COMP310 – Multi Agent Systems
Video 2.2:
Abstract Architecture for Agents

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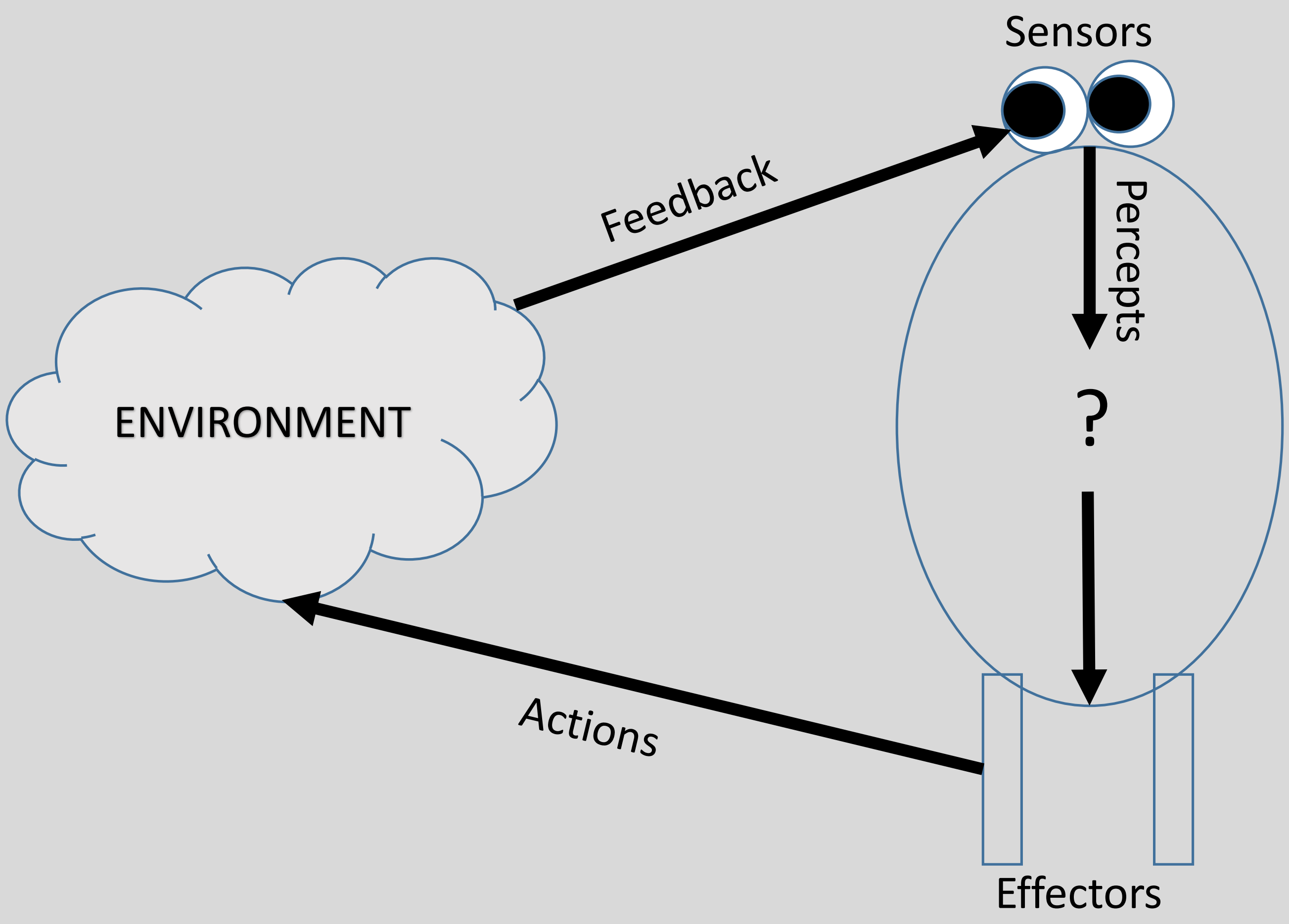
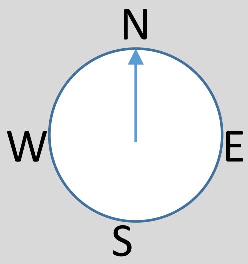
See Vital for all material

Agent within an Environment



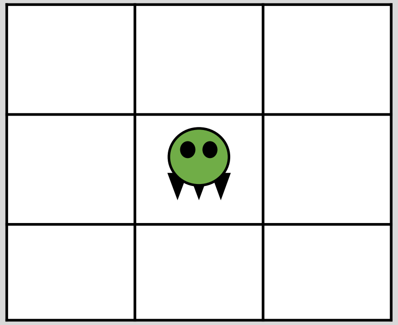
- Can an abstract architecture help us to:
  - Model states of the environment
  - Model possible actions
  - Model decision making?
  - Model actions taken?

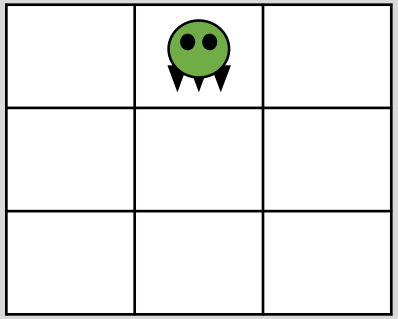
TILEWORLD

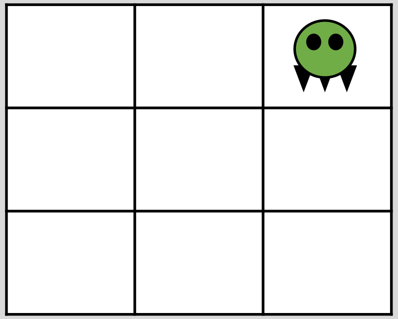


0,0	0,1	0,2
1,0	1,1	1,2
2,0	2,1	2,2

- Finite set of **states**: “Agent in (0,0)”, “Agent in (0,1)”, …, “Agent in (2,2)”
- Finite set of **actions**: “North”, “East”, “South”, “West”







A Bit More Formal....

- States
  - The world can be in **any** of a finite set of states

$$E = \{e, e', ...\}$$

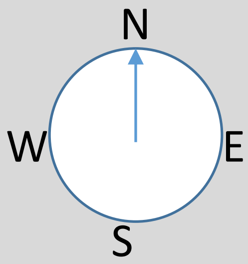
- Actions
  - The finite set of actions that are available to the agent

$$Ac = \{\alpha, \alpha', ...\}$$

- Run
  - Set of interleaved world states and actions

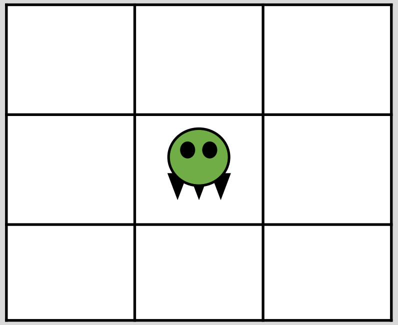
$$r : e_0 \xrightarrow{\alpha_0} e_1 \xrightarrow{\alpha_1} e_2 \ldots$$

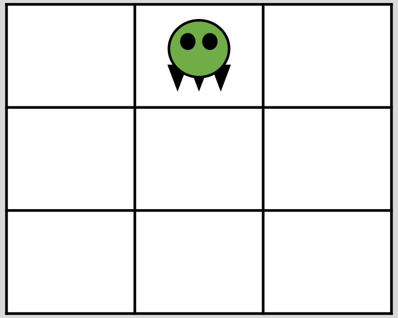
TILEWORLD

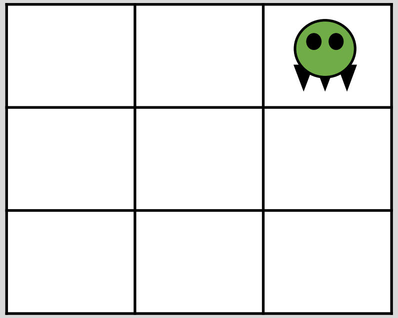


0,0	0,1	0,2
1,0	1,1	1,2
2,0	2,1	2,2

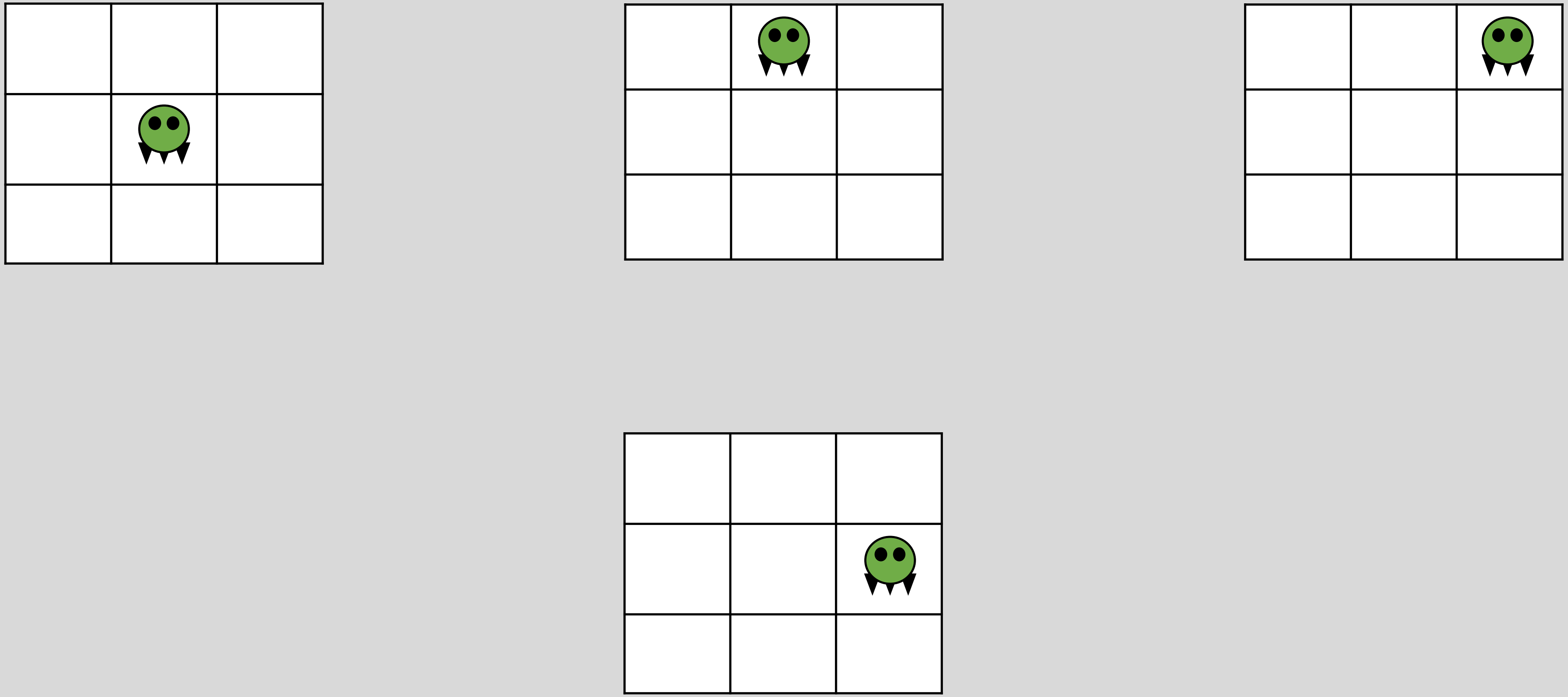
- Finite set of **states**:
- Finite set of **actions**:







TILEWORLD



Runs

- We must be able to consider **all possible** runs from **all possible** starting states

$$\mathcal{R} \qquad \mathcal{R}^{Ac} \qquad \mathcal{R}^{E}$$

Behaviour of Environment

- A **state transformer function** represents the behaviour of the environment

$$\tau : \mathcal{R}^{Ac} \rightarrow 2^{E}$$

An Environment

$$Env = \langle E, e_0, \tau \rangle$$

An Agent

$$Ag : \mathcal{R}^E \to Ac$$

$\mathcal{AG}$

A Purely Reactive Agent

- Some agents don’t care about the past, but only about the **present**
- These are **purely reactive**

$$Ag : E \rightarrow Ac$$

A System

- Pair of an **agent** and an **environment**

$$\mathcal{R}(Ag, Env)$$

Formally, a sequence $e_0, \alpha_0, e_1, \alpha_1, e_2, \ldots$ represents a **run** of agent Ag in environment $Env = \langle E, e_0, \tau \rangle$ iff:

1. e_0 is the initial state of Env
2. $Ag(e_0) = \alpha_0$
3. For $u > 0 : e_u \in \tau((e_0, \alpha_0, ...e_{u-1}, \alpha_{u-1}))$ and $\alpha_u \in Ag(e_0, \alpha_0, ..., e_u)$

…. But why?

- Notation gives us a precise handle on ideas about agents
- Allows us to to go more in-depth and more formal with our analysis and thinking