جامعة الأخوين

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AL AKHAWAYN UNIVERSITY

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CSC 4301

Project : Wampus Game

Team members:

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Performance measure:

- +1000 reward points if the agent comes out of the cave with the gold.
- -1000 points penalty for being eaten by the Wumpus or falling into the pit.
- -1 for each action, and -10 for using an arrow.
- The game ends if either agent dies or came out of the cave.

Environment:

- A 4*4 grid of rooms.
- The agent initially in room square [1, 1], facing toward the right.
- Location of Wumpus and gold are chosen randomly except the first square [1,1].
- Each square of the cave can be a pit with probability 0.2 except the first square.

Actuators:

- Left turn,
- Right turn
- Move forward
- Grab
- Release
- Shoot.

Sensors:

- The agent will perceive the **stench** if he is in the room adjacent to the Wumpus. (Not diagonally).
- The agent will perceive **breeze** if he is in the room directly adjacent to the Pit.
- The agent will perceive the **glitter** in the room where the gold is present.
- When the Wumpus is shot, it emits a horrible **scream** which can be perceived anywhere in the cave.

The prediction in this project:

has_glitter: is a rule, if the room has gold and the hunter is in that room so we have a glitter , if not we don't have glitter. The room(X,Y).

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has_glitter(yes) :- hunter(X,Y), gold(X,Y), !.

has_glitter(no).
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has_stench: is a rule, we have stench if we have the hunter in the room(X,Y), and the Wumpus in the room(A,B), and the room(X,Y) and room(A,B) are adjacent.

has_stench(yes):- hunter(X,Y), wumpus(A,B), isAdjacent((X,Y),(A,B)).

has_stench(no).

has_breeze: is a rule, if the hunter is in room(X,Y) and we have a we have a pit in the room(A,B), and the room(X,Y) and room(A,B) are adjacent.

has_breeze(yes) :- hunter(X,Y), pit(A,B), isAdjacent((X,Y),(A,B)).

has_breeze(no).

has_scream: is a rule too, we have it when the Wampus is dead.

has_scream(yes):- wumpus_is(dead), !.

has_scream(no).

The hunter is dead if the hunter is in the same room with the Wampus, or that room has a pit.

The Wampus is dead if he has been shooted.

For actions we have four actions: grab, shoot, move, and random.

- shoot: we shoot the room(X,Y) when we have a hunter in the room (X,Y) and the hunter has an arrow and the room(A,B) that we will shoot is adjacent to the room where the hunter is. Also, the score will decrease by 10.
- Grab: when the hunter and the gold both are in the same room. The score once the hunter finds the gold will increase by 49.
- Move: The hunter can only move to adjacent room, once he moves the number of the steps increase by 1 and the score decrease by 1.
- Random: When we perceive anything we move to a neighbor room randomly.

When the hunter does one of this action, we should insert it in the knowledge base.

The hunter (agent in our case) take input from the environment by perceiving the environment, and then by inference he takes the best action based on the knowledge base. perceptions([Stench, Breeze, Glitter, Scream]).

We also added:

no_pit_around: not having a pit on all the neighbors of the rom(x,y).

no_pit_around(X, Y) :- neighbors([X, Y],[A, B]), has_pit(A, B, no).

no_wumpus_arround: the neighbors of the room(X,Y) has not a Wampus.

no_wumpus_arround(X, Y) :- neighbors([X, Y],[A, B]), has_wumpus(A, B, no).

all_adjacent_visited: the neighbors of the room(X,Y) that was visited.

all_adjacent_visited(X, Y) :- neighbors([X, Y],[A, B]), visited(A, B).

Configuration1:

gold(2, 3).

wumpus(3, 3).

pit(3, 3).

```
?- run.
At time 0: hunter is in room (1x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x1)
At time 1: hunter is in room (2x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 2: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x2)
At time 3: hunter is in room (3x2), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,20,20,10] for [[4,2],[3,3],[2,2],[3,1]] selected 10
Hunter is Moving to room (3x1)
At time 4: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x1)
At time 5: hunter is in room (4x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 6: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x2)
At time 7: hunter is in room (3x2), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,20,20,30] for [[4,2],[3,3],[2,2],[3,1]] selected 20
Hunter is Moving to room (4x2)
At time 8: hunter is in room (4x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x3)
At time 9: hunter is in room (4x3), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,150,60] for [[4,4],[3,3],[4,2]] selected 20
Hunter is Moving to room (4x4)
At time 10: hunter is in room (4x4), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x3)
At time 11: hunter is in room (4x3), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.
```

Configuratin2:

gold(3, 3).

wumpus(1,2).

pit(3, 3).

SWI-Prolog (AMD64, Multi-threaded, version 8.4.2)

File Edit Settings Run Debug Help

```
?- run.
At time 0: hunter is in room (1x1), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,20] for [[2,1],[1,2]] selected 20
Hunter is Moving to room (2x1)
At time 1: hunter is in room (2x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 2: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x2)
At time 3: hunter is in room (3x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x2)
At time 4: hunter is in room (4x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x1)
At time 5: hunter is in room (4x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 6: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x1)
At time 7: hunter is in room (2x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x2)
At time 8: hunter is in room (2x2), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [10,20,150,70] for [[3,2],[2,3],[1,2],[2,1]] selected 10
Hunter is Moving to room (3x2)
At time 9: hunter is in room (3x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x3)
At time 10: hunter is in room (3x3), and senses [no,no,yes,no].
Hunter perceives Glitter! Hunter Found Gold in room (3x3)
 !At time 11: hunter is in room (3x3), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x3)
At time 12: hunter is in room (2x3), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (1x3)
At time 13: hunter is in room (1x3), and senses [yes,no,no,no].
The Wumpus is near.
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At time 13: hunter is in room (1x3), and senses [yes,no,no,no].
The Wumpus is near.
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Hunter Shot an arrow at room (1x2)
 !You Won! You killed the Wumpus!
----Game has Finished---

                Result
Steps: ............................. 12
Score: ............................ 1077

true.
```

Our solution doesn't work when we have a wampus in a corner, for example: the rooms (4,4), (1,4) and (4,1). If we had time we can handle walls so that we could not have this problem.

Configuration:

gold(2, 3).

wumpus(4, 4).

pit(3, 3).

```
?- run.
At time 0: hunter is in room (1x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x1)
At time 1: hunter is in room (2x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 2: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (2x1)
At time 3: hunter is in room (2x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x1)
At time 4: hunter is in room (3x1), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (3x2)
At time 5: hunter is in room (3x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x2)
At time 6: hunter is in room (4x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x3)
At time 7: hunter is in room (4x3), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,20,10] for [[4,4],[3,3],[4,2]] selected 10
Hunter is Moving to room (4x2)
At time 8: hunter is in room (4x2), and senses [no,no,no,no].
Nothing is perceived, Hunter will move to a random adjacent room...
Hunter is Moving to room (4x3)
At time 9: hunter is in room (4x3), and senses [yes,no,no,no].
The Wumpus is near.
The Wumpus is near.

> Costs [20,20,20] for [[4,4],[3,3],[4,2]] selected 20
Hunter is Moving to room (4x4)
You Lost, Wumpus is sill Alive...
----Game has Finished---

                Result
Steps: ............................. 10
Score: ............................. -960

true.
```