

Knowledge Representation

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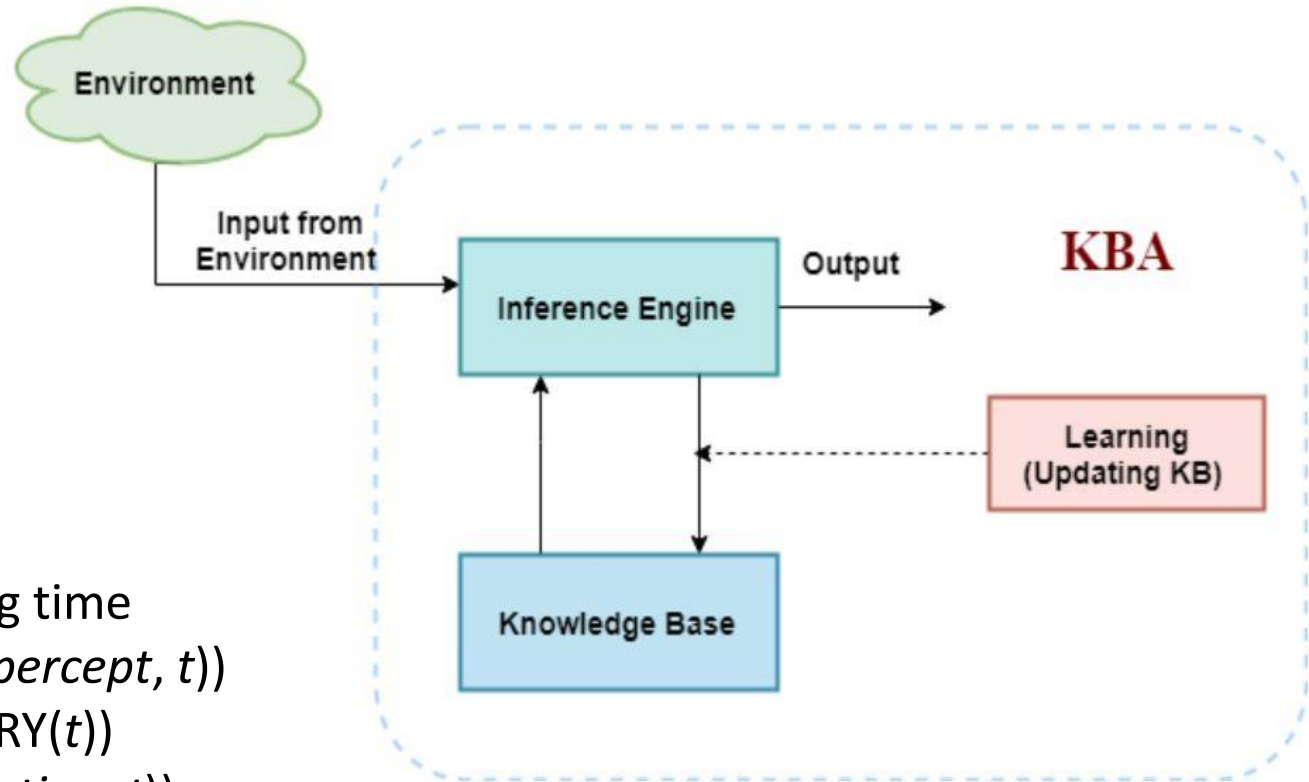
Knowledge Based Agent (KBA)

Operation performed:

1. Tell
2. Ask
3. Perform

Generic KBA:

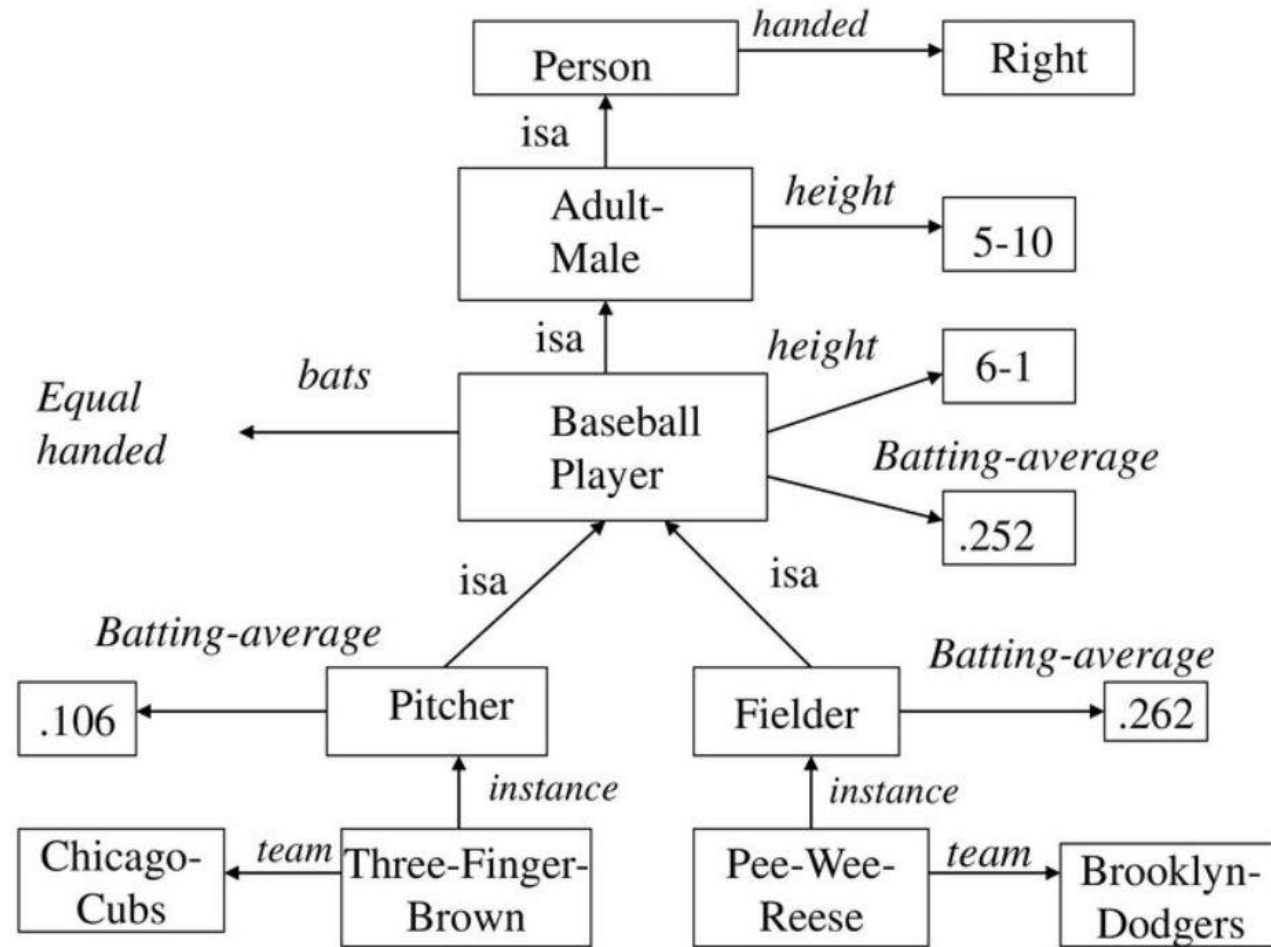
```
function KB-AGENT(percept):  
  persistent: KB, a knowledge base  
             t, a counter, initially 0, indicating time  
  TELL(KB, MAKE-PERCEPT-SENTENCE(percept, t))  
  action = ASK(KB, MAKE-ACTION-QUERY(t))  
  TELL(KB, MAKE-ACTION-SENTENCE(action, t))  
  t = t + 1  
  return action
```



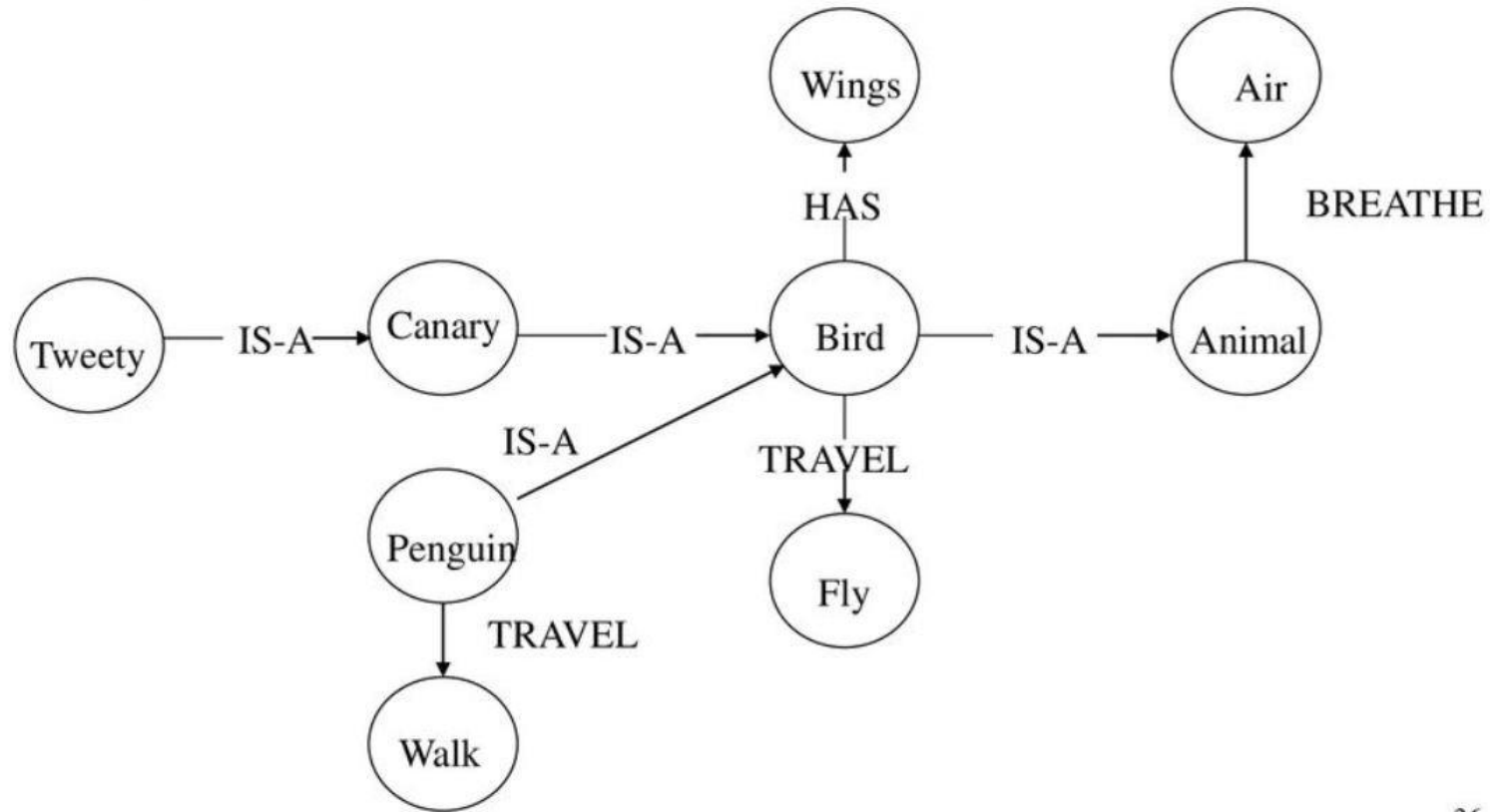
Simple relational knowledge

Player	Height	Weight	Bats-Throws
W	6-2	180	Right-Left
X	5-11	172	Left-Left
Y	6-3	185	Right-Right
Z	6-1	184	Left-Right
Player_info ('X', '5-11', 172, Left-Left)			

Inheritable knowledge



Semantic Network



Inferential knowledge

- Inferential knowledge approach represents knowledge in the form of formal logics.
- This approach can be used to derive more facts.
- It guaranteed correctness.

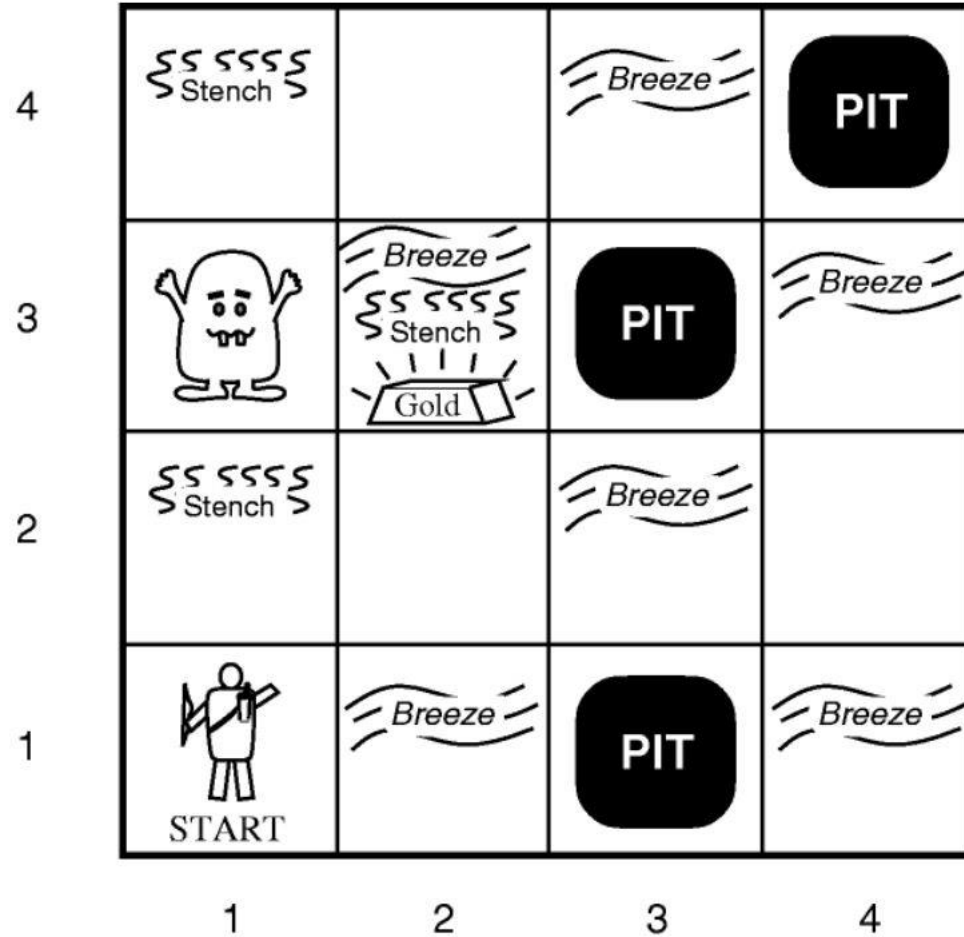
It's a crime for an American to sell weapons to hostile nations.

FOPL: $\text{American}(x) \wedge \text{Weapon}(y) \wedge \text{Sells}(x,y,z) \wedge \text{Hostile}(z) \Rightarrow \text{Criminal}(x)$

Procedural knowledge

- In this approach, one important rule is used which is **If-Then rule**.
- In this knowledge, we can use various coding languages such as **LISP language** and **Prolog language**.

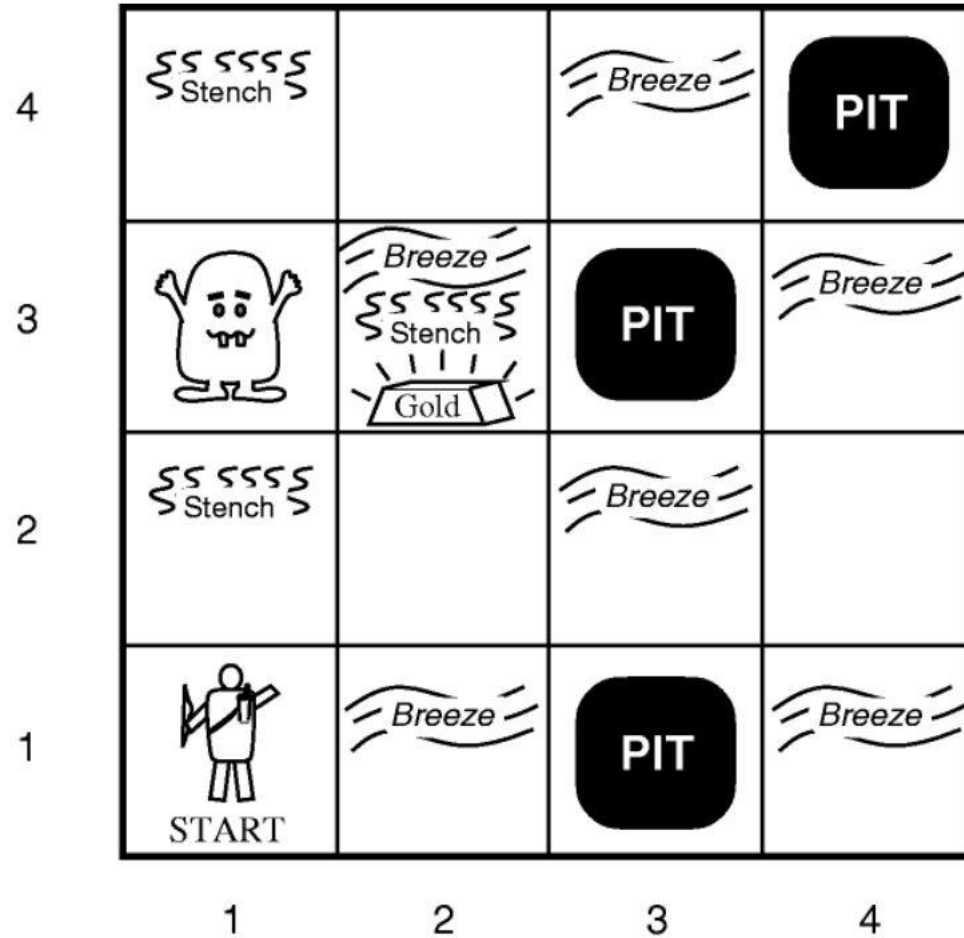
Wumpus World



Agent's performance measure:

1. +1000 for picking up the gold.
2. -1000 for falling into a PIT or being eaten by the wumpus.
3. -1 for each action(turn/move) taken.
4. -10 for using the arrow.

Wumpus World



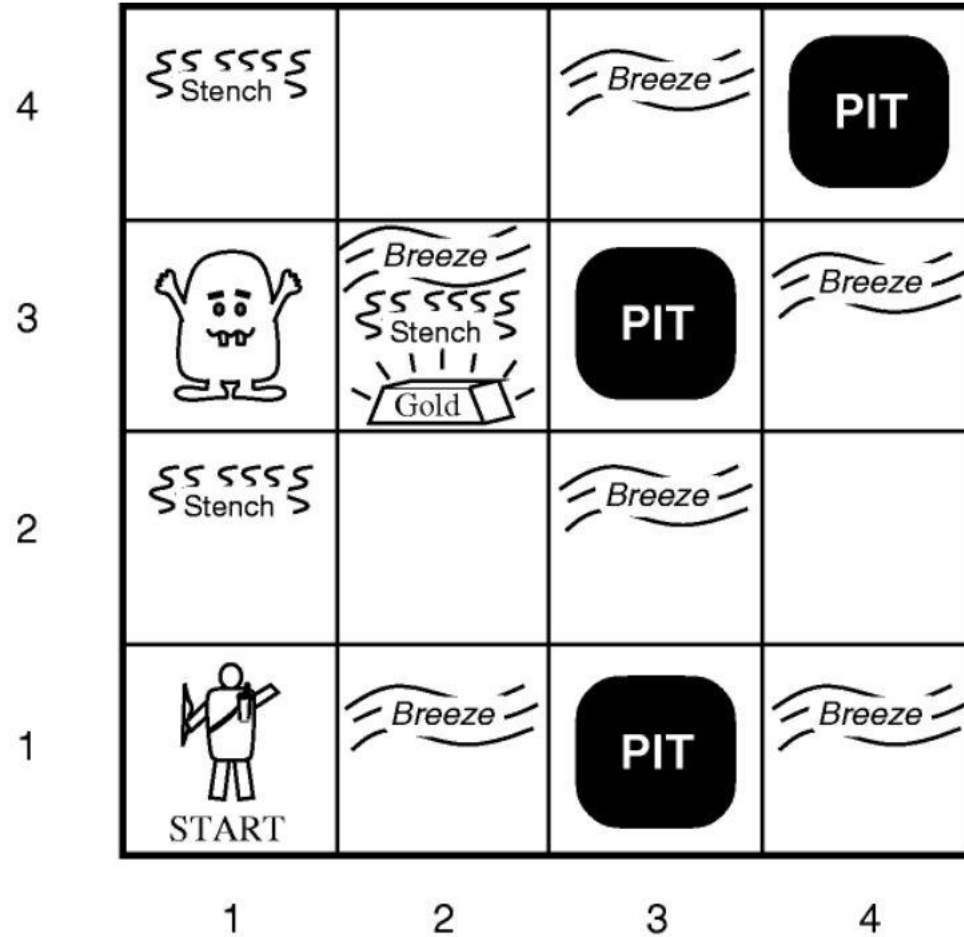
Agent's Environment:

1. 4* 4 grid of rooms.
2. Initially at [1,1], facing towards right.
3. Each square can be a pit with probability 0.2 except the 1st square.
4. Location of wumpus and gold are random except 1st square.

Properties of Environment:

- Partially observable
- Deterministic
- Sequential
- Static
- Discrete

Wumpus World

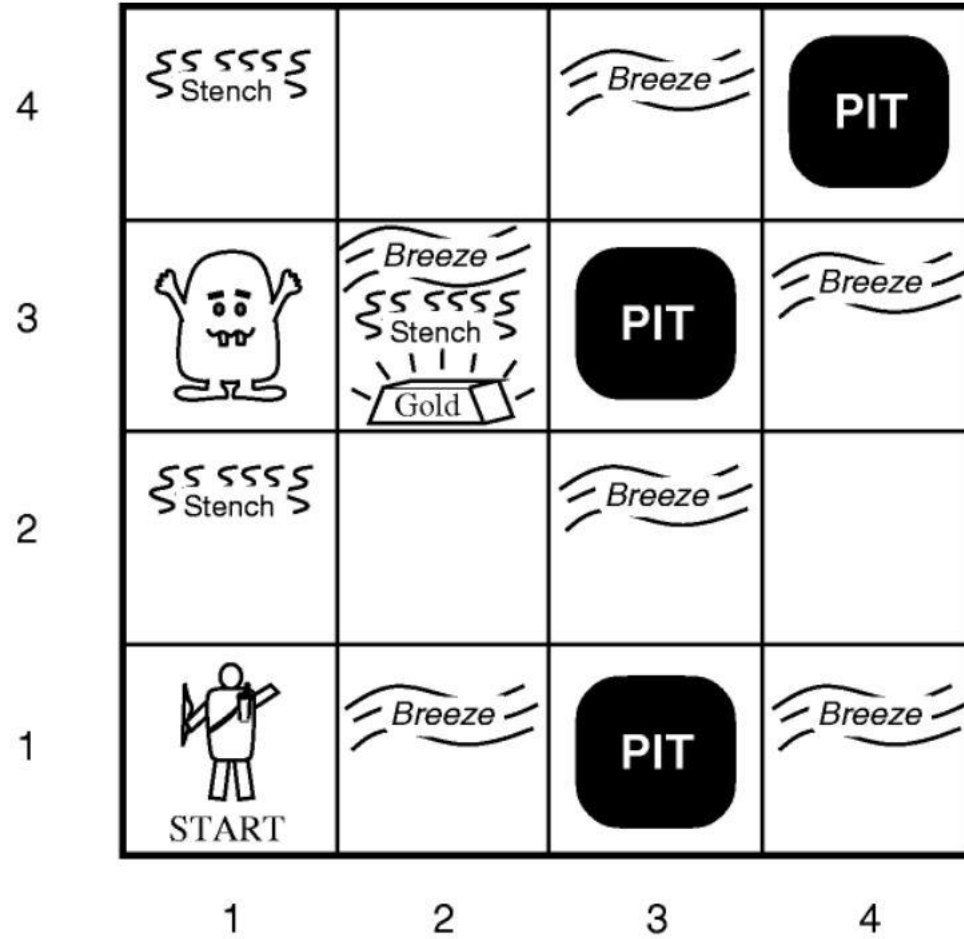


Agent's Actions:

1. Turn left
2. Turn right
3. Move forward
4. Shoot (only once)
5. Grab
6. Release

- Agent will die if it enters a square containing PIT or live wumpus.
- Arrow continues until it hit a wumpus or a wall.

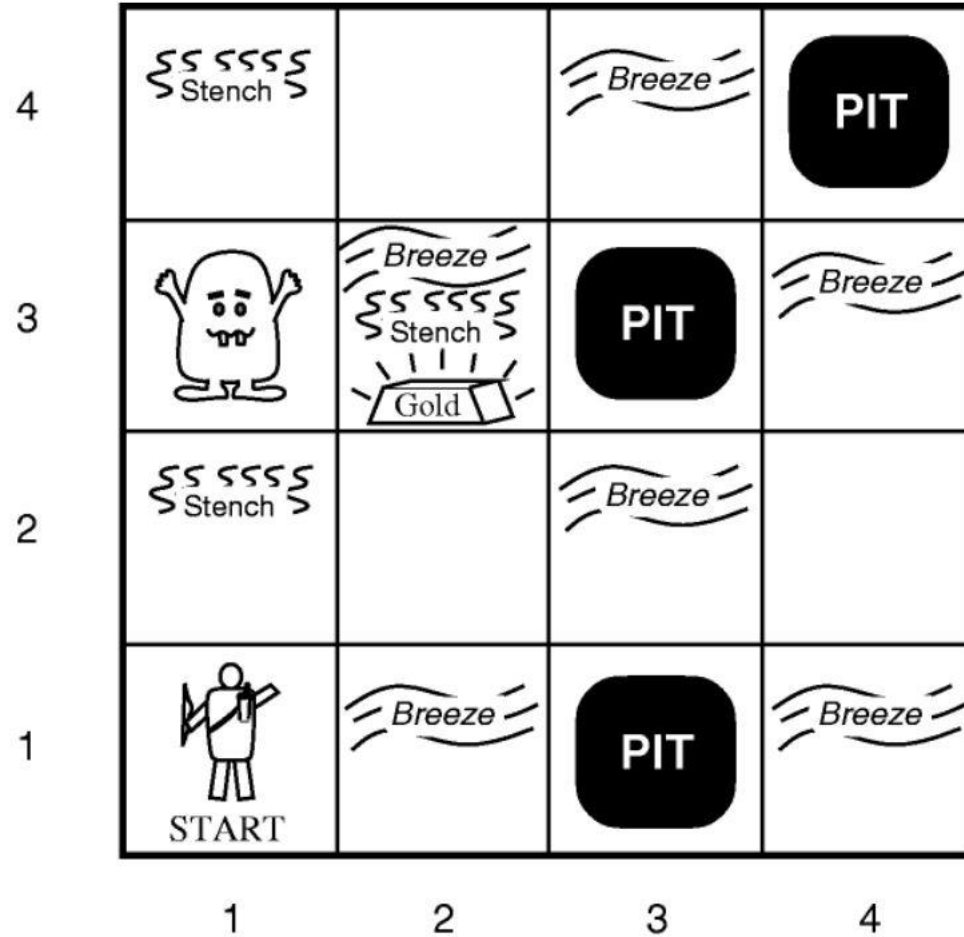
Wumpus World



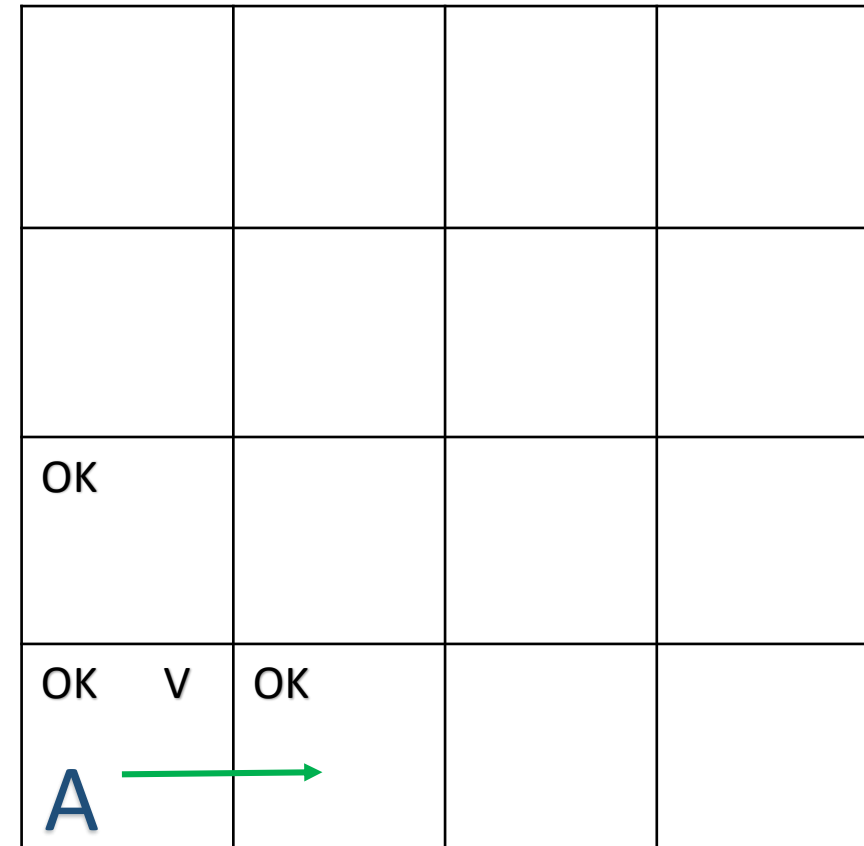
Agent's perception:

[Stench,Breeze,Glitter,Bump,Scream]

Wumpus World

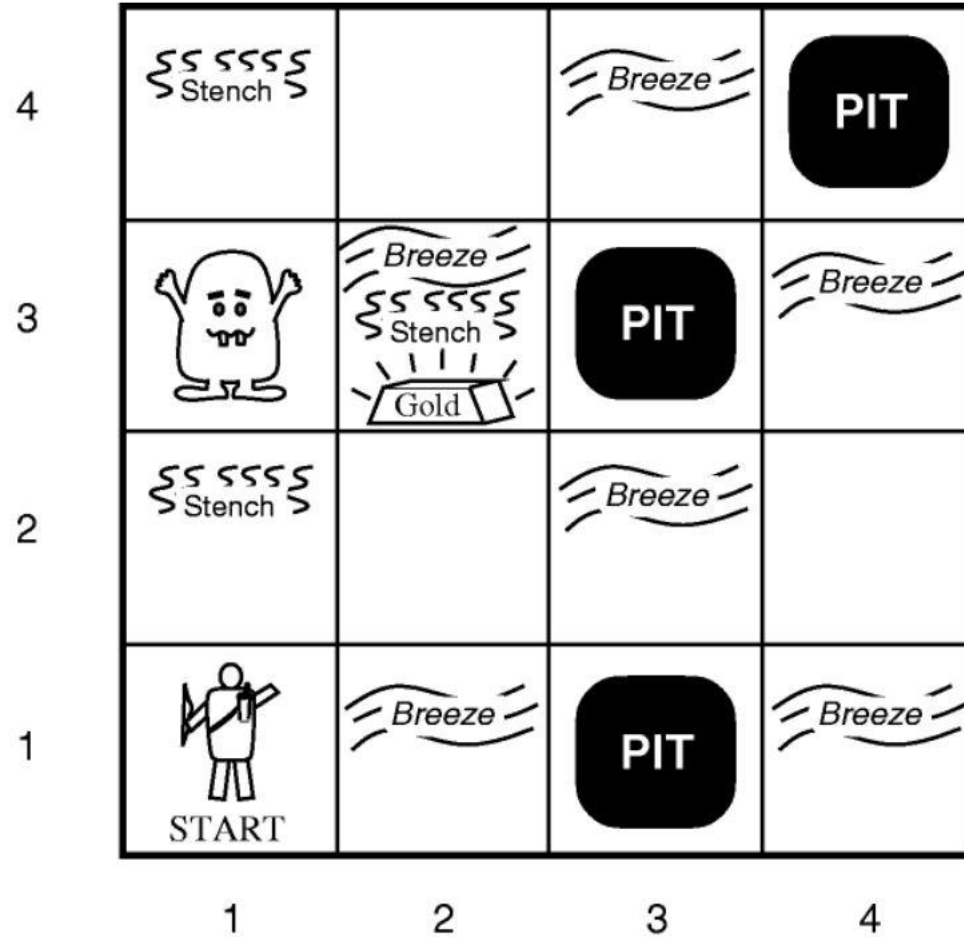


Points: -1

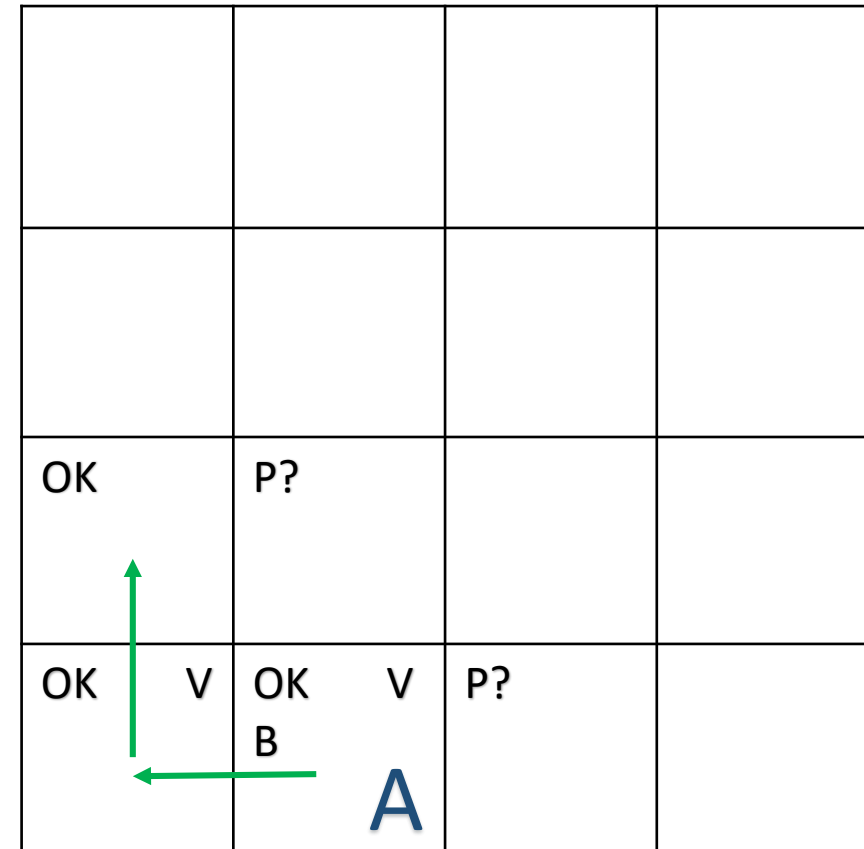


At [1,1] perception is [none,none,none,none,none]. So, all neighbour cells are OK. Hence, move forward (-1).

Wumpus World





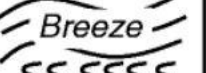

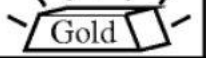










Points: -1-2-1-1-1= -6



At [2,1] perception is [none,Breeze,none,none,none]. So, one of the neighbour cells contains PIT. Hence, turn back(-2) and move to [1,1] (-1) and then turn right (-1) to proceed to [1,2] (-1).

Wumpus World

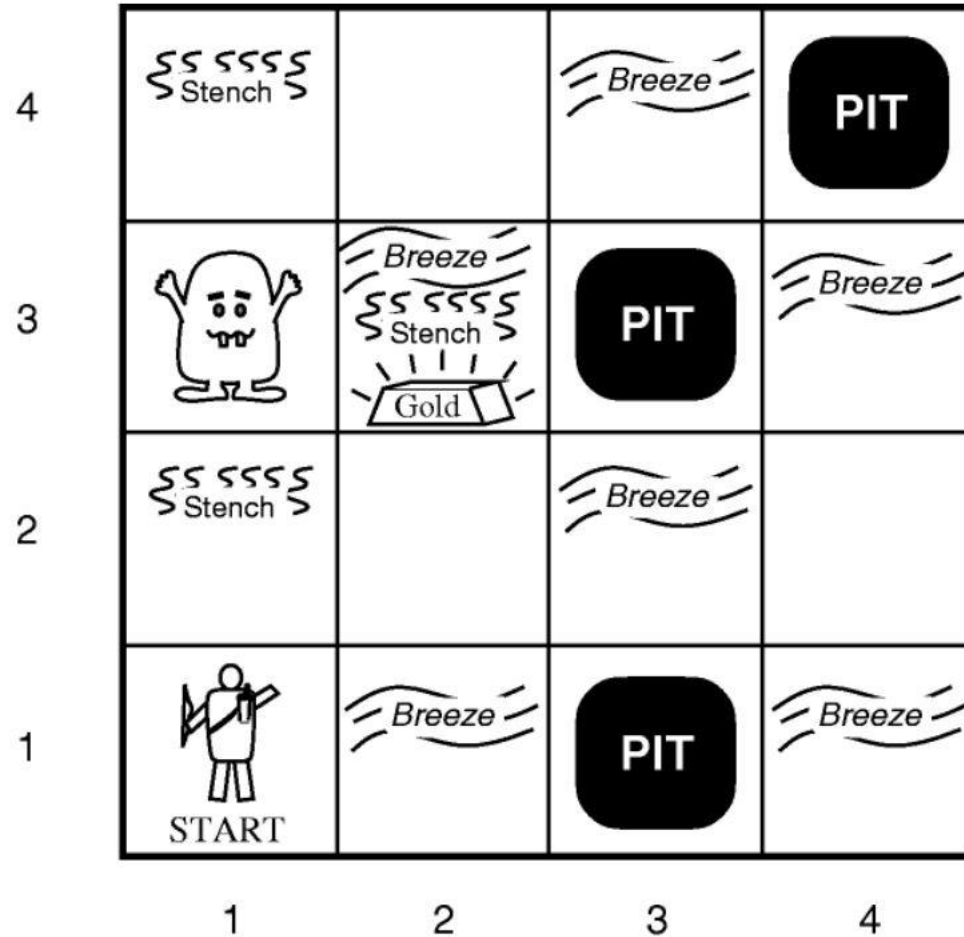
4	 Stench		 Breeze	 PIT
3		  Stench  Gold	 PIT	 Breeze
2	 Stench		 Breeze	
1	 START	 Breeze	 PIT	 Breeze
	1	2	3	4

Points: -6-1-1= -8

W			
OK S A	V	OK	
OK	V	OK B	V P?

At [1,2] perception is [Stench,none,none,none,none]. So, one of the neighbour cells contains wumpus. As [1,1] and [2,2] cannot have wumpus, wumpus must be at [1,3]. [2,2] is OK, due to no Breeze. So, turn right(-1) and move forward (-1) to [2,2].

Wumpus World

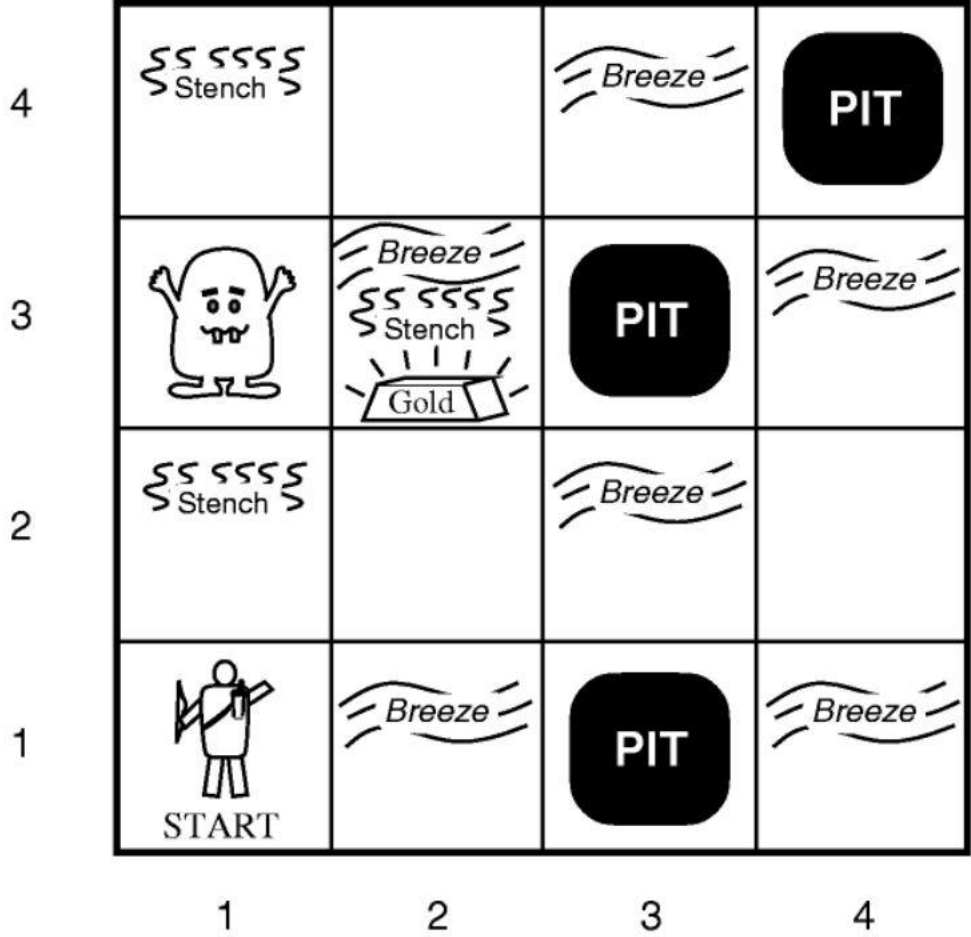


Points: $-8-1-1 = -10$

W	OK		
OK S	V	OK A	V
OK	V	OK B	V

At [2,2] perception is [none,none,none,none,none]. So, [3,2] and [2,3] are OK. At this point optimal move is turn left (-1) and move forward (-1) to [2,3] and Grab the gold(+1000). Alternatively agent may visit [3,2] and then get back to [2,3] which is not optimal.

Wumpus World



Points: $-10+1000= +990$

		P?		
W	OK S B	V A G	P?	
OK S	V	OK V	OK	
OK	V	OK B	V P?	

At [2,2] perception is [Stench,Breeze,Glitter,none,none]. Points to measure the performance is +990.