AI Assignment 2 Report

WUMPUS WORLD AGENT

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Approach

- Used DPLL Algorithm for Inferences (eg. KB ⊨ !w11) with following Heuristics
    - Early Termination
    - Pure Symbol Heuristic
    - Unit Clause Heuristic
    - Random Variable Ordering Heuristic
    - Random Value Ordering Heuristic
    - Random Restart heuristic (in one of the approach)
- Used the HYBRID-WUMPUS-AGENT algorithm for the agent to get percepts, draw inferences and take action according to the knowledge base
- Used BFS to find the action sequence for the agent
- Knowledge Base (in CNF form):
    - Initially
        - !w11
        - !p11
        - !w44
        - !p44
        - Atleast 1 wumpus
            - w11 ∨ w12 ∨ … ∨ w34 ∨ w44
        - Atleast 1 pit
            - p11 ∨ p12 ∨ … ∨ p34 ∨ p44
        - Almost 1 wumpus
            - !w11 ∨ !w12, … , !w34 ∨ !w44
        - Almost 1 pit
            - !p11 ∨ !p12, … , !p34 ∨ !p44
    - On visiting new room (let r22), add:
        - Percepts depending on the sensor output. eg. s31, !w31
        - Breeze and Stench rules for the current location (only considering the rooms which are not in the safe set)
            - b22 ↔(p12 ∨ p23 ∨ p32 ∨ p21)
            - !b22 ↔(!p12 ∧ !p23 ∧ !p32 ∧ !p21)
            - s22 ↔(w12 ∨ w23 ∨ w32 ∨ w21)
            - !s22 ↔(!w12 ∧ !w23 ∧ !w32 ∧ !w21)
        - If the room r23 is inferred safe
            - !w23
            - !p23

Comparison of Various Methods Used

- All tests are run on the given wumpus world
- Since Random Value Heuristic is used, the number of DPLL calls and time taken differs in each run. So a minimum of 5 runs has been reported.

Result Table

Method	Parameters	run 1		run 2		run 3		run 4		run 5		Best run		Average run	
		Time	DPLL Calls	Time	DPLL Calls	Time	DPLL Calls	Time	DPLL Calls	Time	DPLL Calls	Time	DPLL Calls	Time	DPLL Calls
Unit Clause, Pure Symbol, Random Restart, Random Variable Ordering, Random Value Ordering, Random Room Ordering	alpha = 1.5, initial restart limit = 300	3.04	3522	4.03	5537	3.96	3091	3.59	2969	2.10	1998	2.10	1998	3.35	3423
Unit Clause, Pure Symbol, Random Restart, Random Variable Ordering, Random Value Ordering, Random Room Ordering	alpha = 1.1, initial restart limit = 300	9.01	11310	6.98	8102	4.18	5617	6.98	6260	5.65	8538	4.18	5617	6.56	7965
Pure Symbol, Random Restart, Random Variable Ordering, Random Value Ordering, Random Room Ordering	alpha = 1.5, initial restart limit = 300	5.47	4735	4.12	5720	3.46	3046	3.24	4069	5.25	9914	3.24	3046	4.31	5497
Unit Clause, Random Restart, Random Variable Ordering, Random Value Ordering, Random Room Ordering	alpha = 1.5, initial restart limit = 300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unit Clause, Pure Symbol, Random Restart, Random Variable Ordering, Random Room Ordering	alpha = 1.5, initial restart limit = 300	2.96	3446	4.65	5702	5.12	5181	5.32	4388	5.57	6852	2.96	3446	4.72	5114
Unit Clause, Pure Symbol, Random Restart, Random Variable Ordering, Random Value Ordering	alpha = 1.5, initial restart limit = 300	6.35	4572	4.80	5280	6.37	5874	3.13	3458	4.61	5882	3.13	3458	5.05	5013

- Method 4 (without Pure Symbol heuristic) did not complete the run in a reasonable time.