School of Science and Engineering

Wumpus World Project Report

CSC 4301 – Introduction to AI

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1. Introduction:

Wumpus World is a game in which an intelligent agent attempts to eliminate the Wumpus that lives in a 4x4 grid. Additionally, the agent should avoid falling into any pit. Gold is also represented on the world map.

The agent can only perceive the room in which they are currently located. The rooms adjacent to the Wumpus are believed to be stenchy, whereas the rooms adjacent to pits are perceived to be breezy.

When the agent is in the same room as the gold, it appears to sparkle. When an intelligent agent comes upon gold, they must pick it up. And when the agent detects the Wumpus in a room, he has only one shot at it with his arrow.

2. Predicate Screenshots:

```
:- dynamic ([visited/1,
             breeze/1,
             stench/1,
             glitter/1,
             moved/2,
             wumpus_location/1,
             pit_location/1,
             gold_location/1,
             agent_location/1,
             time/1,
             score/1,
              wumpus_final/1]).
```

Figure 1: Dynamic variables

Figure 1 shows the dynamic variables that the program uses to ensure the good functioning of the solution. The variables pit_location, wumpus_location, gold_location are world parameters that are set before running the intelligent agent.

The variables visited, breeze, stench, glitter, time, score,and wumpus_final can all be dynamically asserted to the knowledge base. Wumpus_final is first initialized to [-1,-1] and changes once the intelligent agent finds the Wumpus.

```
take_action(X):-
    retractall(agent_location(_)),
    assert(agent_location(X)),
    update_score(-1),
    update_time(1),
    format('I am in ~p~n',[X]),
    \+ fail_check(X),
    assert(visited(X)),
    perceive(X),
    exist(L),
    get_next(N,L,X),
    wumpus_final(Z),
    Z = [-1,-1],
    take_action(N).
```

Figure 2: take_action predicate

Figure 2 shows the code of the intelligent agent. It, first, assert the agent's new location. Then it updates the score and time. It asserts that it has visited the room it is in and perceives its attributes (stenchy, breezy, glittery). It then checks for the room to go to next and sees if it

adjacent to it, if not, it goes to the closest adjacent room and runs again. It then checks if the Wumpus is found by the intelligent agent or not.

3. Screenshots:

First Scenario:

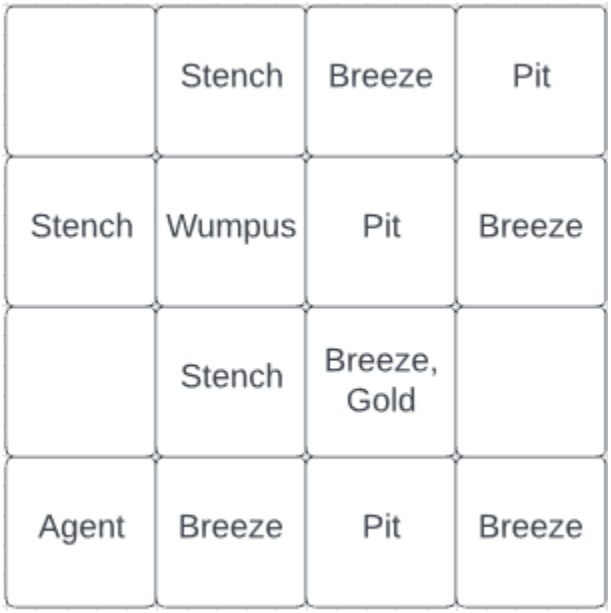

Figure 3: First Scenario

The intelligent agent, when facing the scenario in Figure 3, outputs the following:

```
Call: start
I am in [1,1]
I am in [2,1]
there is a breeze in [2,1]
I am in [1,1]
I am in [1,2]
I am in [2,2]
there is a stench in [2,2]
I am in [1,2]
I am in [1,3]
I am in [2,3]
there is a breeze in [2,3]
I have found GOLD, Score is now 522
I am in [1,3]
I am in [1,4]
I am in [2,4]
I am in [3,4]
there is a breeze in [3,4]
there is a breeze in [3,4]
The wumpus has been located in [3,2]! I am shooting my arrow!
WON
Score: 518
Time: 12
true
```

Figure 4: First Scenario Execution

Second Scenario:

Wumpus	Stench	Breeze	Pit
Stench		Pit	Breeze
		Breeze, Gold	
Agent	Breeze	Pit	Breeze

Figure 5: Second Scenario

The intelligent agent, when facing the the scenario in figure 5, outputs the following:

```
Call: start
I am in [1,1]
I am in [2,1]
there is a breeze in [2,1]
I am in [1,1]
I am in [1,2]
I am in [2,2]
I am in [1,2]
I am in [1,3]
there is a stench in [1,3]
I am in [2,2]
I am in [3,2]
there is a breeze in [3,2]
there is a breeze in [3,2]
I am in [1,3]
there is a stench in [1,3]
I am in [2,3]
there is a breeze in [2,3]
I have found GOLD, Score is now 519
The wumpus has been located in [1,4]! I am shooting my arrow!
WON
Score: 519
Time: 11
true
```

Figure 6: Second Scenario Execution

4. Solution Limitations:

In some scenarios, the intelligent agent is faced with a decision that needs to be made with pure chance. One of these scenarios would be the following:

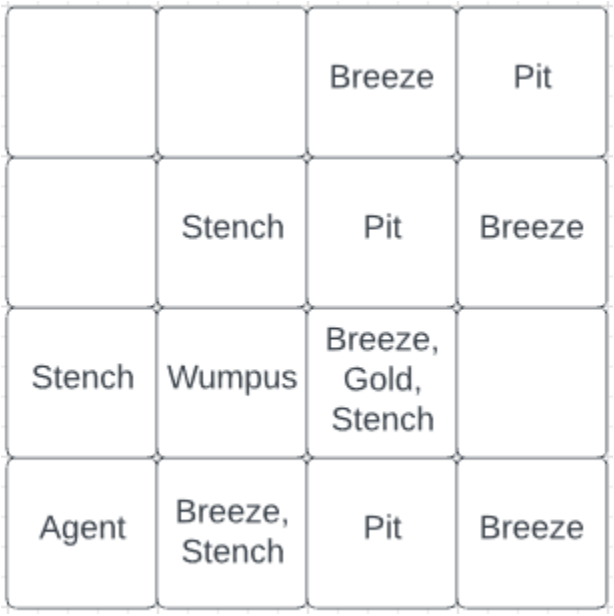

Figure 7: Failing Scenario

When the intelligent agent is faced with this given scenario, it follows a random decision which leads to its failure. The execution below shows it:

```
Call: start
I am in [1,1]
I am in [2,1]
there is a breeze in [2,1]
there is a stench in [2,1]
I am in [1,1]
I am in [1,2]
there is a stench in [1,2]
I am in [2,2]
I have been eaten by Wumpus!
Failed!
```

Figure 8: Failing Scenario Execution