Contents

1 Kinds of agent architectures

- **uniform architectures**
  - reactive architectures
  - deliberative architectures. Much more complex architectures (problem solving, search)
- **hybrid architectures**: reactive and deliberative components. Often used for more complex robotic tasks
- **multi-agent system architectures** agents may have uniform or hybrid architectures (usually with additional coordination component(s))

2 Simple reactive architectures

Actions are directly triggered by percepts.

- no representations of the environment, meaning no goals
- predefined, fixed response to a situation. Always have the same response to a same situation
- fast response to changes in the environment

3 Action selection function

- the action selection function for a simple reactive agent looks like $selectAction : Event \rightarrow Action$
- i.e., it responds only to single events in a predetermined way
- add state to respond to sequences of events (next lecture)

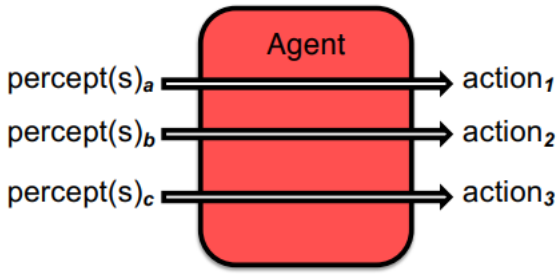
4 What's in a percept?

- Russell and Norvig model action selection as a function that takes a **single input** (percept) to a **single unique output** (action)
- this is fine if we allow percepts and actions to be arbitrarily complex
- e.g., if the output of all the agents sensors are combined into a single percept on the basis of which the agent chooses a single composite action
- Because an agent can have multiple sensors, it becomes inefficient to use a look-up table as the amount of input value combinations grow exponentially.
- however it is more natural to view the **output of each of the agents sensors as a distinct percept**, and each of the atomic actions the agent can perform as different actions
- gives a more compact representation of the task environment (we dont have to enumerate all possible combinations of sensor outputs and effector inputs
- however action selection becomes more complex
- need to be able to combine the outputs of a *set of action selection functions*

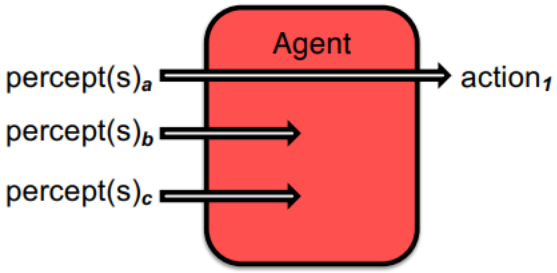
5 Action selection

- same percept may trigger multiple actions
- actions can be combined in various ways:
  - multiple actions may be executed in **parallel**
  - one action may take **precedence** over the others
  - combined into a **single action**

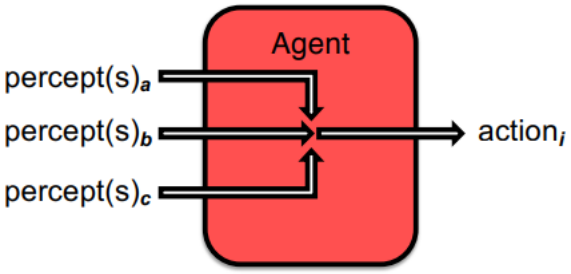
5.1 Parallel actions



5.2 Prioritised actions



5.3 Combined actions



6 Boids

- a boid is a simple agent that navigates according to its local perception of its environment, the simulated physics of the environment and a set of simple behavioural rules:
  - collision avoidance: avoid collisions with nearby boids (and static obstacles)
  - velocity matching: attempt to match velocity with nearby boids
  - flock centring: attempt to stay close to nearby boids
- each boid also has a migratory urge, a global direction or position towards which the boids will fly

7 Advantages of simple reactive architectures

- simple architectures can produce complex behaviour
- no representations of the environment or complex problem solving required
- can use dedicated, parallel hardware
- fast (often real-time) response to changes in the environment

8 Disadvantages of simple reactive architectures

- fixed response to a given situation
- all responses must be defined in advance
- cant cope with novel situations for which they dont have a predefined behaviour
- cant solve some problems at all

Reference section

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