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CSC 4301(01) – Intro to Artificial Intelligence

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## **Wumpus Game Logical Agent**

In this project we needed to create an intelligent agent for the Wumpus game. The agent was supposed to start in the room [1, 1] and then move to the adjacent rooms in order to look for the gold and win the game. The agent was supposed to sense stench, breeze, glitter or nothing. If he sensed glitter it means that he is close to gold, if he sensed breeze it means that the pit is not too far and if he sensed stench, it means that the Wumpus is in one of the neighbor rooms. This project was coded in prolog, where we created rules in the knowledge base in order to help the agent get the optimal path and not lose the game, by being eaten by the Wumpus or die because of a pit.

First, we created all the predicates that are necessary such as room, breeze, pit, Wumpus... etc. We know that to make a rational agent, we need all those blocks.

Room: Is the predicate where we give a visited list. We call a sense function that does the perception using what is in the knowledge base. Of course, the knowledge base should be updated every time so that the agent knows what room is safe and what room he did not visit yet. What needed to be updated is the time spent on the game and the final score as well.

While running the programming, we keep getting where the agent is located and we display what he senses while moving from a room to another.

Update\_time: When it is called, the time  $T+1$

Update\_score: When it is called,  $S+1$  the score is updated.

Status: It calls the Wumpus location, gold location, and agent location. When the is-pit is true, the agent loses the game. When the is-pit is false, the agent should check whether there is a Wumpus or a gold in there. However, if none of them is found, that means that the agent still needs to play and move to another room.

Init: It is an initialization of the game.

Land: is the size of the game, the pit location and the gold location.

After that, we initialized the agent by providing its location, the Wumpus and the gold.

Unfortunately, we did not work with arrows and we removed the option of shooting the Wumpus because at each time the program stops working.

Also, we preferred to change the locations of the Wumpus, the gold and the puts manually rather than working with probability rules, because it was too challenging for us.

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

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% //vdi-share/DEMPROFILES/74869/Downloads/prolog2/test.pl compiled 0.00 sec, 56 clauses

?- start.

Lets play the game!

I'm in the room [1,1], and : [no,no,no]

The agent knows [1,2] - no Wumpus there!

The agent knows [1,0] - no Wumpus there!

The agent knows [2,1] - no Wumpus there!

The agent knows [0,1] - no Wumpus there!

The agent knows [1,2] - there's no Pit there!

The agent knows [1,0] - there's no Pit there!

The agent knows [2,1] - there's no Pit there!

The agent knows [0,1] - there's no Pit there!

The agent knows [3,2] - there's no gold here!

I will move to : [1,2]

I am still in the game, I have to play

I'm in the room [1,2], and : [no,yes,no]

The agent knows [1,3] - no Wumpus there!

The agent knows [1,1] - no Wumpus there!

The agent knows [2,2] - no Wumpus there!

The agent knows [0,2] - no Wumpus there!

The agent knows [1,3] - there is a Pit!

The agent knows [1,1] - there is a Pit!

The agent knows [2,2] - there is a Pit!

The agent knows [0,2] - there is a Pit!

The agent knows [3,2] - there's no gold here!

I will move to : [2,1]

I am still in the game, I have to play

I'm in the room [2,1], and : [no,no,no]

The agent knows [2,2] - no Wumpus there!

The agent knows [2,0] - no Wumpus there!

The agent knows [3,1] - no Wumpus there!

The agent knows [1,1] - no Wumpus there!

The agent knows [2,2] - there's no Pit there!

The agent knows [2,0] - there's no Pit there!

The agent knows [3,1] - there's no Pit there!

The agent knows [1,1] - there's no Pit there!

The agent knows [3,2] - there's no gold here!

I will move to : [2,2]

I am still in the game, I have to play

I'm in the room [2,2], and : [no,no,no]

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```
I'm in the room [2,2], and : [no,no,no]
The agent knows [2,3] - no Wumpus there!
The agent knows [2,1] - no Wumpus there!
The agent knows [3,2] - no Wumpus there!
The agent knows [1,2] - no Wumpus there!
The agent knows [2,3] - there's no Pit there!
The agent knows [2,1] - there's no Pit there!
The agent knows [3,2] - there's no Pit there!
The agent knows [1,2] - there's no Pit there!
The agent knows [3,2] - there's no gold here!
I will move to : [3,1]
I am still in the game, I have to play
I'm in the room [3,1], and : [yes,no,no]
I'm in the room [3,1], and : [no,no,no]
The agent knows [3,2] - no Wumpus there!
The agent knows [3,0] - no Wumpus there!
The agent knows [4,1] - no Wumpus there!
The agent knows [2,1] - no Wumpus there!
The agent knows [3,2] - there's no Pit there!
The agent knows [3,0] - there's no Pit there!
The agent knows [4,1] - there's no Pit there!
The agent knows [2,1] - there's no Pit there!
The agent knows [3,2] - there's no gold here!
I will move to : [2,3]
I am still in the game, I have to play
I'm in the room [2,3], and : [no,yes,no]
The agent knows [2,4] - no Wumpus there!
The agent knows [2,2] - no Wumpus there!
The agent knows [3,3] - no Wumpus there!
The agent knows [1,3] - no Wumpus there!
The agent knows [2,4] - there is a Pit!
The agent knows [2,2] - there is a Pit!
The agent knows [3,3] - there is a Pit!
The agent knows [1,3] - there is a Pit!
The agent knows [3,2] - there's no gold here!
I will move to : [3,2]
I am still in the game, I have to play
Congratulations!
The Score: 995,
Time: 6
true █
```

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```
% //vdi-share/DEMPROFILES/74869/Downloads/prolog2/test.pl compiled 0.00 sec, 56 clauses
```

```
?- start.
```

```
Lets play the game!
```

```
I'm in the room [2,3], and : [no,yes,no]
```

```
The agent knows [2,4] - no Wumpus there!
```

```
The agent knows [2,2] - no Wumpus there!
```

```
The agent knows [3,3] - no Wumpus there!
```

```
The agent knows [1,3] - no Wumpus there!
```

```
The agent knows [2,4] - there is a Pit!
```

```
The agent knows [2,2] - there is a Pit!
```

```
The agent knows [3,3] - there is a Pit!
```

```
The agent knows [1,3] - there is a Pit!
```

```
The agent knows [3,2] - there's no gold here!
```

```
I'm in the room [2,3], and : [no,yes,no]
```

```
The agent knows [2,4] - no Wumpus there!
```

```
The agent knows [2,2] - no Wumpus there!
```

```
The agent knows [3,3] - no Wumpus there!
```

```
The agent knows [1,3] - no Wumpus there!
```

```
The agent knows [2,4] - there is a Pit!
```

```
The agent knows [2,2] - there is a Pit!
```

```
The agent knows [3,3] - there is a Pit!
```

```
The agent knows [1,3] - there is a Pit!
```

```
The agent knows [3,2] - there's no gold here!
```

```
I'm in the room [2,3], and : [no,no,no]
```

```
The agent knows [2,4] - no Wumpus there!
```

```
The agent knows [2,2] - no Wumpus there!
```

```
The agent knows [3,3] - no Wumpus there!
```

```
The agent knows [1,3] - no Wumpus there!
```

```
The agent knows [2,4] - there's no Pit there!
```

```
The agent knows [2,2] - there's no Pit there!
```

```
The agent knows [3,3] - there's no Pit there!
```

```
The agent knows [1,3] - there's no Pit there!
```

```
The agent knows [3,2] - there's no gold here!
```

```
I will move to : [2,4]
```

```
I am still in the game, I have to play
```

```
I'm in the room [2,4], and : [no,no,no]
```

```
The agent knows [2,5] - no Wumpus there!
```

```
The agent knows [2,3] - no Wumpus there!
```

```
The agent knows [3,4] - no Wumpus there!
```

```
The agent knows [1,4] - no Wumpus there!
```

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```
I am still in the game, I have to play
I'm in the room [1,4], and : [no,yes,no]
The agent knows [1,5] - no Wumpus there!
The agent knows [1,3] - no Wumpus there!
The agent knows [2,4] - no Wumpus there!
The agent knows [0,4] - no Wumpus there!
The agent knows [1,5] - there is a Pit!
The agent knows [1,3] - there is a Pit!
The agent knows [2,4] - there is a Pit!
The agent knows [0,4] - there is a Pit!
The agent knows [3,2] - there's no gold here!
I will move to : [2,3]
I am still in the game, I have to play
I'm in the room [2,3], and : [no,yes,no]
The agent knows [2,4] - no Wumpus there!
The agent knows [2,2] - no Wumpus there!
The agent knows [3,3] - no Wumpus there!
The agent knows [1,3] - no Wumpus there!
The agent knows [2,4] - there is a Pit!
The agent knows [2,2] - there is a Pit!
The agent knows [3,3] - there is a Pit!
The agent knows [1,3] - there is a Pit!
The agent knows [3,2] - there's no gold here!
I will move to : [2,1]
I am still in the game, I have to play
I'm in the room [2,1], and : [no,no,no]
The agent knows [2,2] - no Wumpus there!
The agent knows [2,0] - no Wumpus there!
The agent knows [3,1] - no Wumpus there!
The agent knows [1,1] - no Wumpus there!
The agent knows [2,2] - there's no Pit there!
The agent knows [2,0] - there's no Pit there!
The agent knows [3,1] - there's no Pit there!
The agent knows [1,1] - there's no Pit there!
The agent knows [3,2] - there's no gold here!
I will move to : [3,2]
I am still in the game, I have to play
Congratulations!
The Score: 991,
Time: 10
true
```

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```
% //vdi-share/DEMPROFILES/74869/Downloads/prolog2/test.pl compiled 0.02 sec, 56 clauses
```

```
?- start.
```

```
Lets play the game!
```

```
I'm in the room [1,1], and : [no,no,no]
```

```
The agent knows [1,2] - no Wumpus there!
```

```
The agent knows [1,0] - no Wumpus there!
```

```
The agent knows [2,1] - no Wumpus there!
```

```
The agent knows [0,1] - no Wumpus there!
```

```
The agent knows [1,2] - there's no Pit there!
```

```
The agent knows [1,0] - there's no Pit there!
```

```
The agent knows [2,1] - there's no Pit there!
```

```
The agent knows [0,1] - there's no Pit there!
```

```
The agent knows [4,2] - there's no gold here!
```

```
I will move to : [1,2]
```

```
I am still in the game, I have to play
```

```
I'm in the room [1,2], and : [no,yes,no]
```

```
The agent knows [1,3] - no Wumpus there!
```

```
The agent knows [1,1] - no Wumpus there!
```

```
The agent knows [2,2] - no Wumpus there!
```

```
The agent knows [0,2] - no Wumpus there!
```

```
The agent knows [1,3] - there is a Pit!
```

```
The agent knows [1,1] - there is a Pit!
```

```
The agent knows [2,2] - there is a Pit!
```

```
The agent knows [0,2] - there is a Pit!
```

```
The agent knows [4,2] - there's no gold here!
```

```
I will move to : [2,1]
```

```
I am still in the game, I have to play
```

```
I'm in the room [2,1], and : [yes,yes,no]
```

```
I'm in the room [2,1], and : [yes,no,no]
```

```
I'm in the room [2,1], and : [no,yes,no]
```

```
The agent knows [2,2] - no Wumpus there!
```

```
The agent knows [2,0] - no Wumpus there!
```

```
The agent knows [3,1] - no Wumpus there!
```

```
The agent knows [1,1] - no Wumpus there!
```

```
The agent knows [2,2] - there is a Pit!
```

```
The agent knows [2,0] - there is a Pit!
```

```
The agent knows [3,1] - there is a Pit!
```

```
The agent knows [1,1] - there is a Pit!
```

```
The agent knows [4,2] - there's no gold here!
```

```
I'm in the room [2,1], and : [no,no,no]
```

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```
The agent knows [3,1] - no Wumpus there!
The agent knows [1,1] - no Wumpus there!
The agent knows [2,2] - there's no Pit there!
The agent knows [2,0] - there's no Pit there!
The agent knows [3,1] - there's no Pit there!
The agent knows [1,1] - there's no Pit there!
The agent knows [4,2] - there's no gold here!
I will move to : [2,2]
Boom, you havefallen into a pit
I will move to : [3,1]
I am still in the game, I have to play
I'm in the room [3,1], and : [no,no,no]
The agent knows [3,2] - no Wumpus there!
The agent knows [3,0] - no Wumpus there!
The agent knows [4,1] - no Wumpus there!
The agent knows [2,1] - no Wumpus there!
The agent knows [3,2] - there's no Pit there!
The agent knows [3,0] - there's no Pit there!
The agent knows [4,1] - there's no Pit there!
The agent knows [2,1] - there's no Pit there!
The agent knows [4,2] - there's no gold here!
I will move to : [2,2]
Boom, you havefallen into a pit
I will move to : [3,2]
I am still in the game, I have to play
I'm in the room [3,2], and : [no,yes,no]
The agent knows [3,3] - no Wumpus there!
The agent knows [3,1] - no Wumpus there!
The agent knows [4,2] - no Wumpus there!
The agent knows [2,2] - no Wumpus there!
The agent knows [3,3] - there is a Pit!
The agent knows [3,1] - there is a Pit!
The agent knows [4,2] - there is a Pit!
The agent knows [2,2] - there is a Pit!
The agent knows [4,2] - there's no gold here!
I will move to : [4,1]
I am still in the game, I have to play
Woups,you lost
The Score: -7,
Time: 7
true ■
```

From those screenshots, we can clearly see that depending on the positions the agent can either fail or win the game.

As for our fails in the code, we have encountered a few bugs, such as, the game doesn't end when the agent falls into a pit in some cases, I believe that the problem came from the placement of the pit and agent but we are not sure. We also couldn't implement a mechanism to kill the Wumpus so that he can win the game that way, therefore, in this version the agent should only avoid the Wumpus and finds the gold to win.

We have learned a lot from this project on how to use a smart agent that learns and perceive its surroundings using a predefined knowledge base. This project was coded by Yasmine Najd and my teammate Ahmed Al Hilal.