Rules of the Wumpus World

The **neighborhood** of a node consists of the four squares north, south, east, west of the given square.

In a square the agent gets a vector of percepts, with components

Stench,Breeze,Glitter,Bump,Scream

For example [Stench,None,Glitter,None,None]

- Stench is perceived at a square iff the wumpus is at this square or in its neighborhood.
- Breeze is perceived at a square iff a pit is in the neighborhood of this square.
- Glitter is perceived at a square iff gold is in this square
- Bump is perceived at a square iff the agent goes Forward into a wall
- Scream is perceived at a square iff the wumpus is killed anywhere in the cave

Holding(x, y)
where x is an object and y is a situation. It means that the agent is holding the object x in situation y.

Action(x, y)
where x must be an action (i.e. Turn(Right), Turn(Left), Forward, ..) and y must be a situation. It means that at situation y the agent takes action x.

At(x, y, z)
where x is an object, y is a Location, i.e. a pair [u,v] with u and v in {1,2,3,4}, and z is a situation. It means that the agent x in situation z is at location y.

Present(x, s)
means that object x is in the current room in the situation s.

Result(x, y)
It means that the result of applying action x to the situation y is the situation Result(x, y). Note that Result(x, y) is a term, not a statement.
For example we can say

- Result(Forward, S0) = S1
- Result(Turn(Right),S1) = S2

Effect Axioms

Effect axioms characterize what is changed because of an action. For example:

- Present(x,s) & Portable(x) = > Holding(x, Result(Grab,s))
- Not Holding(x, Result(Release,s))

Frame Axioms

Frame axioms characterize what has remained the same because of an action. For example:

- Holding(x, s) & (a/=Release) = > Holding(x, Result(a, s))
- NOT Holding(x, s) & ((a/=Grab)) | NOT(Present(x, s) & Portable(x)) = > NOT Holding(x, Result(a, s))

Successor-State Axioms

For each predicate that can change over time they characterize the actions under which it changes and the actions under which it remains the same. For example:

- Holding(x, Result(a, s)) IFF [(a=Grab & Present(x, s) & Portable(x)) OR (Holding(x, s) & (a/=Release))

More Definitions and Axioms

- Orientation(Agent,s0) = 0
- At(Agent,[1,1],s0)
- Portable(Gold)
- AtGold(s) = > Present(Gold, s)
- LocationToward([x, y],0) = [x+1,y]
- LocationToward([x, y],90) = [x,y+1]
- LocationToward([x, y],180) = [x-1,y]
- LocationToward([x, y],270) = [x,y-1]
- At(p, l, s) => LocationAhead(p, s) = LocationToward(l, Orientation(p, s))
- Adjacent(l1,l2) ⇔ ∃ d (l1 = LocationToward(l2,d))
- Wall([x, y]) ⇔ (x=0 OR x=5 OR y=0 OR y=5)

- At(p, l, Result(a, s)) ⇔ [(a=Forward & l=LocationAhead(p, s) & NOT Wall(l)) OR (At(p, l, s) & a/=Forward)]
- Orientation(p, Result(a, s))=d ⇔ [
  (a=Turn(Right) & d=Mod(Orientation(p, s)-90,360)) OR
  (a=Turn(Left) & d=Mod(Orientation(p, s)+90,360)) OR
  (Orientation(p, s)=d & NOT(a=Turn(Right) & a=Turn(Left)))]
- At(Wumpus.l1,s) & Adjacent(l1,l2) = > Smelly(l2)
- At(Pit,l1,s) & Adjacent(l1,l2) = > Breezy(l2)

Model-Based and Diagnostic Reasoning

Causal Rules specify how aspects of the state of the world determine our percepts. **Model-Based Reasoning** is what we do when we use causal rules. Here are some causal rules:

- At(Wumpus,l1,s) & Adjacent(l1,l2) = > Smelly(l2)
- At(Pit,l1,s) & Adjacent(l1,l2) = > Breezy(l2)

Diagnostic Rules specify how to go from percepts to assertions about the state of the world. **Diagnostic Reasoning** is what we do when we use diagnostic rules. Here are some diagnostic rules:

- At(Agent, l, s) & Breeze(s) = > Breezy(l)
- At(Agent, l, s) & Stench(s) = > Smelly(l)
- Smelly(l1) = > (∃ l2 At(Wumpus,l2,s) & (l2=l1 OR Adjacent(l1,l2)))
- At(Wumpus, x, t) & NOT Pit(x) IFF OK(x)

به موارد زیر دقت شود :

- پروژه با پایتون 3.8 ران شود.

- اگر detail1 را به عنوان ورودی وارد کنید، جدول ومپوس را با جزییات کمتری میبینید. ولی اگر میخواهید موقعیت pits,gold,wumpus دقیقا مشخص باشد در جدول، detail2 را وارد کنید.

- Pits, wampus, gold و غیره با حرف اول آنها نمایش داده میشود.