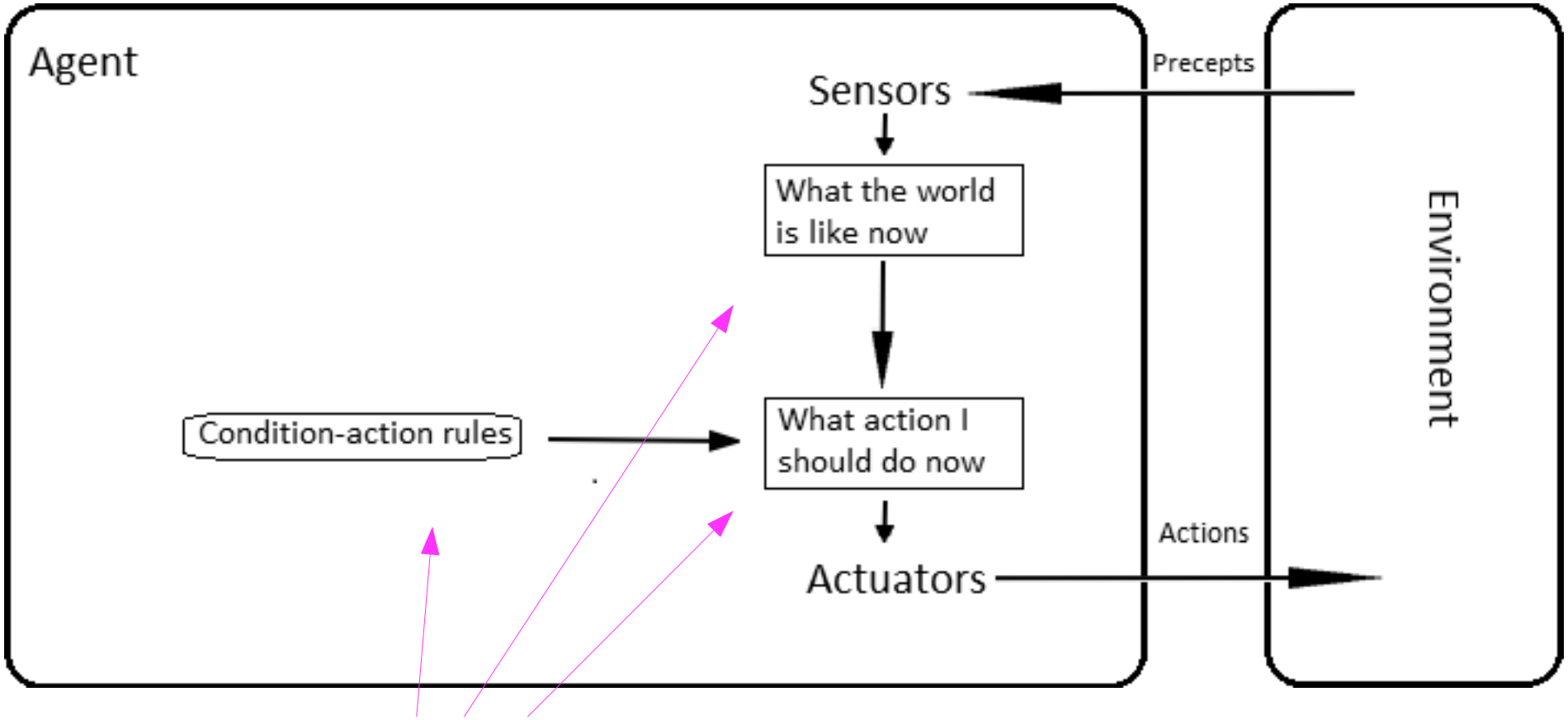
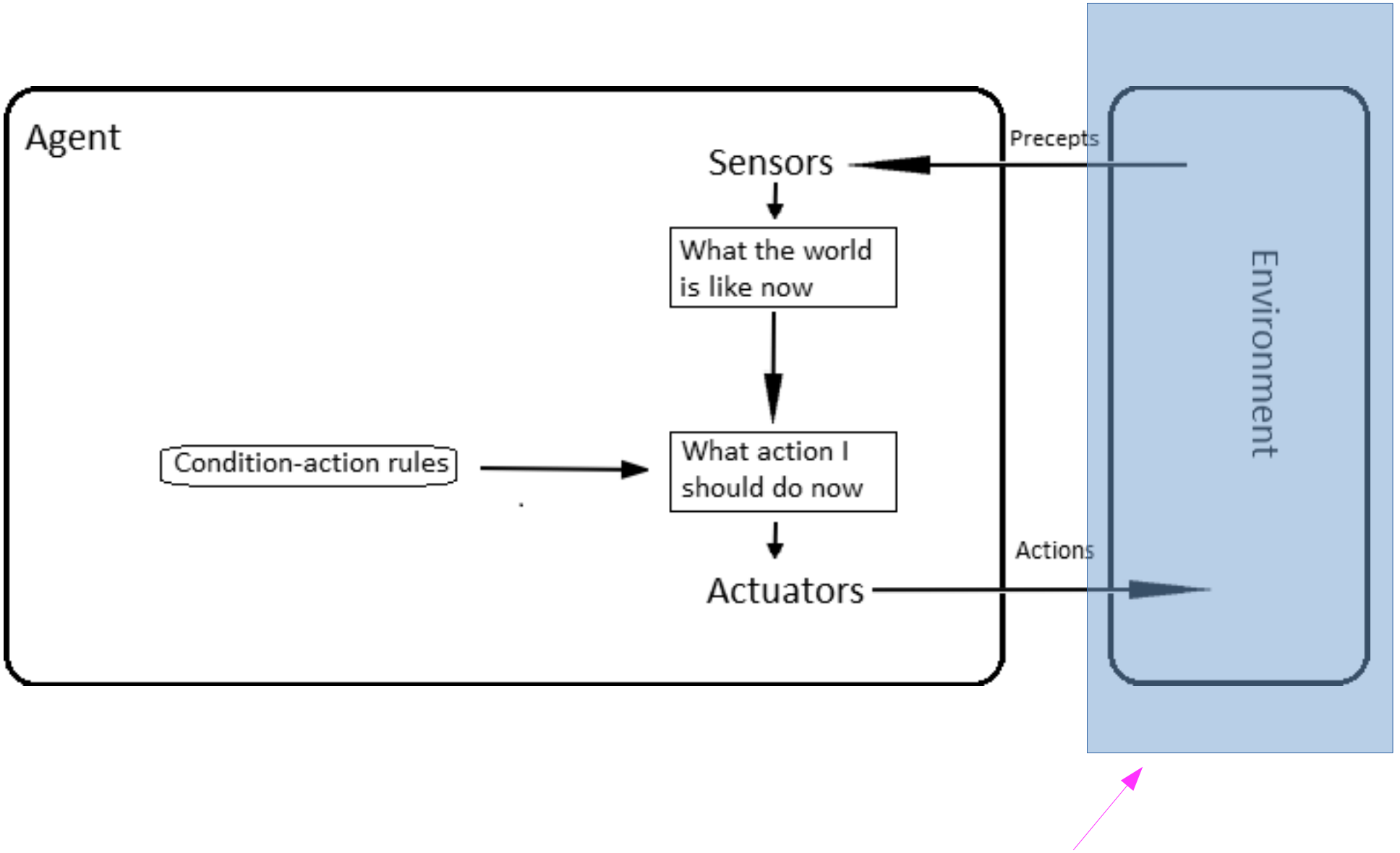


Different types of agents fill in these boxes differently

Types of Agents



Let's think about environment first

Environment Types

- Fully observable (vs. partially observable): An agent's sensors give it access to the complete state of the environment at each point in time.

Fully observed

Partially observed

Environment Types

- Deterministic (vs. stochastic): Next state completely determined by current state and action executed by agent.

Deterministic

Stochastic

Environment Types

- Static (vs. dynamic): The environment is unchanged while an agent is deliberating.

Static

Dynamic

Environment Types

- Discrete (vs. continuous): A finite number of distinct, clearly defined states, percepts and actions.

Environment Types

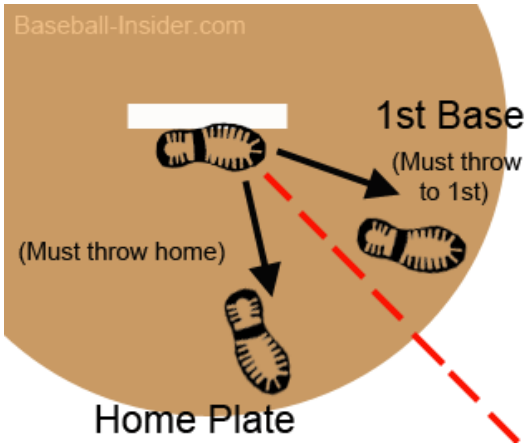
- Single agent (vs. multi-agent): An agent operating by itself in an environment. Do other agent interfere with my performance measure? Multi-agent can be competitive or collaborative.

Competitive

Collaborative

Knowledge of the environment

- Known vs. Unknown: An agent may not know the laws that govern the environment
  - *Often incredibly hard problem.*
  - *Imagine watching a baseball game for the first time*
  - *Balks, infield fly rule, 3rd strike steal, fouling being or not being a strike – all these exceptions*



Environment Types

task environm.	observable	determ./ stochastic	episodic/ sequential	static/ dynamic	discrete/ continuous	agents
crossword puzzle	fully	determ.	sequential	static	discrete	single
chess with clock	fully	strategic	sequential	semi	discrete	multi
poker						
back gammon						
taxi driving	partial	stochastic	sequential	dynamic	continuous	multi
medical diagnosis	partial	stochastic	sequential	dynamic	continuous	single
image analysis	fully	determ.	episodic	semi	continuous	single
partpicking robot	partial	stochastic	episodic	dynamic	continuous	single
refinery controller	partial	stochastic	sequential	dynamic	continuous	single
interact. Eng. tutor	partial	stochastic	sequential	dynamic	discrete	multi

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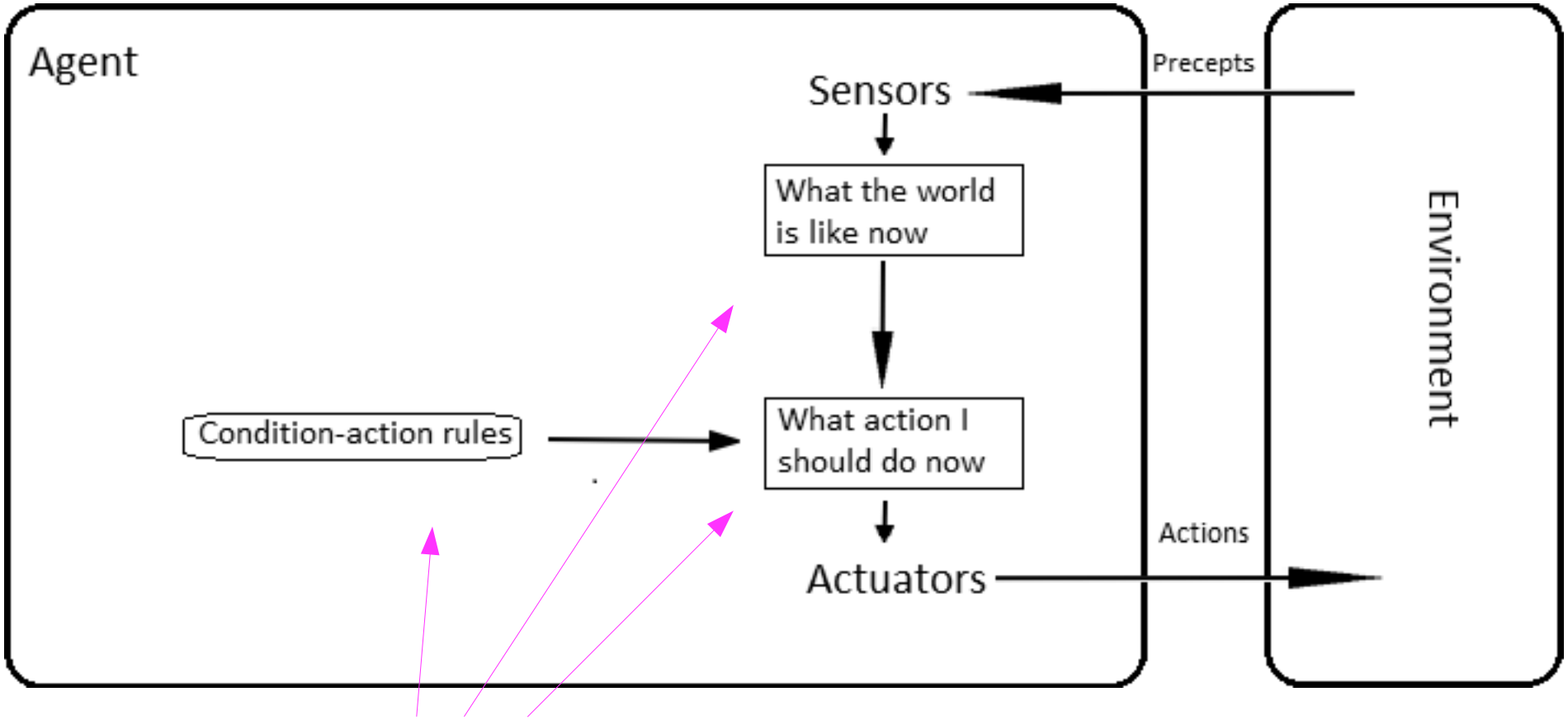

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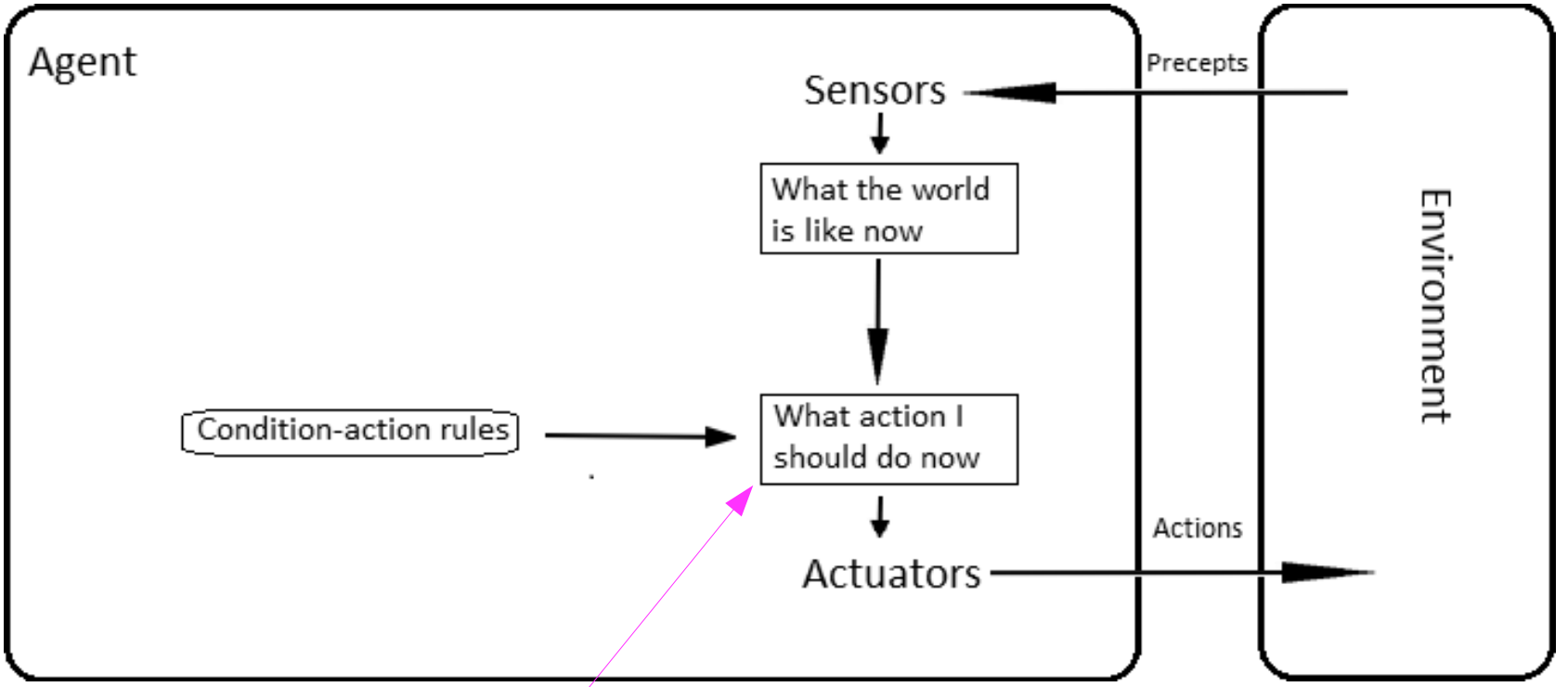
Types of Agents: Reflex Agent



Reflex Agent:

Chooses action based on current percept

Does not consider (explicitly) future consequences of actions

Types of Agents: Reflex Agent

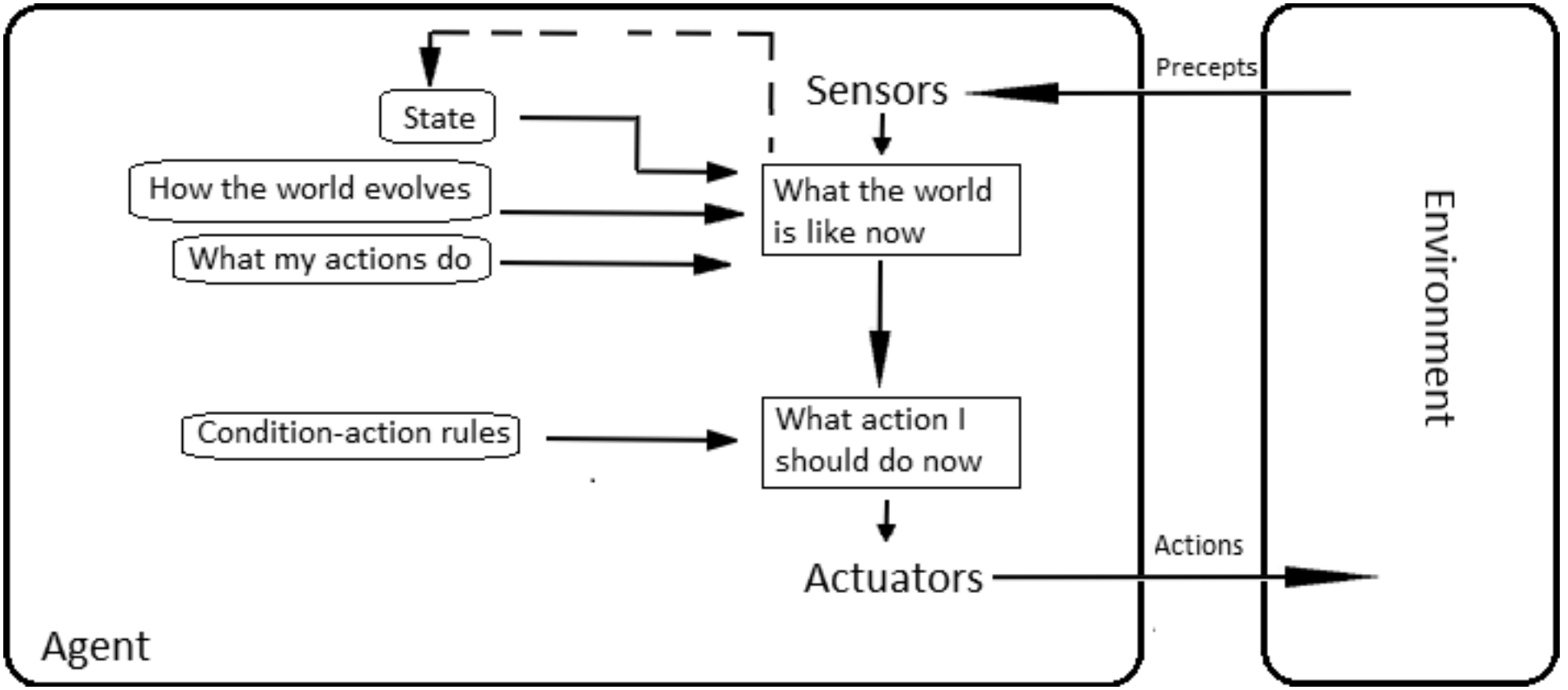
Direct connection between perceptions and action

– encoded by a set of if-then statements
(e.g. if I hit a wall, rotate 45 deg clockwise)

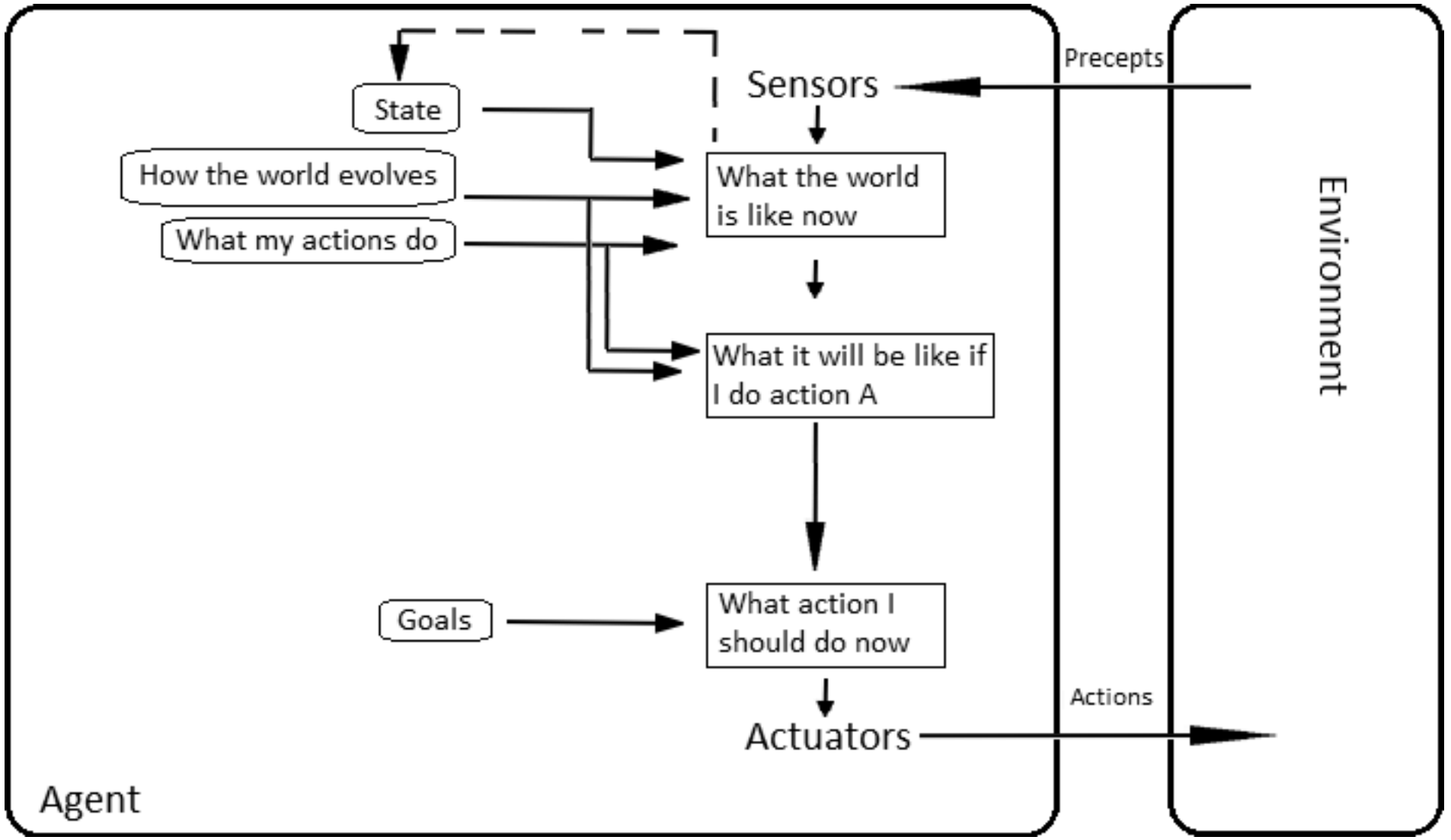
– when does this work well/poorly?

– would you design a self-driving car like this?

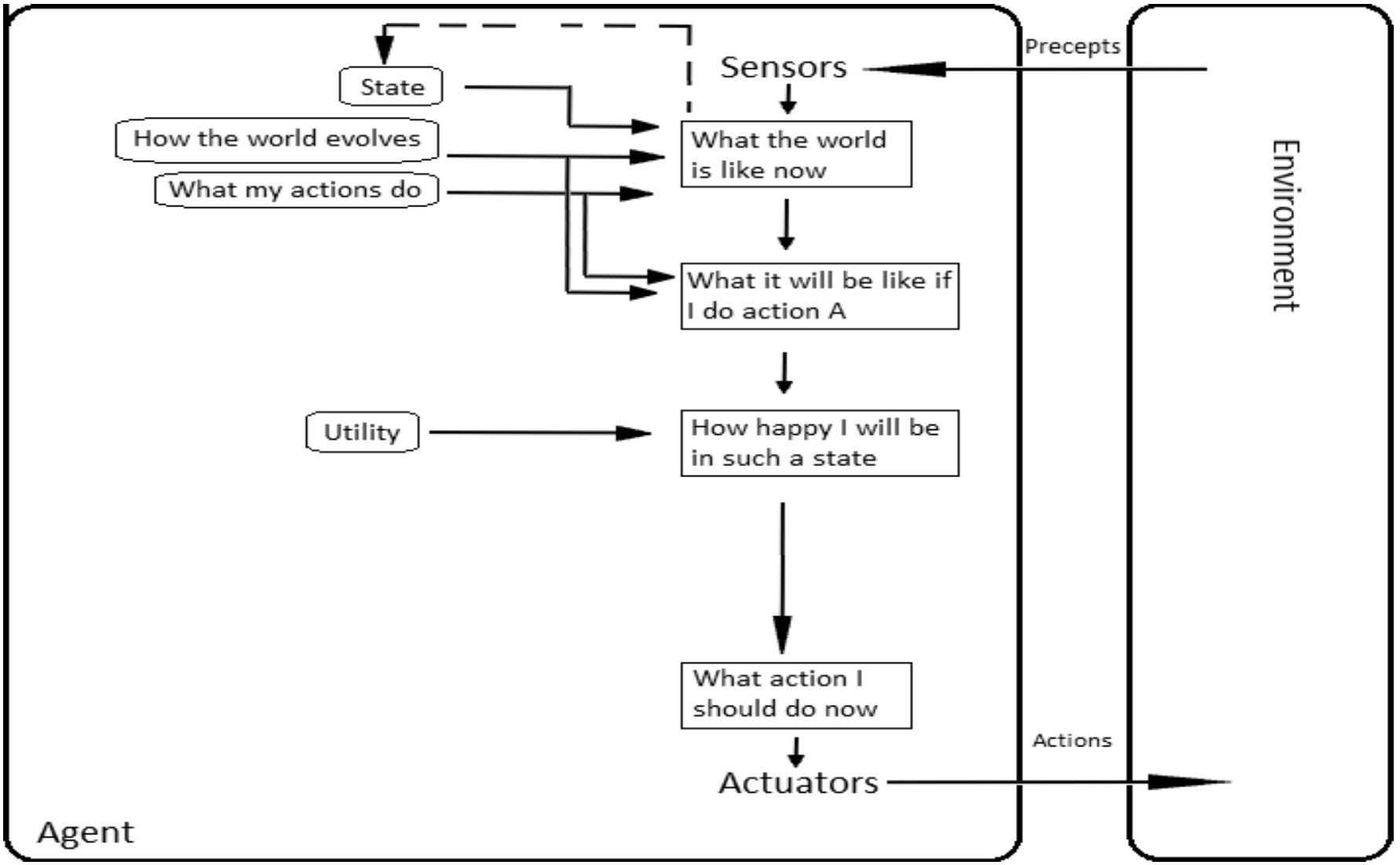
Types of Agents: Model Based Reflex Agent



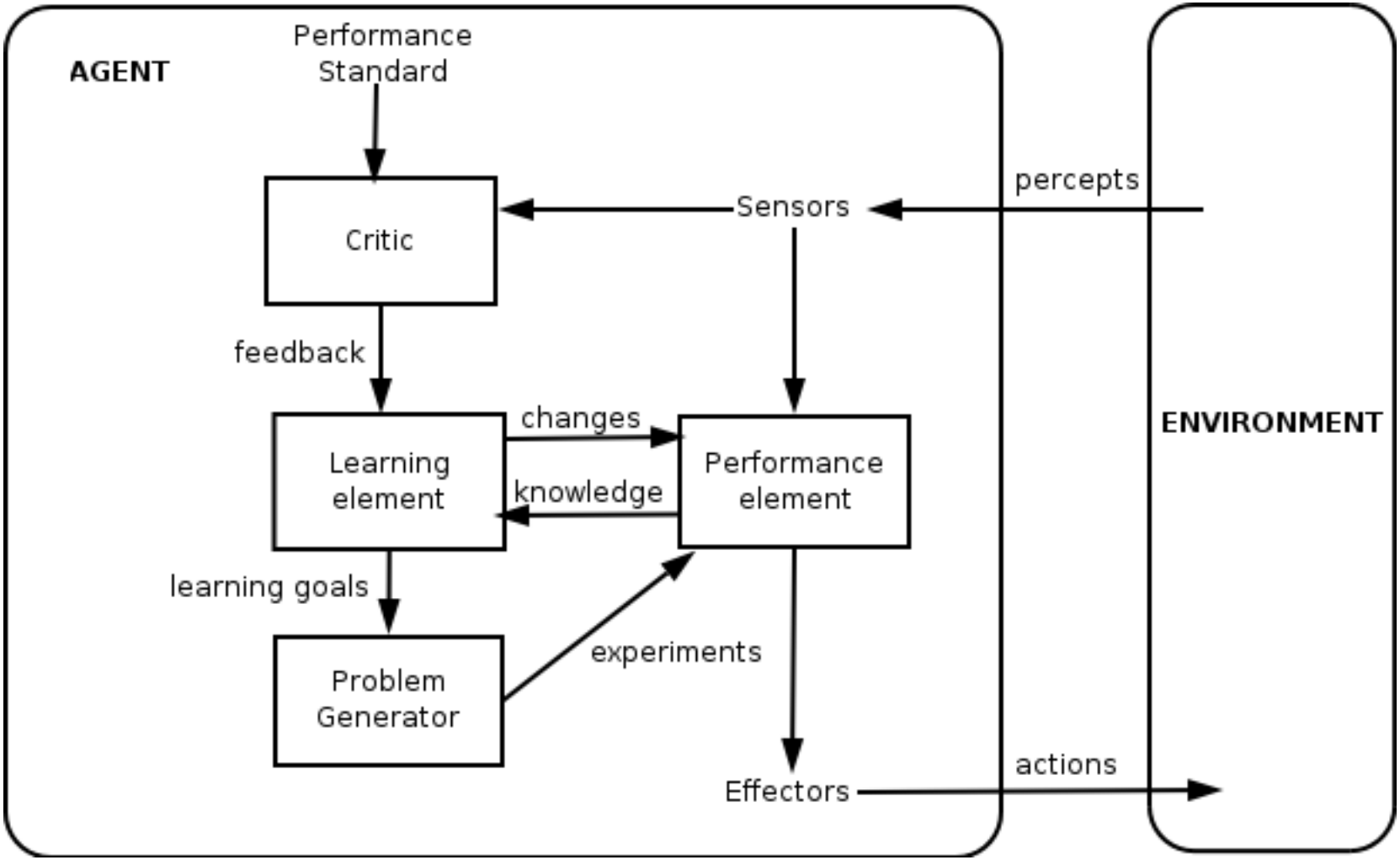
Types of Agents: Goal Based Agent



Types of Agents: Utility Based Agent



Types of Agents: Learning Agent



This Course

This course is largely about problem solving in increasingly uncertain environments and agents with more complex tasks/goals in those environments...

… and the more sophisticated approaches to representation and agent design that are needed to be effective in those domains