Week 2 Part 2

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1 Tree Search

1.1 Breadth First Search

State is represented in a queue. General search steps:

- Visit all level x node's in the queue,and expand the node (add children to the queue)
- Once all level x nodes have been visited, repeat
- FIFO

BFS is optimal if the depth of the tree is a reflection of cost (a 4 cost goal will be at level 4). BFS finds the shallowest goal state.

Uniform cost search expands only the lowest cost node on the fringe. This remedies issue where BFS does not retrieve optimal solution when depth is not proportional to cost.Queue is ordered from least to highest cost (dijkstra).

1.2 Depth First Search

- Go down own track (left) until you process leaf node
- Go down second track (right) and repeat

Properties:

- If depth of tree is finite, problem is complete
- Not optimal (goal node in right sub-tree only looked at after entire left sub-tree is done)
- Time: O(b^m) where b is the maximum branching factor of the tree and m is the maximum height of the tree
- Space: O(bm), the size of the deepest stack

Depth limited search will limit the depth in search. Once the depth limit is reached, the traversal will go back up the tree.

Properties:

- Complete if depth of solution is lower than depth-limit ($d \leq l$)
- Not optimal
- Always terminates
- Time: O(b^l)
- Space: O(bl)

If $l >> d$, depth-limited search may be slower then breadth-first search.