

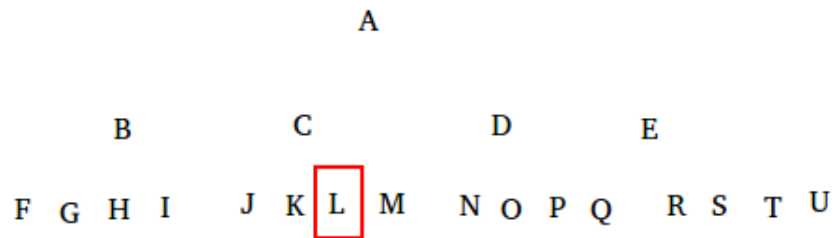
Artificial Intelligence Homework - 5

Garima Prasad
Sogol Haghighat

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1 Describe an example state space or problem in which iterative deepening search performs much worse than depth-first search.

Iterative deepening search performs much worse than depth-first search in scenarios where the branching factor, b is greater than the depth of the goal state, d . For example consider the following scenario:



In the above figure:

Branching factor, $b = 4$

L - is the goal, and

The goal-depth, $d = 3$

Therefore, $b > d$

In Iterative deepening search, the visited nodes are:

A, A, B, C, D, E, A, B, C, D, E, F, G, H, I, J, K, L

And in Depth-first search:

A, B, F, G, H, I, C, J, K, L

Thus, iterative deepening visited 18 nodes, whereas depth-first search visited 10 nodes.

Thus, for any state space where $b > d$, and the goal lies on the left side, iterative deepening performs worse than depth-first search.

2 Describe the performance of the algorithm in each map

2.1 Map 1

Deepest level reached: 225
Total of stored nodes: 291901
Total of visited nodes: 291789
Total number of Goals: 4
Number of Goals found: 4

Observation:

Space Complexity: Very High
Time Complexity: Good
Complete: Yes

2.2 Map 2

Deepest level reached: 159
Total of stored nodes: 115259
Total of visited nodes: 115219
Total number of Goals: 9
Number of Goals found: 9

Observation:

Space Complexity: High
Time Complexity: Good
Complete: Yes

2.3 Map 3

Deepest level reached: 116
Total of stored nodes: 8457207
Total of visited nodes: 8460591
Total number of Goals: 9

Number of Goals found: 8

Note: The deepest level doesnot take into consideration the unreachable goal

Observation:

Space Complexity: Very High

Time Complexity: Good

Complete: No

Conclusion

Even though iterative deepening search has high space complexity, the time complexity is very good, which makes it desirable. The algorithm is complete for finite state space and optimal.