Queensland University of Technology

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IFN – 680 ADVANCED TOPICS IN ARTIFICIAL INTELLENGENCE

ASSIGNMENT 1

NAME	STUDENT NUMBER
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PART A : STATEMENT OF COMPLETENESS

- PitWumpus_probability_distribution and next_room_prob are the functions which have been completed as per the assignment requirements. The changes in python file probability_based_move.py are made using Anaconda Navigator using Spyder as the python development environment.
- The modification was done only in probability_based_move.py and no other modification was done except adding the student name and id in the_Wumpus_world.py.
- Work Distribution

Karthik	Darsheel	Suprith
1st version of code, testing and debugging	Removal of errors, 2nd version of code	final version of code Testing and debugging
Report writing	Report writing	Report reviewing
Test case 1,2	Test case 3	Test case 4

PART B: PROBABILITY-BASED APPROACH

We have used the approach which is discussed in section 2 of assignment document provided to us.in the probability based approach we are focusing on two function's which are pitWumpus_probability_distribution and next_room_prob() which are the most important part of for working of probability based agent in Wumpus world problem. There are two variable associated with each room in cave .$PW_{i,j}$ is used to represent if the room has a pit or Wumpus .$BS_{i,j}$ is used to represent if the room has breeze or stench present. Both this variable are Boolean variable that is if the value is true for a variable that means it has the item inside it ,if value is false then it does not have the item in it.for any time the agent is alive in the game the room in caves can be spilt into three sections which are R_{known} for visited room , R_{query} for query part and R_{other} for the remaining .

A dictionary array is created to store the value of PW and BS of the visited room by agent when he is alive. visteroom_dict is directory array created in next_room_prob() for the following storage of value.

- Visited room (R_{known}) : these are the room which the agent has already visited are know to be safe for agent since it does not have any pit or Wumpus.There are a set of variable for R_{known}.
  $PW_{c,r} \in PW_{KNOWN}$, $PW_{c,r}$=FALSE , $BS_{c,r} \in BS_{c,r}$ will be true or false.
- Query part (R_{query}): these are the room which are not be visited or unknown to agent, the agent decides which query room he wants to explore next. These are room which are accessible to agent
- Others (R_{others}): these are room which are not accessible to agent and are haven't been visited yet.

For probability based agent to explore other room in query the decision are made based upon the probability that each room contain in PW_{known} and BS_{known}.

Condition probability is calculated based on the following formula.

$$\boldsymbol{P}(Pq|PWknown, BSknown) =$$

$$\alpha \sum y \in R_{\text{unknown}} \boldsymbol{P}(Pq, PW_{known}, BS_{known}, y)$$

Where p_q is query variable in Rquery and $R_{unknown} = R_{others} \cup (R_{query} - \{Pq\})$ which has unknown variable involved which are hidden and need to be enumerated.

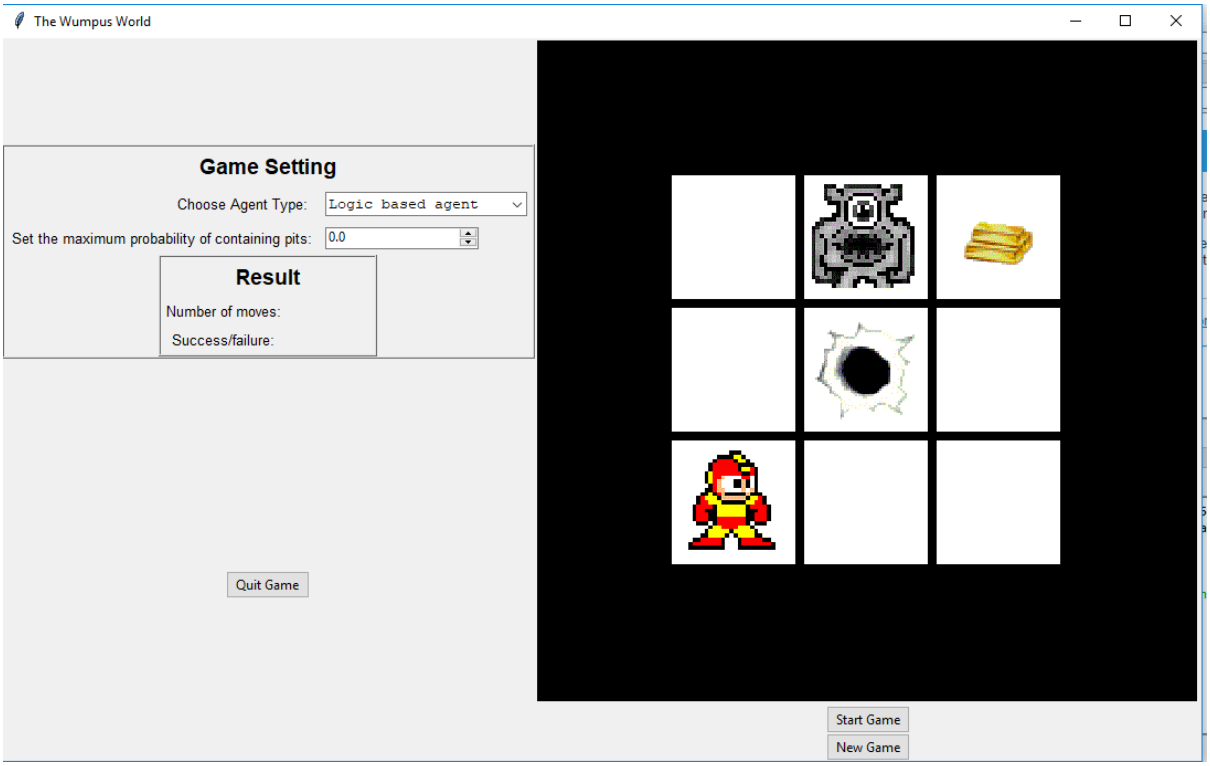
$$\boldsymbol{P}(Pq|PW_{known},BS_{known}) = \alpha \sum_{y \in R\text{unknown}} \boldsymbol{P}(BS_{known}|Pq,PW_{known}, y) \times \boldsymbol{P}(Pq, PW_{known}, y)$$

In cave surrounding sel.cave.getsurrounding funcition is used to check adjacent rooms to agent current location. The movement of agent to the next room depends on the comparison with agent known rooms BS VALUES and PW values for each query room .The PW probability are been compared with maximum probability threshold which is specified by the user, the which is having the lowest probability then the maximum probability threshold for having pit and wampus chooses to move in that room. The value for PW and BS is updated after each move for the query room. The room which the agent is moved is updated in known room. This process is continued till there is no room to explore, agent dies by finding pit or wumpus or the agent finds the gold.

PART C: TEST CASES

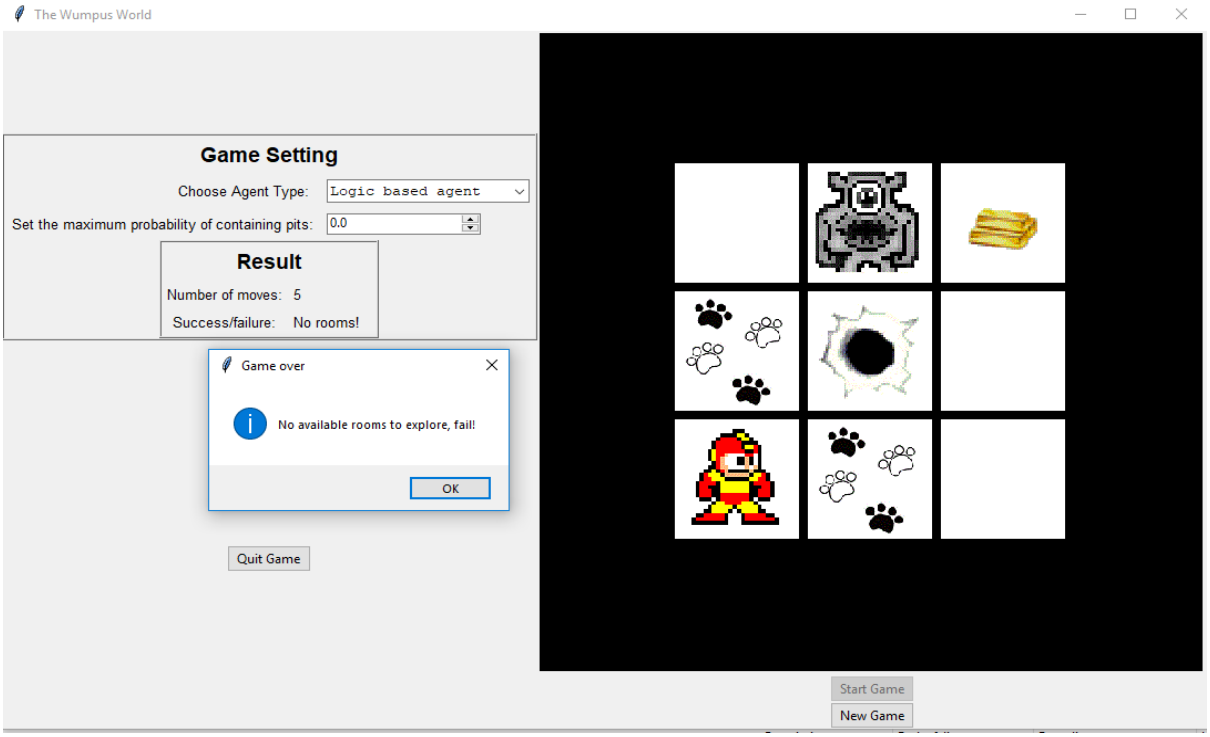
We have conducted some test four test which are listed below where the logical-based agent has been failed to get the gold. whereas the probability-based agent was successful in getting the gold. Test were conducted by using 3*3 board and result of the following test are displayed below with help of screenshot. For each of the test cases the position of wampus,pit and gold are changed for checking the ability efficiently.

CASE 1:



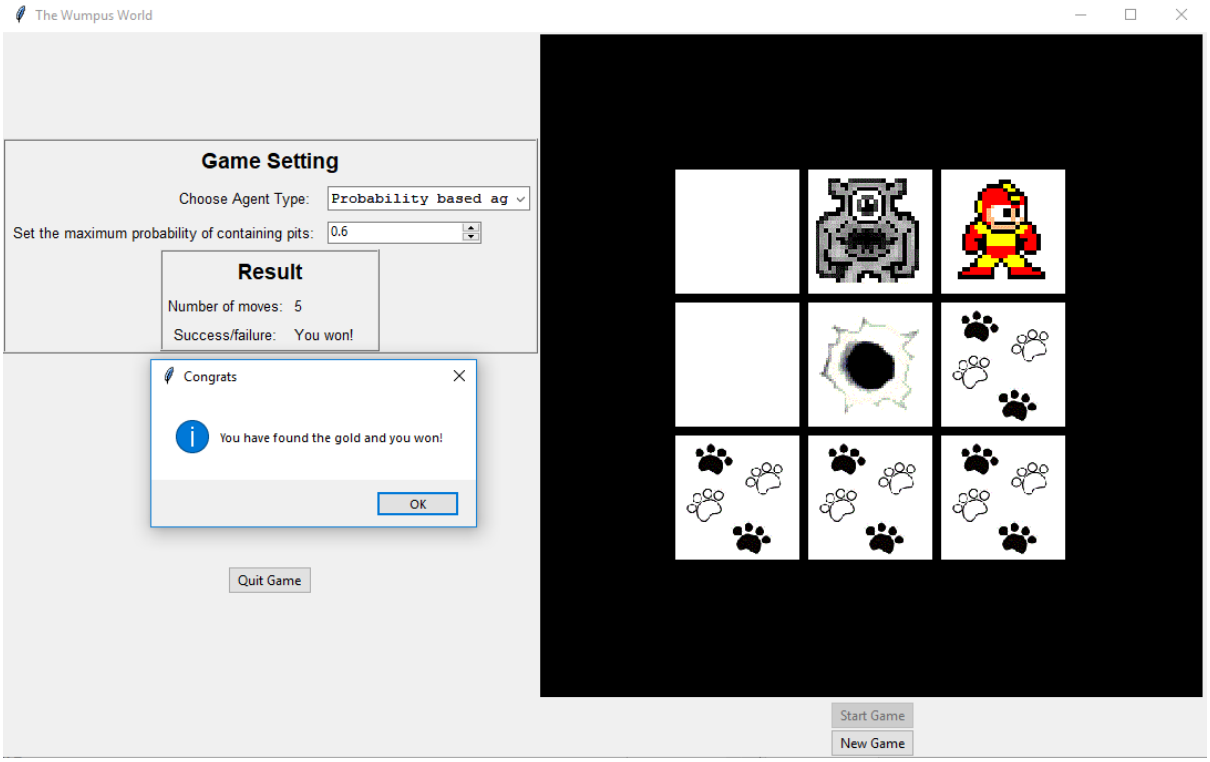
In case 1 we have positioned pit at (2,2) ,wampus is positioned at (2,1) and gold is positioned at (3,1) and the agent starts from position (1,3).

LOGICAL-BASED AGENT:



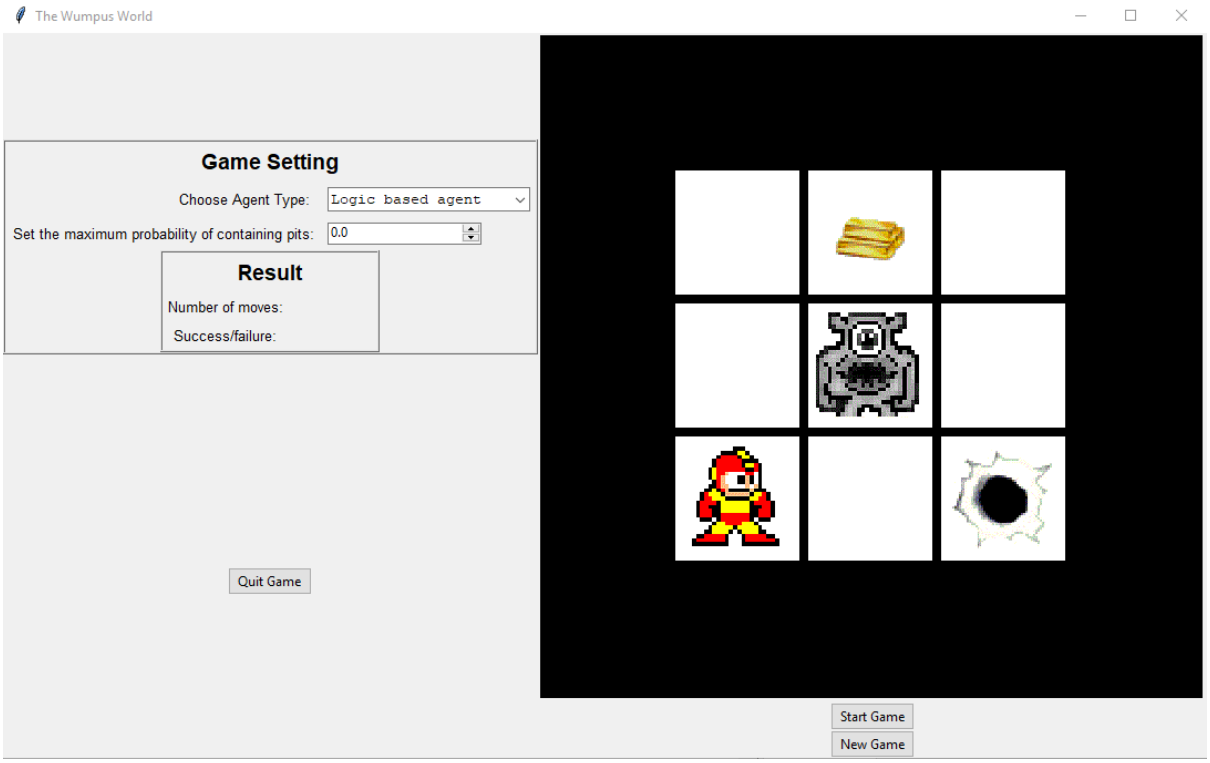
Logical -based agent is not able to find the gold and returns back to its original position (1,3) after making 5 moves. It happens because there are no room available for logical based agent to explore

PROBABALITY BASED AGENT:



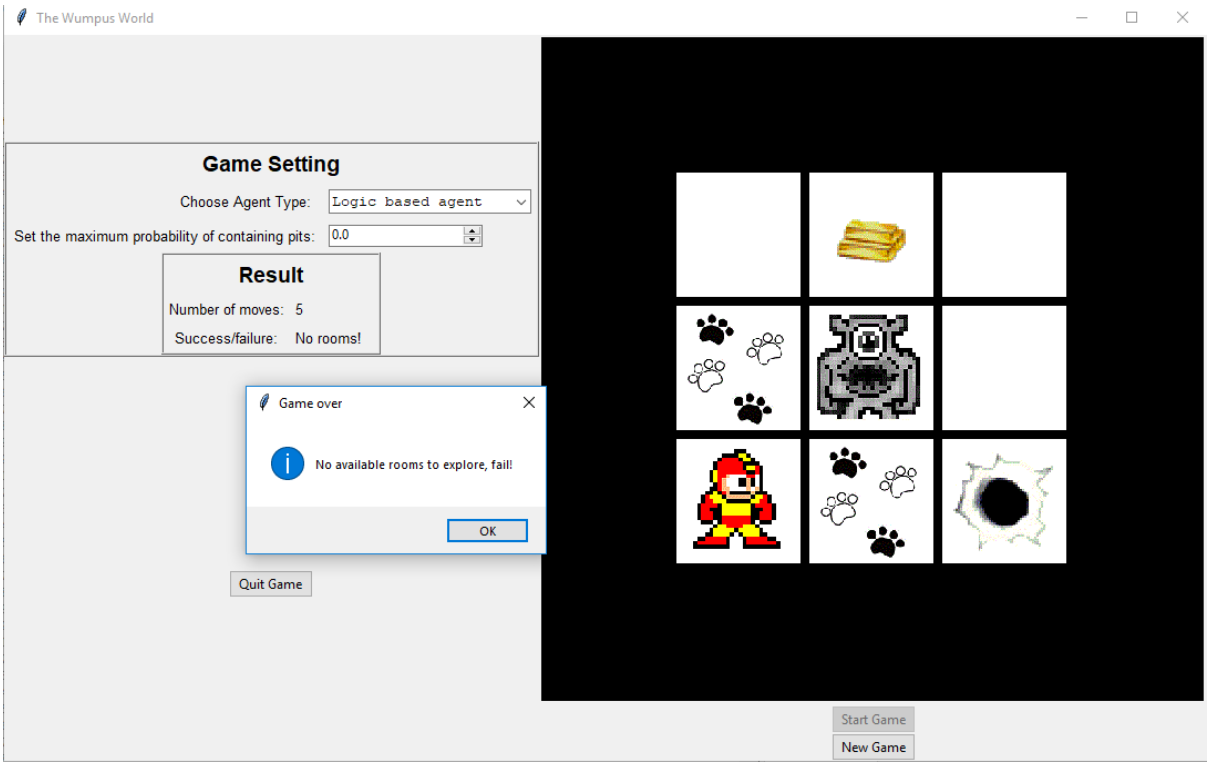
Probability based agent was successful in finding gold, it takes 5 steps to find gold. The maximum threshold probability for the agent was taken as 0.6. Compare to logical-based agent the number moves taken to complete task where same but it was unsuccessful.

CASE 2:



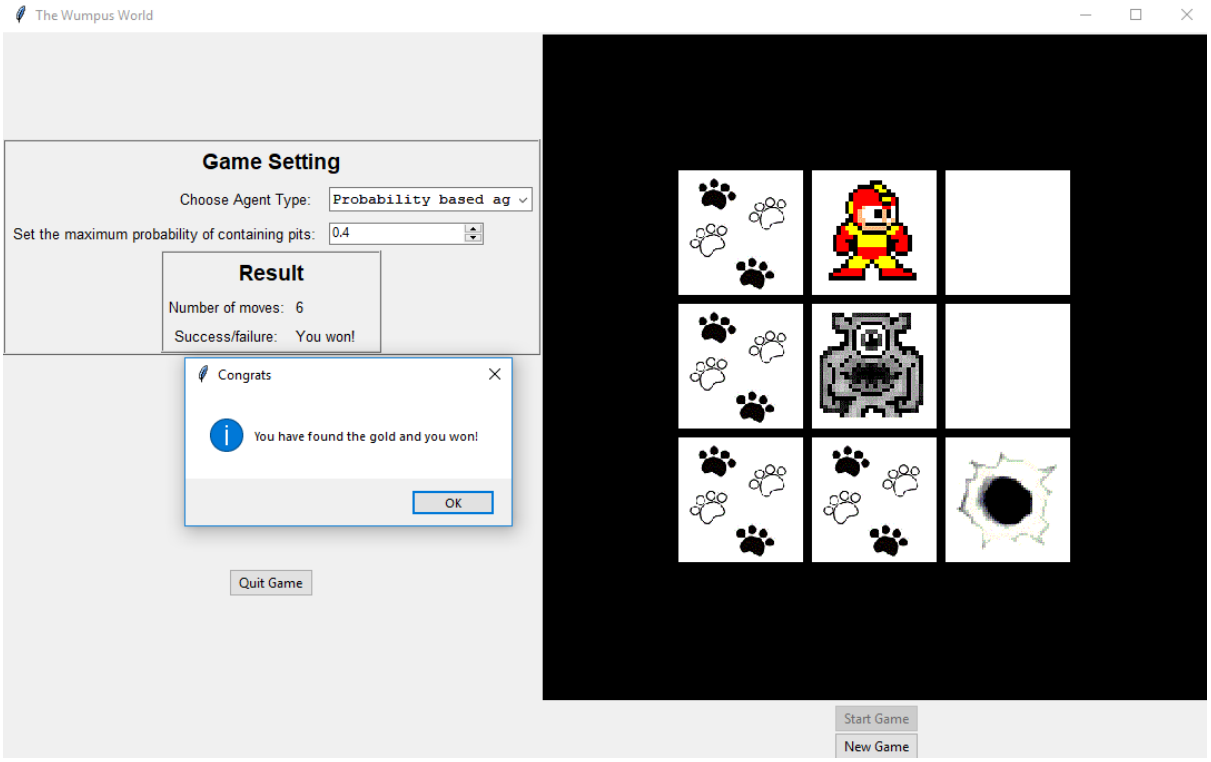
In case 2 we have positioned pit at (3,3) ,wampus is positioned at (2,2) and gold is positioned at (2,1) and the agent starts from position (1,3).

LOGICAL-BASED AGENT:



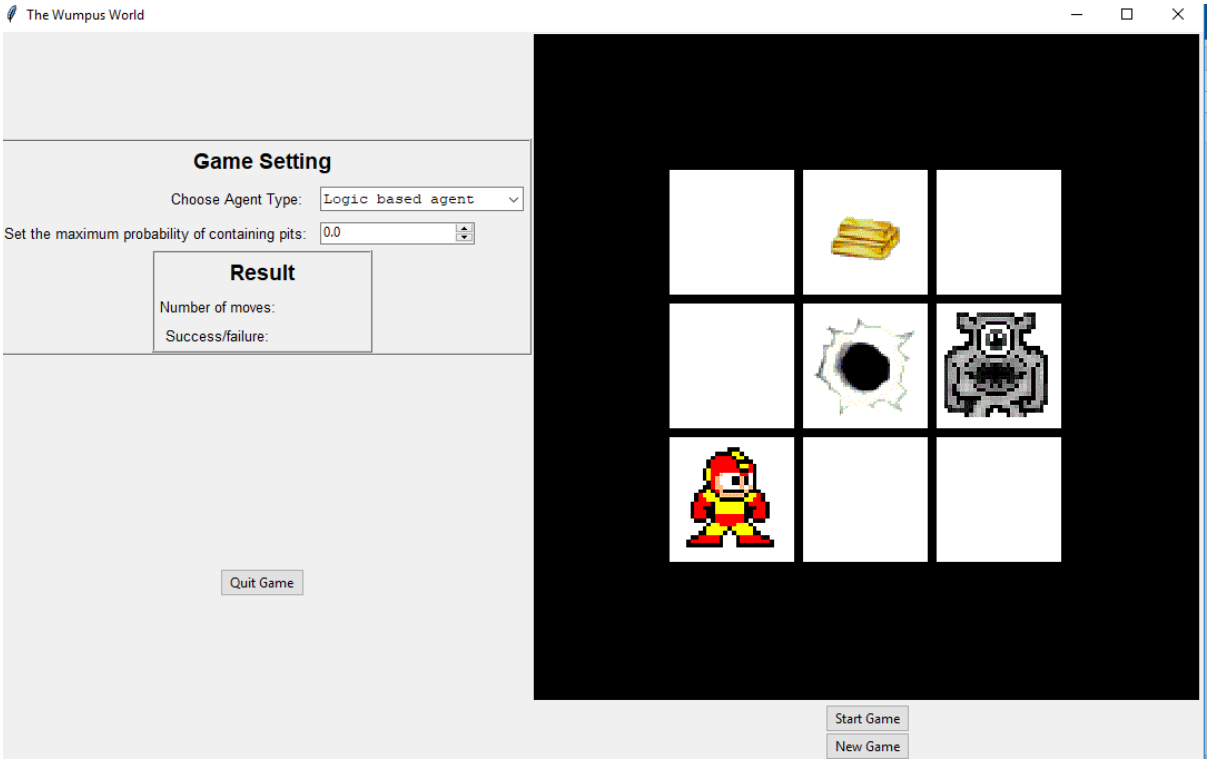
Logical -based agent is not able to find the gold and returns back to its original position (1,3) after making 5 moves. It happens because there are no room available for logical based agent to explore.

PROBABALITY BASED AGENT:



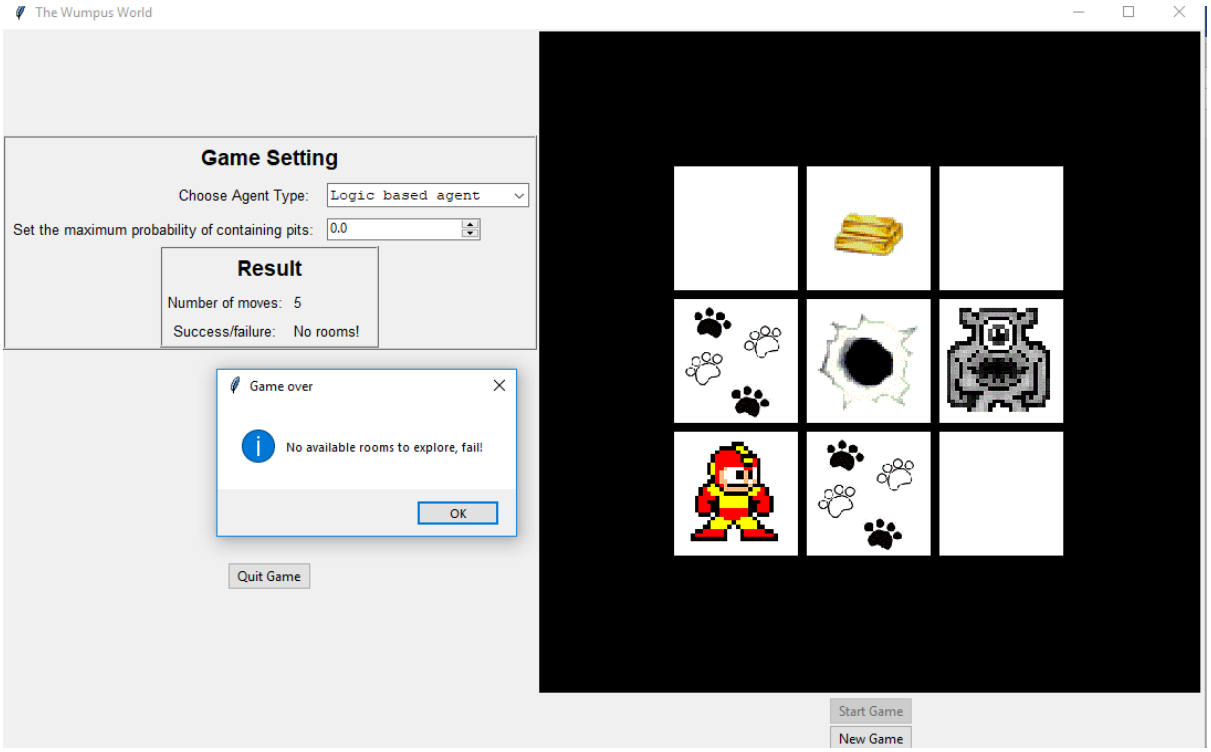
Probability based agent was successful in finding gold, it takes 6 steps to find gold. The maximum threshold probability for the agent was taken as 0.4. Compare to logical-based agent the number moves taken to complete task where 5 but it was unsuccessful.

CASE 3:



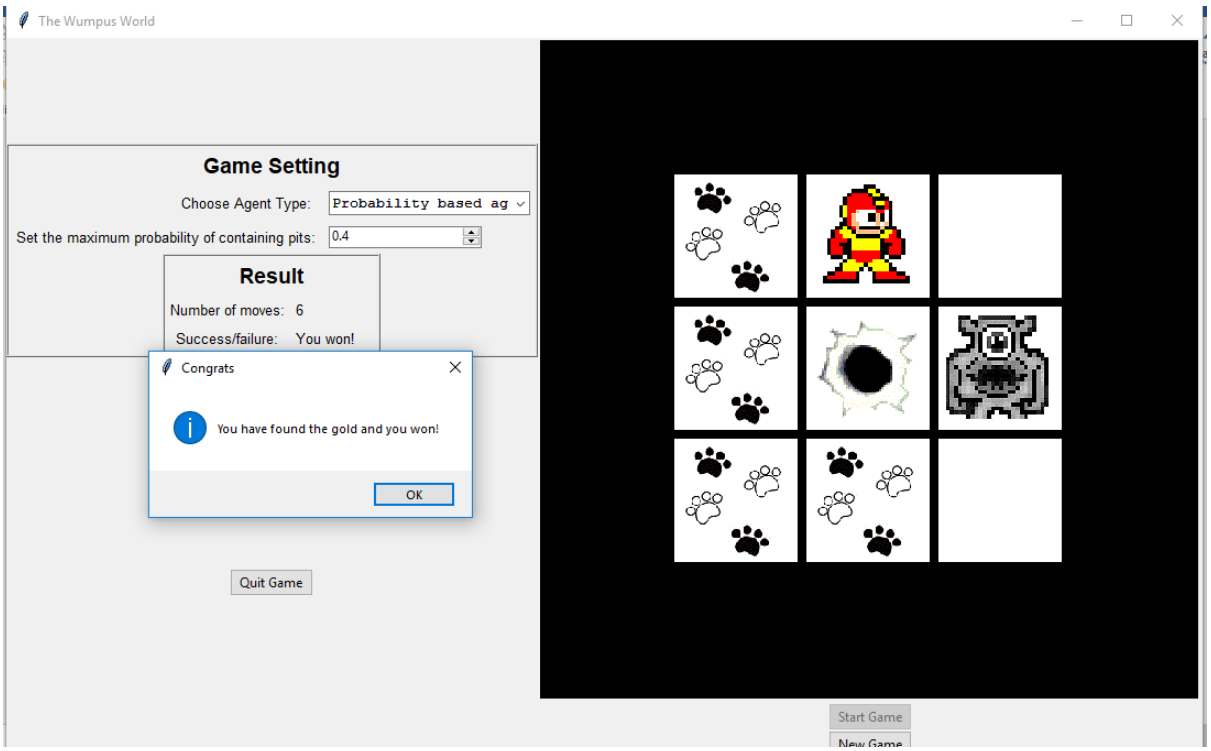
In case 2 we have positioned pit at (2,2) ,wampus is positioned at (3,2) and gold is positioned at (2,1) and the agent starts from position (1,3).

LOGICAL-BASED AGENT:



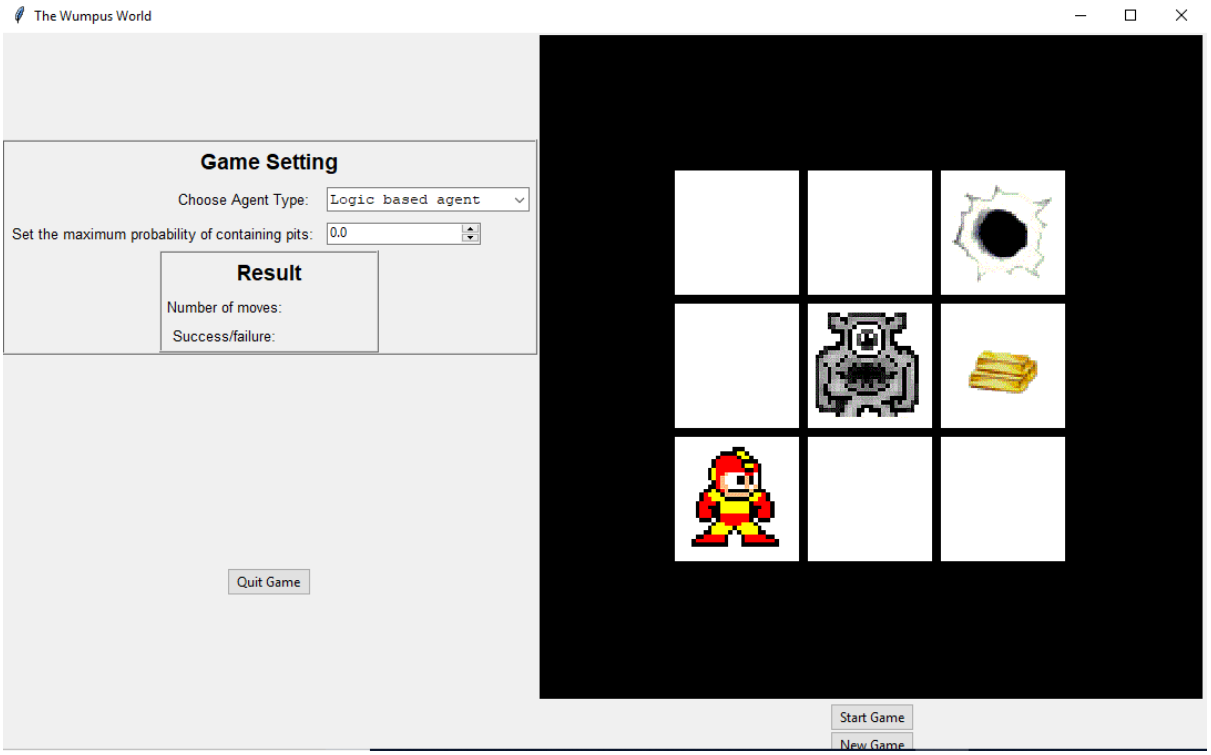
Logical -based agent is not able to find the gold and returns back to its original position (1,3) after making 5 moves. It happens because there are no room available for logical based agent to explore

PROBABALITY BASED AGENT:



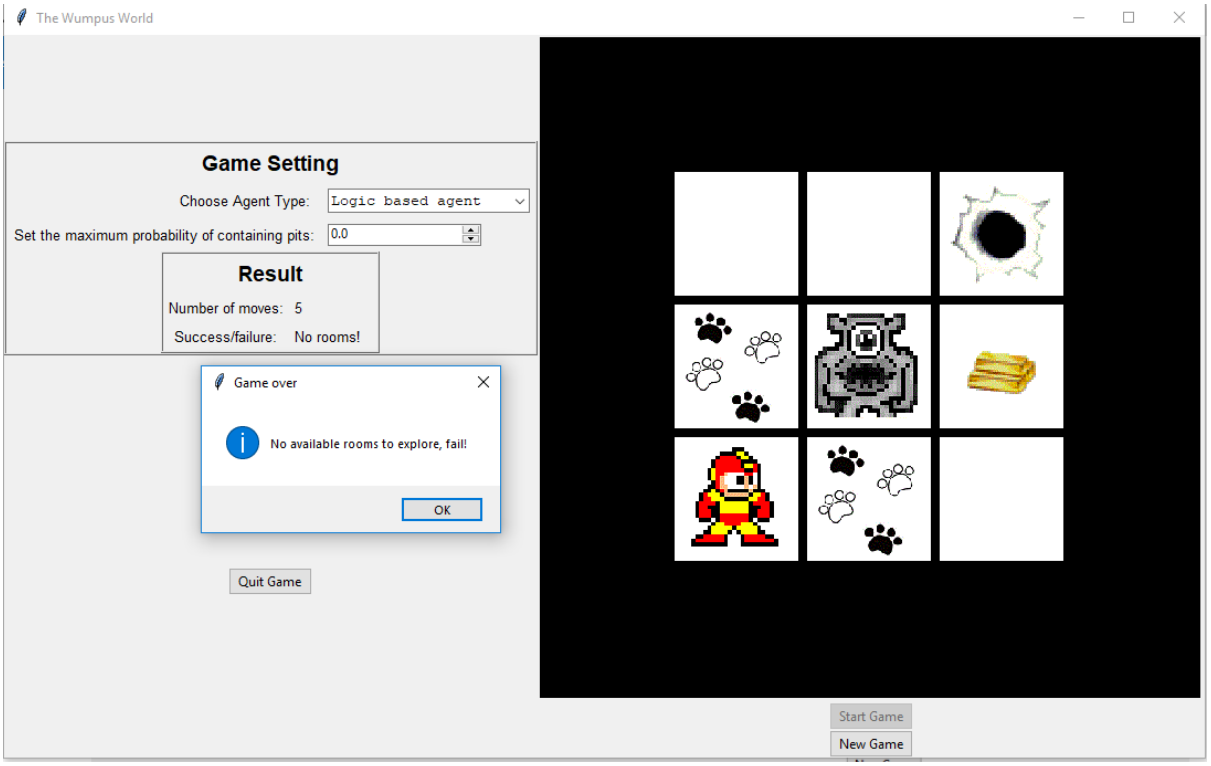
Probability based agent was successful in finding gold, it takes 6 steps to find gold. The maximum threshold probability for the agent was taken as 0.4. Compare to logical-based agent the number moves taken to complete task where 5 but it was unsuccessful.

CASE 4:



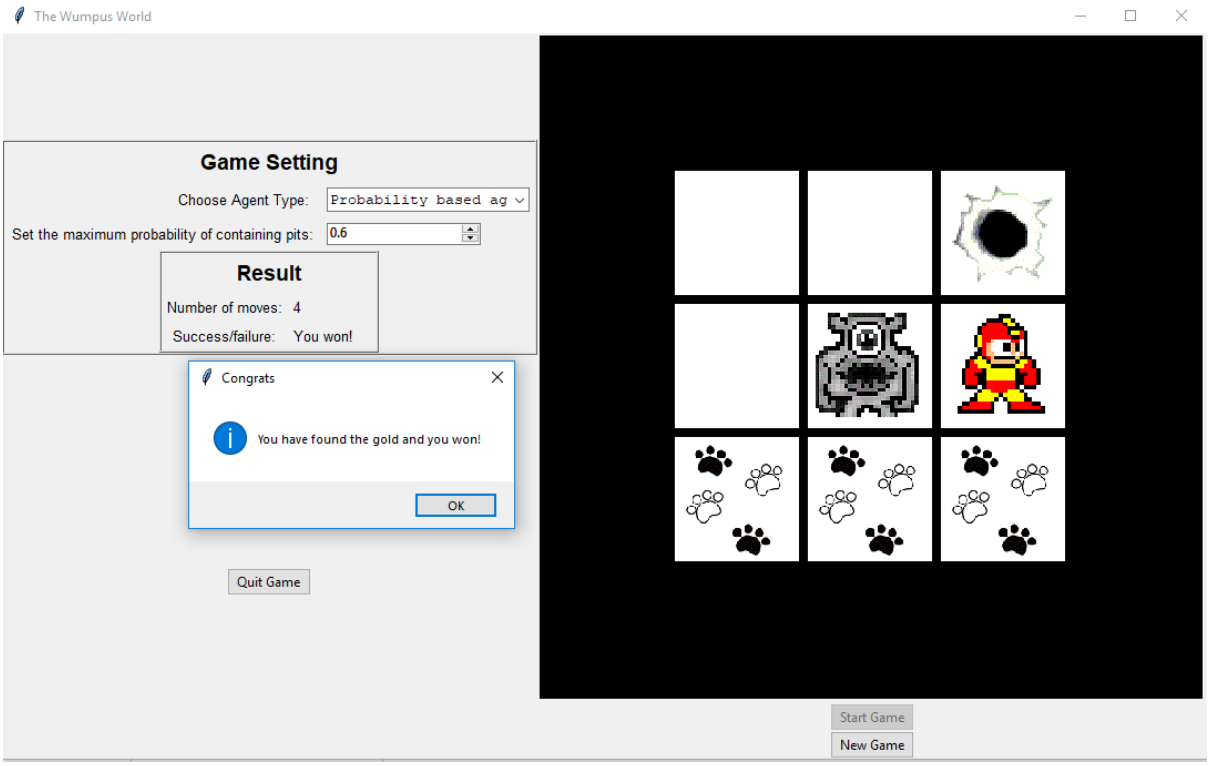
In case 2 we have positioned pit at (3,1) ,wampus is positioned at (2,2) and gold is positioned at (3,2) and the agent starts from position (1,3).

LOGICAL-BASED AGENT:



Logical -based agent is not able to find the gold and returns back to its original position (1,3) after making 5 moves. It happens because there are no room available for logical based agent to explore

PROBABALITY BASED AGENT:



Probability based agent was successful in finding gold, it takes 4 steps to find gold. The maximum threshold probability for the agent was taken as 0.6. Compare to logical-based agent the number moves taken to complete task where 5 but it was unsuccessful.