

Approach

- A version of hybrid wumpus agent was implemented to solve the assignment.
- The knowledge base was maintained in CNF Form and literals [1,64] and [-64,-1] were used to represent information inside clauses. For room at coordinate (x,y) :-
 - $x + 4*(y-1)$ represents that wumpus is present in the room.
 - $-1*(x + 4*(y-1))$ represents that wumpus is not present in the room.
 - $16 + x + 4*(y-1)$ represents that stench is present in the room.
 - $-1*(16 + x + 4*(y-1))$ represents that stench is not present in the room.
 - $32 + x + 4*(y-1)$ represents that pit is present in the room.
 - $-1*(32 + x + 4*(y-1))$ represents that pit is not present in the room.
 - $48 + x + 4*(y-1)$ represents that breeze is present in the room.
 - $-1*(48 + x + 4*(y-1))$ represents that breeze is not present in the room.
- The following background knowledge was initially added to the knowledge base in CNF form:-
 - Wumpus and Pit are not present in room [1,1]
 - Wumpus at room (x,y) \leftrightarrow Stench in adjacent rooms
 - Pit at room (x,y) \leftrightarrow Breeze in adjacent rooms
 - Only one wumpus and only one pit is present.
- In the main function, a while loop runs until the agent reaches the room [4,4]. At each iteration, the current percept is sent to the wumpusAgent function which returns a list of action that the agent must follow.
- The wumpusAgent function calls ask function to check which of the adjacent rooms are safe. The ask function uses DPLL algorithm to check whether the knowledge base is satisfiable.
- The DPLL algorithm uses early termination heuristic, pure symbol heuristic and unit clause heuristic to check the satisfiability of the knowledge base
- BFS algorithm was used to find a path from current room to next safe room

Comparison of Heurestics

- The following table shows the total number of times DPLL algorithm was called. Here, inputs are as follows:-
 - Input 1 : Wumpus = [2,3], Pit = [3,2] (Input given in Agent.py)
 - Input 2 : Wumpus = [3,1], Pit = [4,3]
 - Input 3 : Wumpus = [3,3], Pit = [3,4]
- The heuristics are referred to as following in the table:-
 - h1 = early termination heuristic.
 - h2 = pure symbol heuristic.
 - h3 = unit symbol heuristic.

Heuristics	Input 1	Input 2	Input 3
h1	4588	4641	7265
h1 + h2	3904	4071	6223
h1 + h3	48	56	54
h1 + h2 + h3	48	56	54

- Also another implementation was used to solve the problem which had separate knowledge base for wumpus and pit. The results for that implementation are mentioned below

Heuristics	Input 1	Input 2	Input 3
h1	1142	1886	1254
h1 + h2	1088	1791	1220
h1 + h3	31	33	41
h1 + h2 + h3	31	33	41

- As we can see from the results unit clause heuristic is much more dominating than pure symbol heuristic. Also using separate knowledge base for wumpus and pit leads to better results