Concepts and Models

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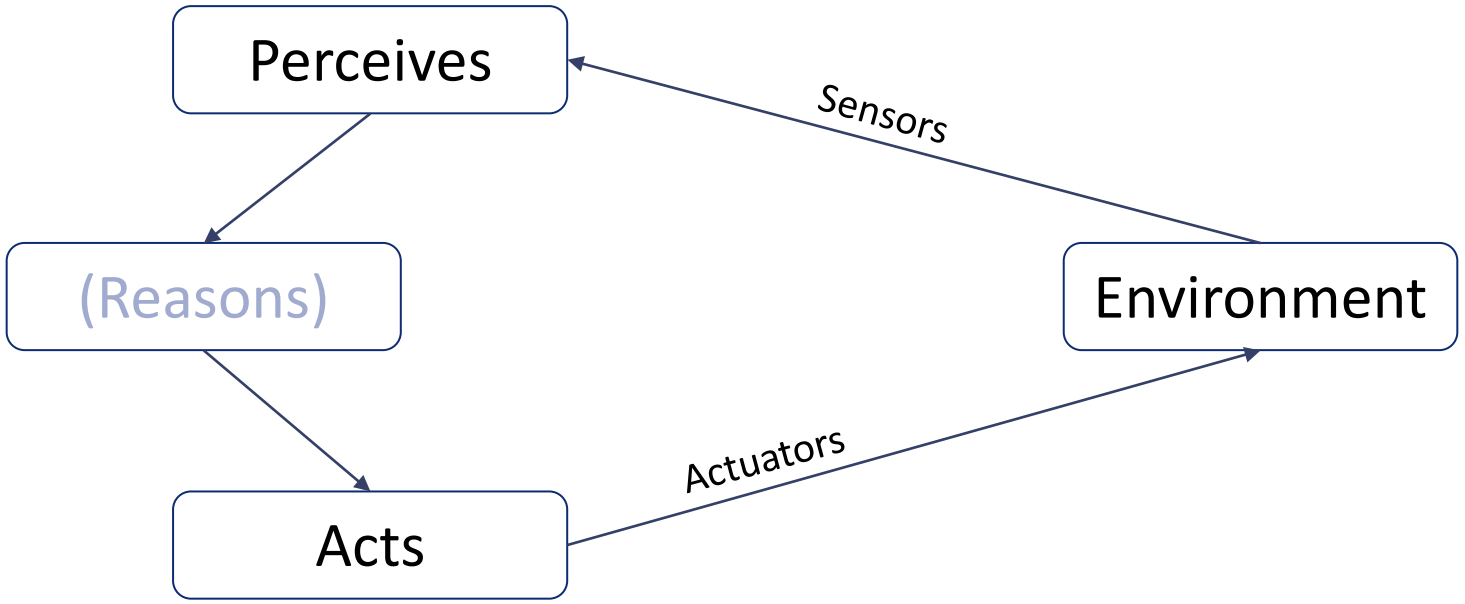
MULTIMEDIA ENGINEERING

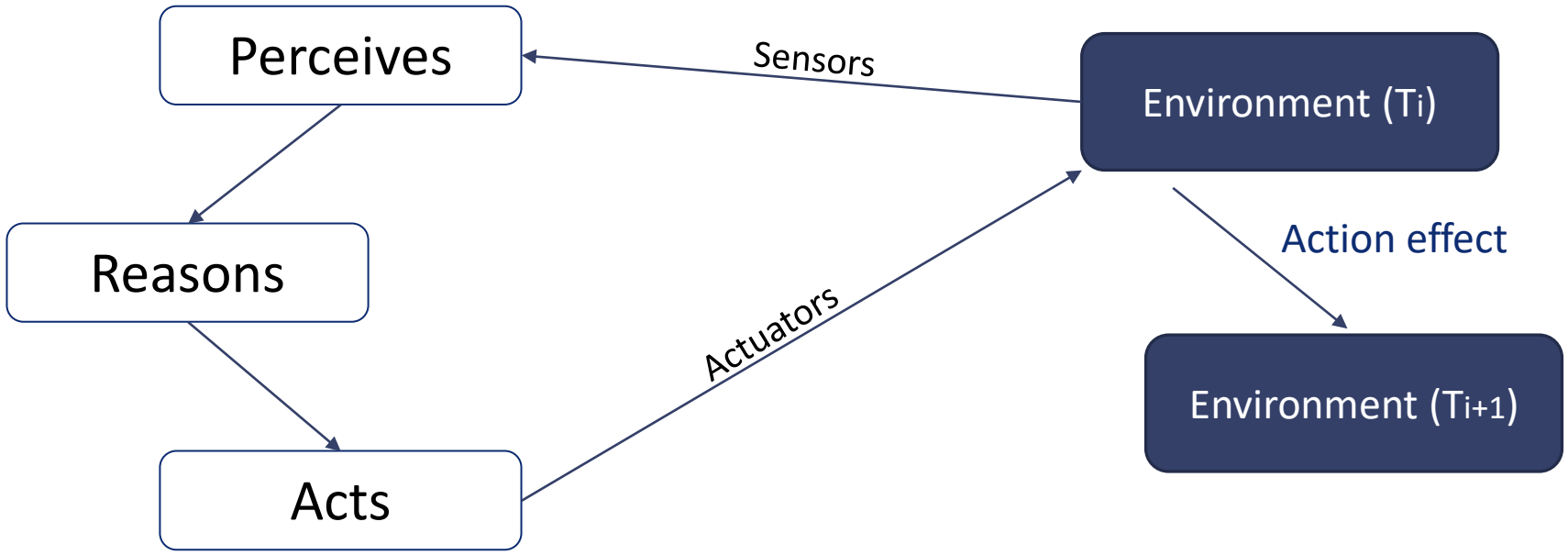
ARTIFICIAL INTELLIGENCE

Agent

Agent: Anything that can perceive the environment and act on it (Rusell,2010)



Rational agent



Rational Agent - Perception

"(...) an agent's choice of action at any given instant can depend on the entire **percept sequence** observed to date, but not on anything it hasn't perceived"

(Russell,2010)

Rational Agent – Function and program

Function: Determines the behavior of the agent - > What action according to the perception sequence

Program: Behavior implementation that executes the actions.

(Russell,2010)

Rational agent

Rational agent

Right inferences

Makes the right thing

Executes those actions that aim at achieving its goal

Rational Agent - Features

Rationality ≠ Omniscience

(González, 2015)

SITUATED:

Inhabits and has a model (representation) of its **environment**.

AUTONOMOUS:

Execute **actions**. It does not depend on external interventions to act.

PRO-ACTIVE:

Achieves **goals**. Decides and acts.

SOCIAL:

May **communicate**.

PEAS Model

Performance measure: How is the performance measured?

Environment: Where the agent lives?

Actuators: How the environment is modified? Is the agent moving or how it modifies its ambient?

Sensors: How the agent recognizes the environment? Which variables does it perceive?

PEAS

"(**In a specific environment**), for each possible **percept 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."

Definition of **Rational Agent** (Russell,2010)

Performance

Performance

Environment > Agent

Tradeoffs

Example: NPC Car

Performance measure:

- Speed, number of crashes, time to arrive to its destination, ranking.

Environment:

- Roads, other cars, other actors in the roads.

Actuators:

- Accelerator, break, lights.

Sensors:

- “Camera” (Car detector, pedestrian detector, curves, etc.), GPS, Velocimeter.

Example: Emotions detector

Performance measure:

- Number of right emotions identified. Percentage of right decisions..

Environment:

- Scene image (face), other biometric signals.

Actuators:

- Screen or another display system.

Sensors:

- Camera, biometric sensors.

Exercises

Agent Type	Performance Measure	Environment	Actuators	Sensors
Medical diagnosis system				

(Russell, 2010 p. 42)

Exercises

Agent Type	Performance Measure	Environment	Actuators	Sensors
Medical diagnosis system	Healthy patient, reduced costs	Patient, hospital, staff	Display of questions, tests, diagnoses, treatments, referrals	Keyboard entry of symptoms, findings, patient's answers

(Russell, 2010 p. 42)

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Interactive English tutor	Student's score on test	Set of students, testing agency	Display of exercises, suggestions, corrections	Keyboard entry

(Russell, 2010 p. 42)

Environment

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- Fully observable vs. partially observable vs. unobservable

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- Known vs. Unknown

Exercises

Task Environment	Observable	Agents	Deterministic	Episodic	Static	Discrete
Crossword puzzle Chess with a clock						

Figure 2.6 Examples of task environments and their characteristics.

(Russell, 2010 p. 45)

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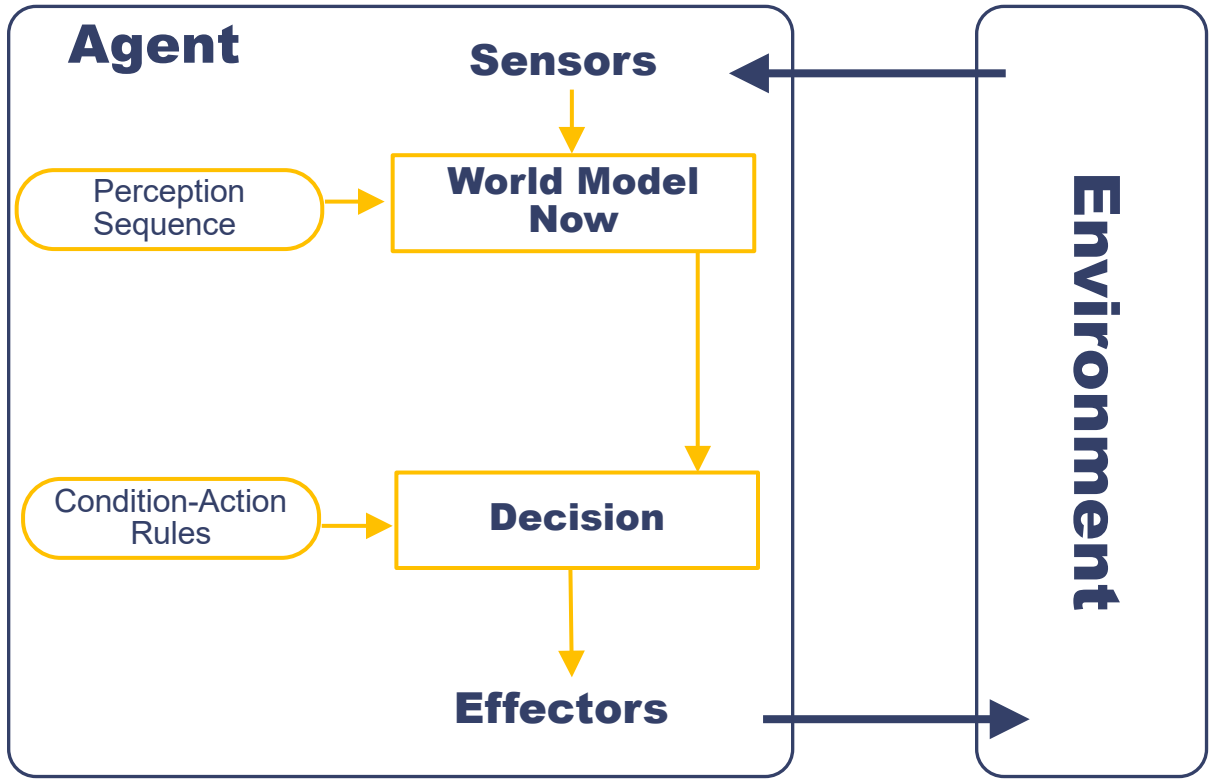
AGENTS

Agent

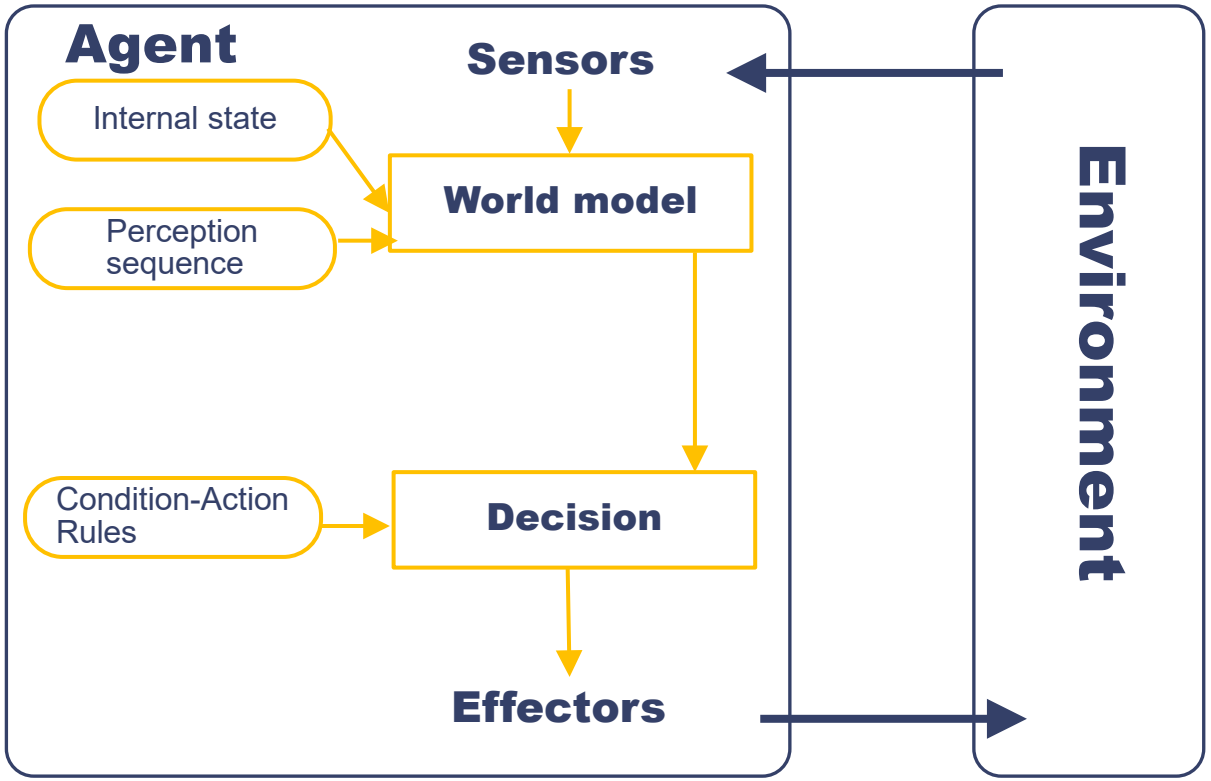
$$Agent = Architecture + \boldsymbol{Program}$$

Reactive - Simple



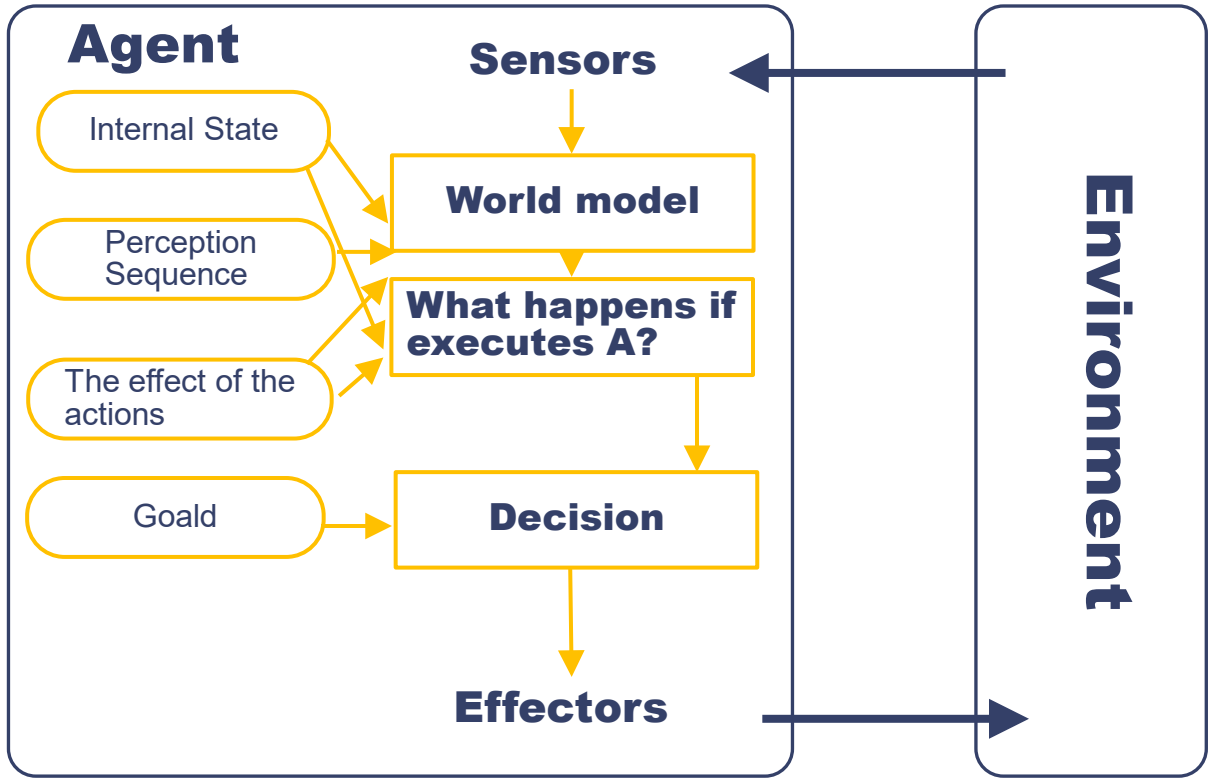
*Modified from González, 2015

Reactive based on models



*Modified from González, 2015

Based on goals



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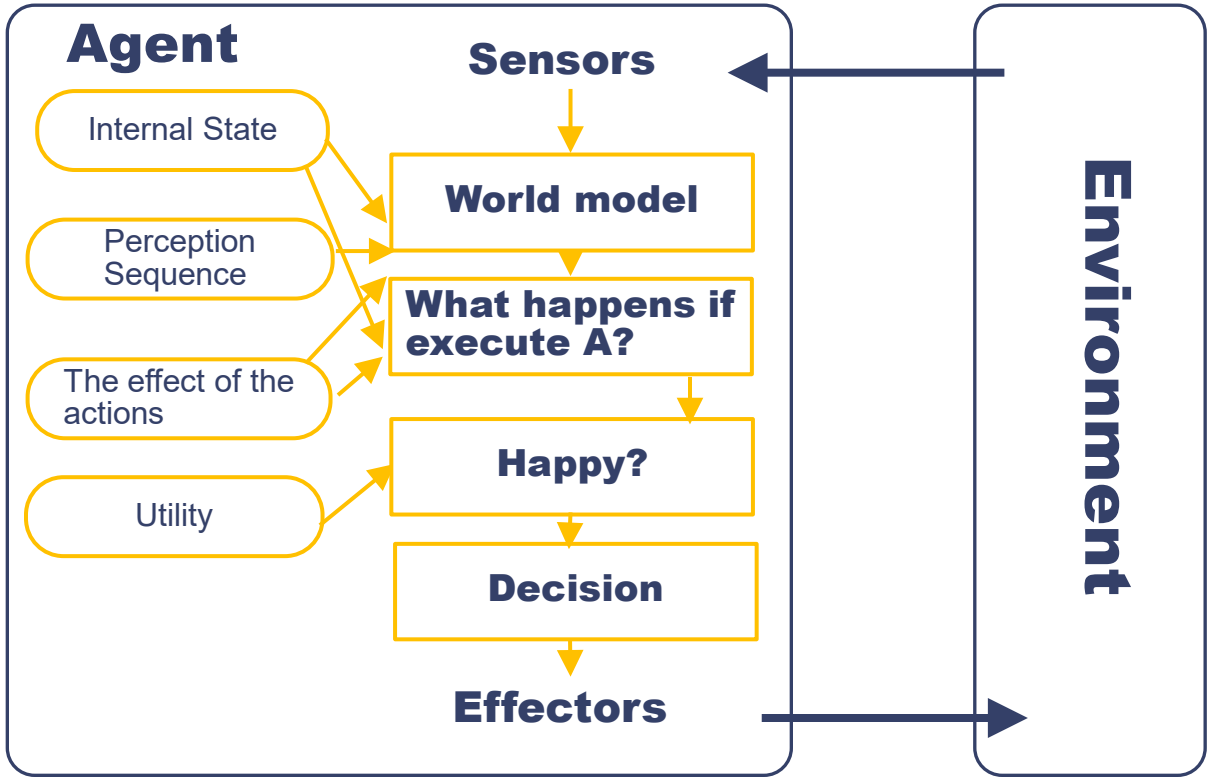
Based on utility



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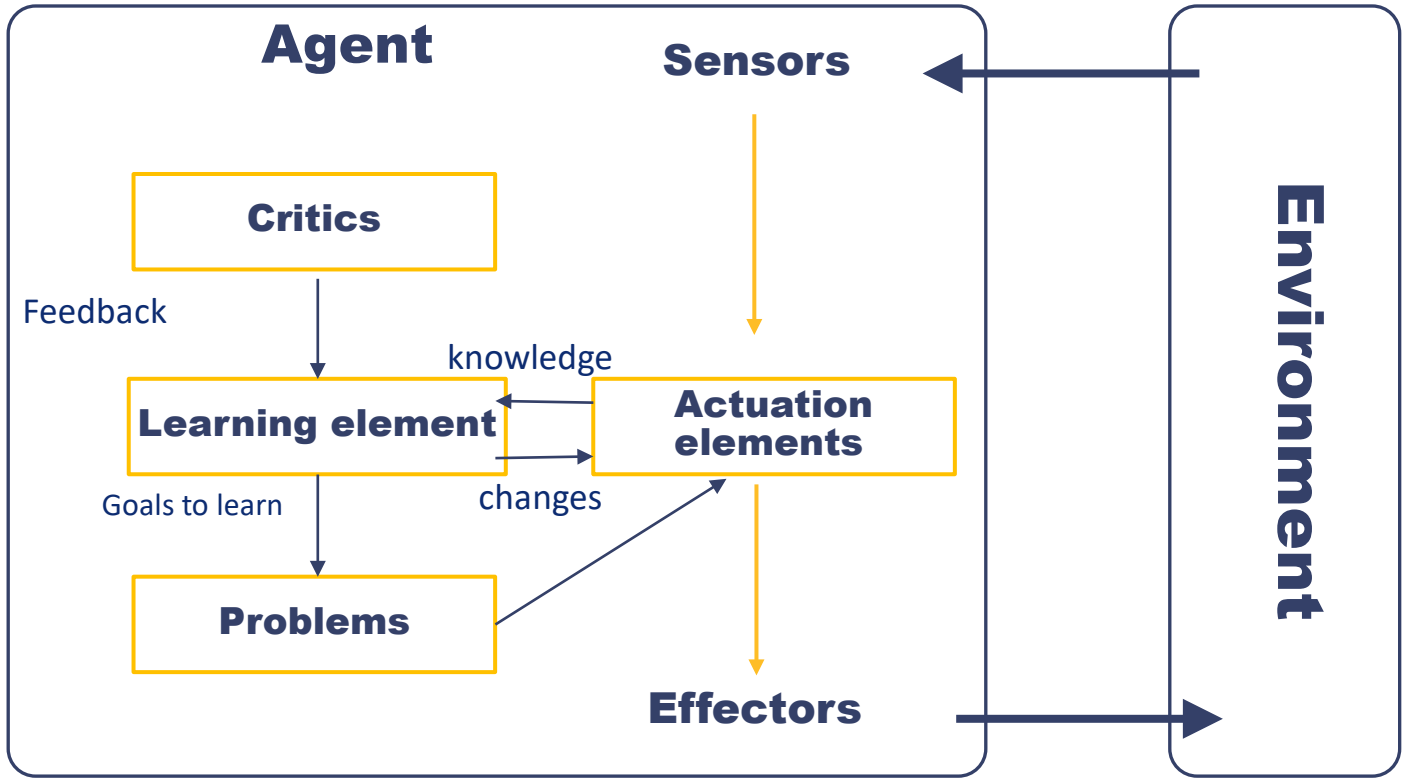
That learn


Agent
Sensors
Critics
Feedback
knowledge
Learning element
Actuation elements
Goals to learn
changes
Problems
Effectors
Environment

References

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