



## **Project 2**

Coding a logical agent for the Wumpus game

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**Spring 2022**

**Intro To Artificial Intelligence CSC 4301**

**Introduction:**

The Wumpus world is a simple world example to illustrate the worth of a knowledge-based agent and to represent knowledge representation. It was inspired by a video game **Hunt the Wumpus** by Gregory Yob in 1973.

In this project my teammate Asmae Dalil and I worked on the coding of a logical agent for the Wumpus game, using Prolog, a logic programming language associated with artificial intelligence and computational linguistics

**Used Technologies:**

**SWI-Prolog** offers a comprehensive free Prolog environment. Since its start in 1987, SWI-Prolog development has been driven by the needs of real world applications. SWI-Prolog is widely used in research and education as well as commercial applications.

In the past 3 days before the submission SWI-Prolog online version stopped running from any device connected to AUI wifi, may be because all the class was using the same wifi and accessing the website at the same time.

**Objectif:**

The Agent aims is to kill the Wumpus before moving into its room. He tries to explore a four-by-four layout of rooms in order to kill the Wumpus and move safely to his room, during this process the agent also tries to find gold so as he can increase his chances of staying alive +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.
















## Predicates

We started by building the following predicates:

- **wall([X,Y])** : determines the border of [X,Y]
- **makestatement([X,Y])** : takes the perception of the hunter
- **pit([X,Y])** : determines if there is a pit
- **wumpus([X,Y])** : determines if there is a wumpus
- **gold([X,Y])** : determines if there is gold
- **point\_safe([X,Y])** : determines if the room is safe from pit
- **adjacent([X,Y],L)** :determines if L and room [X,Y]
- **wumpus\_safe([X,Y])** : determines if the room is safe from wumpus
- **maybe([X,Y])** : the room may be dangerous
- **safe([X,Y])** : determines if the room is safe (Wsafe and psafe)
- **good([X,Y])** : determines if the room is good to move to
- **existgood(A)**: determines if there's a good move to do
- **existmaybe(A)**: determines the less risky move to do if there are no good moves
- **start** : starts the game
- **action(X)**: determines the action to take
- **get\_next([X,Y],[X1,Y1],[X2,Y2])** :the inference to get the next action
- **update\_score(X)**:updates the score
- **update\_timer(X)**:updates the timer
- **init** : initializes the board and the position of each thing

## Experiments:

Starting configuration1 :

			
		 	
	 		
 START			

```

161
162     init:-
163         retractall(timer(_)),
164         assert(timer(0)),
165         retractall(score(_)),
166         assert(score(30)),
167         retractall(gold_location(_)),
168         assert(gold_location([1,3])),
169         retractall(wumpus_location(_)),
170         assert(wumpus_location([3,2])),
171         retractall(pit_location(_)),
172         assert(pit_location([2,3])),
173         assert(pit_location([4,4])),
174         retractall(agent_location(_)),
175         assert(agent_location([1,1])),
176         retractall(wumpus_final_location(_)),
177         assert(wumpus_final_location([-1,-1])).

```

```







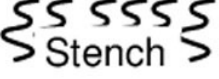





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For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.00 sec, 28 clauses
?- start.
Current position [1,1]
Current position [2,1]
Current position [1,1]
Current position [1,2]
Current position [2,1]
Current position [3,1]
I SMELL A STENCH IN POSITION [3,1]
Current position [1,2]
Current position [2,2]
I FEEL A BREEZE IN POSITION [2,2]
I SMELL A STENCH IN POSITION [2,2]
Current position [1,2]
Current position [1,3]
I FEEL A BREEZE IN POSITION [1,3]
YAAAYY !! IT IS GOLD. SCORE UPDATED NOW TO : now 520
Current position [3,1]
I SMELL A STENCH IN POSITION [3,1]
Current position [4,1]
Current position [4,2]
I SMELL A STENCH IN POSITION [4,2]
The wumpus position is [5,2]! shoooootttt !
Current Score: 517
timer: 13
I DID IT!
true.
?- █

```

Starting configuration2 :

			
			
			
 START			

```

180     init:-
181     retractall(timer(_)),
182     assert(timer(0)),
183     retractall(score(_)),
184     assert(score(30)),
185     retractall(gold_location(_)),
186     assert(gold_location([3,3])),
187     retractall(wumpus_location(_)),
188     assert(wumpus_location([4,4])),
189     retractall(pit_location(_)),
190     assert(pit_location([1,3])),
191     assert(pit_location([1,4])),
192     retractall(agent_location(_)),
193     assert(agent_location([1,1])),
194     retractall(wumpus_final_location(_)),
195     assert(wumpus_final_location([-1,-1])).













```

```

?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.00 sec, 28 clauses
?- start.
Current position [1,1]
Current position [2,1]
I FEEL A BREEZE IN POSITION [2,1]
Current position [1,1]
Current position [1,2]
Current position [2,2]
Current position [1,2]
Current position [1,3]
I FEEL A BREEZE IN POSITION [1,3]
Current position [2,2]
Current position [3,2]
I FEEL A BREEZE IN POSITION [3,2]
Current position [1,3]
I FEEL A BREEZE IN POSITION [1,3]
Current position [2,3]
Current position [3,3]
YAAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 518
Current position [2,3]
Current position [2,4]
I FEEL A BREEZE IN POSITION [2,4]
Current position [3,3]
YAAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 1015
Current position [4,3]
I SMELL A STENCH IN POSITION [4,3]
Current position [4,2]
Current position [2,4]
I FEEL A BREEZE IN POSITION [2,4]
Current position [3,4]
I SMELL A STENCH IN POSITION [3,4]
Current position [4,2]
Current position [4,1]
I FEEL A BREEZE IN POSITION [4,1]
The wumpus position is [3,5]! shoooootttt !
Current Score: 1009
timer: 21
I DID IT!
true.
?-

```

Starting configuration3 :

			
	 		
			
 <b>START</b>			

```

180     init:-
181         retractall(timer(_)),
182         assert(timer(0)),
183         retractall(score(_)),
184         assert(score(30)),
185         retractall(gold_location(_)),
186         assert(gold_location([2,3])),
187         retractall(wumpus_location(_)),
188         assert(wumpus_location([1,3])),
189         retractall(pit_location(_)),
190         assert(pit_location([4,2])),
191         assert(pit_location([4,4])),
192         retractall(agent_location(_)),
193         assert(agent_location([1,1])),
194         retractall(wumpus_final_location(_)),
195         assert(wumpus_final_location([-1,-1])).

```



```










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?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.00 sec, 28 clauses
?- start.
Current position [1,1]
Current position [2,1]
Current position [1,1]
Current position [1,2]
I FEEL A BREEZE IN POSITION [1,2]
Current position [2,1]
Current position [3,1]
Current position [1,2]
I FEEL A BREEZE IN POSITION [1,2]
Current position [2,2]
Current position [3,1]
Current position [4,1]
Current position [2,2]
Current position [3,2]
Current position [2,2]
Current position [2,3]
I FEEL A BREEZE IN POSITION [2,3]
Current position [3,2]
Current position [4,2]
Current position [2,3]
I FEEL A BREEZE IN POSITION [2,3]
Current position [3,3]
YAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 512
Current position [4,3]
I SMELL A STENCH IN POSITION [4,3]
Current position [3,3]
YAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 1010
Current position [3,4]
I SMELL A STENCH IN POSITION [3,4]
Current position [2,4]
I FEEL A BREEZE IN POSITION [2,4]
The wumpus position is [3,5]! shoooootttt !
Current Score: 1008
timer: 22
I DID IT!
true.
?- 

```

Starting configuration4 :

			
			
			
 <b>START</b>			

```

197
198     init:-
199         retractall(timer(_)),
200         assert(timer(0)),
201         retractall(score(_)),
202         assert(score(30)),
203         retractall(gold_location(_)),
204         assert(gold_location([4,3])),
205         retractall(wumpus_location(_)),
206         assert(wumpus_location([1,3])),
207         retractall(pit_location(_)),
208         assert(pit_location([4,2])),
209         assert(pit_location([4,4])),
210         retractall(agent_location(_)),
211         assert(agent_location([1,1])),
212         retractall(wumpus_final_location(_)),
213         assert(wumpus_final_location([-1,-1])).
214














```

```

% c:/Users/HP/Downloads/wumpus2.pl compiled 0.02 sec, -1 clauses
?- start.
Current position [1,1]
The wumpus position is [3,5]! shoooootttt !
Current Score: 29
timer: 1
I DID IT!
true.

```

Starting configuration5:

			
			 
		 	
 START			

```

16  init:-
17      retractall(timer(_)),
18      assert(timer(0)),
19      retractall(score(_)),
20      assert(score(30)),
21      retractall(gold_location(_)),
22      assert(gold_location([1,3])),
23      retractall(wumpus_location(_)),
24      assert(wumpus_location([4,2])),
25      retractall(pit_location(_)),
26      assert(pit_location([2,2])),
27      assert(pit_location([4,4])),
28      retractall(agent_location(_)),
29      assert(agent_location([1,1])),
30      retractall(wumpus_final_location(_)),
31      assert(wumpus_final_location([-1,-1])).
32

```

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```

?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.02 sec, 28 ,
?- start.
Current position [1,1]
Current position [2,1]
I FEEL A BREEZE IN POSITION [2,1]
Current position [1,1]
Current position [1,2]
I FEEL A BREEZE IN POSITION [1,2]
Oh ?? Where is the Wumpus ?
FAILED !
true.
?-

```

Starting configuration6:

			
 			 
		 	
 START			

```

33      init:-
34          retractall(timer(_)),
35          assert(timer(0)),
36          retractall(score(_)),
37          assert(score(30)),
38          retractall(gold_location(_)),
39          assert(gold_location([1,3])),
40          retractall(wumpus_location(_)),
41          assert(wumpus_location([4,2])),
42          retractall(pit_location(_)),
43          assert(pit_location([2,2])),
44          assert(pit_location([4,4])),
45          assert(pit_location([1,4])),
46          retractall(agent_location(_)),
47          assert(agent_location([1,1])),
48          retractall(wumpus_final_location(_)),
49          assert(wumpus_final_location([-1,-1])).
50

```

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

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```

?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.00 sec, 28 clauses
?- start.
Current position [1,1]
Current position [2,1]
I FEEL A BREEZE IN POSITION [2,1]
Current position [1,1]
Current position [1,2]
I FEEL A BREEZE IN POSITION [1,2]
Oh ?? Where is the Wumpus ?
FAILED !
true.
?- █

```

**Starting configuration7 :**

			
			
			
 START			



```

271
272     init:-
273         retractall(timer(_)),
274         assert(timer(0)),
275         retractall(score(_)),
276         assert(score(30)),
277         retractall(gold_location(_)),
278         assert(gold_location([4,2])),
279         retractall(wumpus_location(_)),
280         assert(wumpus_location([4,4])),
281         retractall(pit_location(_)),
282         assert(pit_location([3,1])),
283         assert(pit_location([1,4])),
284         retractall(agent_location(_)),
285         assert(agent_location([1,1])),
286         retractall(wumpus_final_location(_)),
287         assert(wumpus_final_location([-1,-1])).
288

```

```

?-
% c:/Users/HP/Downloads/wumpus2.pl compiled 0.00 sec, 28 clauses
?- start.
Current position [1,1]
Current position [2,1]
I FEEL A BREEZE IN POSITION [2,1]
Current position [1,1]
Current position [1,2]
Current position [2,2]
Current position [1,2]
Current position [1,3]
I FEEL A BREEZE IN POSITION [1,3]
Current position [2,2]
Current position [3,2]
I FEEL A BREEZE IN POSITION [3,2]
Current position [1,3]
I FEEL A BREEZE IN POSITION [1,3]
Current position [2,3]
Current position [3,3]
Current position [2,3]
Current position [2,4]
I FEEL A BREEZE IN POSITION [2,4]
Current position [3,3]
Current position [4,3]
I SMELL A STENCH IN POSITION [4,3]
Current position [4,2]
YAAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 513
Current position [2,4]
I FEEL A BREEZE IN POSITION [2,4]
Current position [3,4]
I SMELL A STENCH IN POSITION [3,4]
Current position [4,2]
YAAAYY !! IT IS GOLD, SCORE UPDATED NOW TO : now 1010
Current position [4,1]
I FEEL A BREEZE IN POSITION [4,1]
The wumpus position is [3,5]! shoooootttt !
Current Score: 1009
timer: 21

```

**Detected problems and future implementation :**

As mentioned in the previous part of the reports, We were able to detect some logical problems in the code after testing it several times. And we received some results that show that the rooms of Gold have been visited twice and the Gold grabbed twice.

The future implementations :

If we have more time we will be implementing the following code in the makestatement part:

```
forall((gold_location(G),([X,Y] == G)),(assert(glitter([X,Y])),score(S), N is S  
+ 500 , format('I have found GOLD, Score is now ~p~n',[N]),  
retractall(score()),retractall(glitter()),retractall(gold_location(_)),  
assert(score(N)))).
```