Chapter 7.4 & 7.5

Logical Agents in the Wumpus World

and

Simple Reflex Agents

Logical Agents for the wumpus world

• Must have an interface between the agent and the environment.
• Agents percepts – must include both the percept and the time at which it occurred; otherwise the agent will get confused about when it saw what.
• We use integers for time steps.
Percepts and Actions

• A typical percept sentence would be

\[
\text{Percept([Stench, Breeze, Glitter, None, None], 5)}
\]

• The actions are:

Turn(right), Turn(left), Forward, Shoot, Grab, Release, Climb

Function KB – Agent(percept) returns an action

static: KB, a knowledge base

t, a counter, initially 0, indicating time

\[
\text{TELL(KB, MAKE-PERCEPT-SENTENCE(percept,t))}
\]

\[
\text{action} \leftarrow \text{ASK(KB, MAKE-ACTION-QUERY(t))}
\]

\[
\text{TELL(KB, MAKE-ACTION-SENTENCE(action,t))}
\]

\[
t \leftarrow t + 1
\]

return action

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Figure 7.2 a generic knowledge-based agent
Simple Reflex Agent

- They have rules that directly connect percepts to actions.
- $\forall \ s, \ b, \ u, \ c, \ t \ \text{Percept([s, b, Glitter, u, c], t)} \Rightarrow \text{Action(Grab, t)}$
- If the percept sees glitter it will automatically grab for gold.

Simple Reflex Agent

- The connection between percept and action can be mediated by rules for perception, which will abstract the immediate perceptual input into more useful forms.
- $\forall \ b, g, u, c, t \ \text{Percept([Stench, b, g, u, c], t)} \Rightarrow \text{Stench(t)}$
- $\forall \ s, g, u, c, t \ \text{Percept([s, Breeze, g, u, c], t)} \Rightarrow \text{Breeze(t)}$
- $\forall \ s, b, u, c, t \ \text{Percept([s, b, Glitter, u, c], t)} \Rightarrow \text{AtGold(t)}$

... 

- Then a connection can be made from these predicates to the action choices:
  $\forall \ t \ \text{AtGold(t)} \Rightarrow \text{Action(Grab, t)}$
Limitations

• The simple reflex agent will have a hard time in the wumpus world.

• The *Climb* action
  – The agent doesn’t know when to climb out because having the gold or being in the start square isn’t part of the percept, those are known by forming a representation of the world.

Limitations

• Infinite Loops
  – If the agent receives a percept twice it will perform the same action as before.
  – Since it cannot tell when the goal has been reached it will be stuck in an infinite loop.
Summary

- Logical agents must keep track of their past actions in order to select the next correct one.
- Simple reflex agents are very limited in the goals achieved unless they form a representation of the world.