∞ on DFS there is no guarantee that the path is optimal ✗

Page 1

U25712111

for DFS order of neighbour matters

In-class Activity

ME 570 - Prof. Tron

2023-10-31

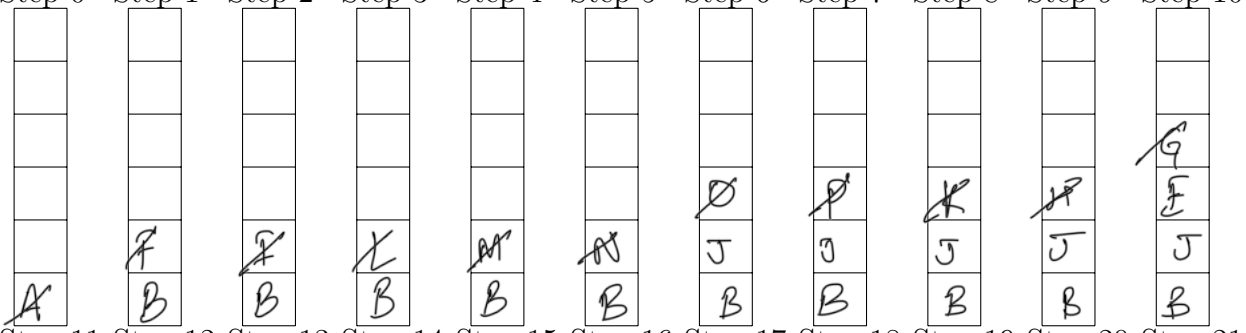
Problem 1: Depth-First Search

Question 1.1. Consider the discretized environment in the figure below, with a four-connected neighborhood. Manually run the DFS algorithm from the start location **A** to the end location **E**. For each step, keep track of the content of the stack in the provided diagram. For each node, the neighbors should be considered in the order *down, right, up, left*. As you proceed, mark the cells in the figure with an arrow for the backpointer, and a number for the backpointer cost.

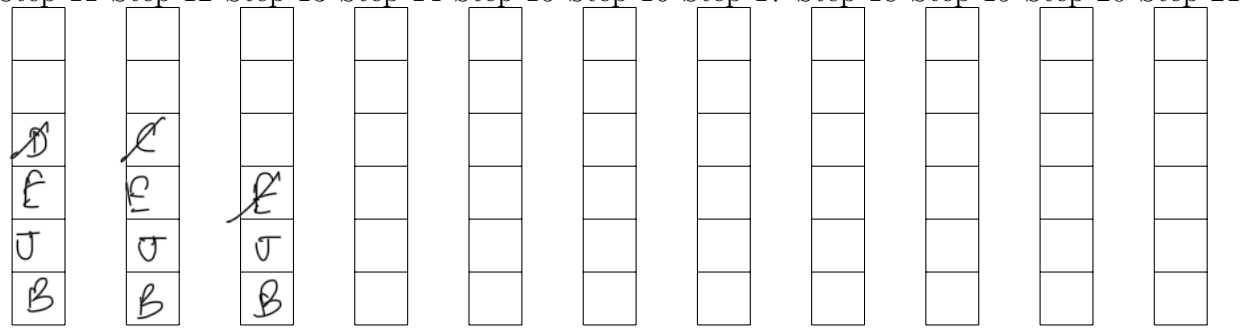
3 ↓ L	4 ← M	← 5 N	← 6 O	← 7 P
2 ↓ I		6 J		↑ 8 K
1 ↓ F			10 G	↑ 9 H
0 ↓ **A**	13 → B	12 → C	11 ↑ D	Goal **E**

4 connected graph grid with updown left/right edges

Step 0 Step 1 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7 Step 8 Step 9 Step 10



Step 11 Step 12 Step 13 Step 14 Step 15 Step 16 Step 17 Step 18 Step 19 Step 20 Step 21



Question 1.2. Give the sequence of letters corresponding to the path found from A to E.

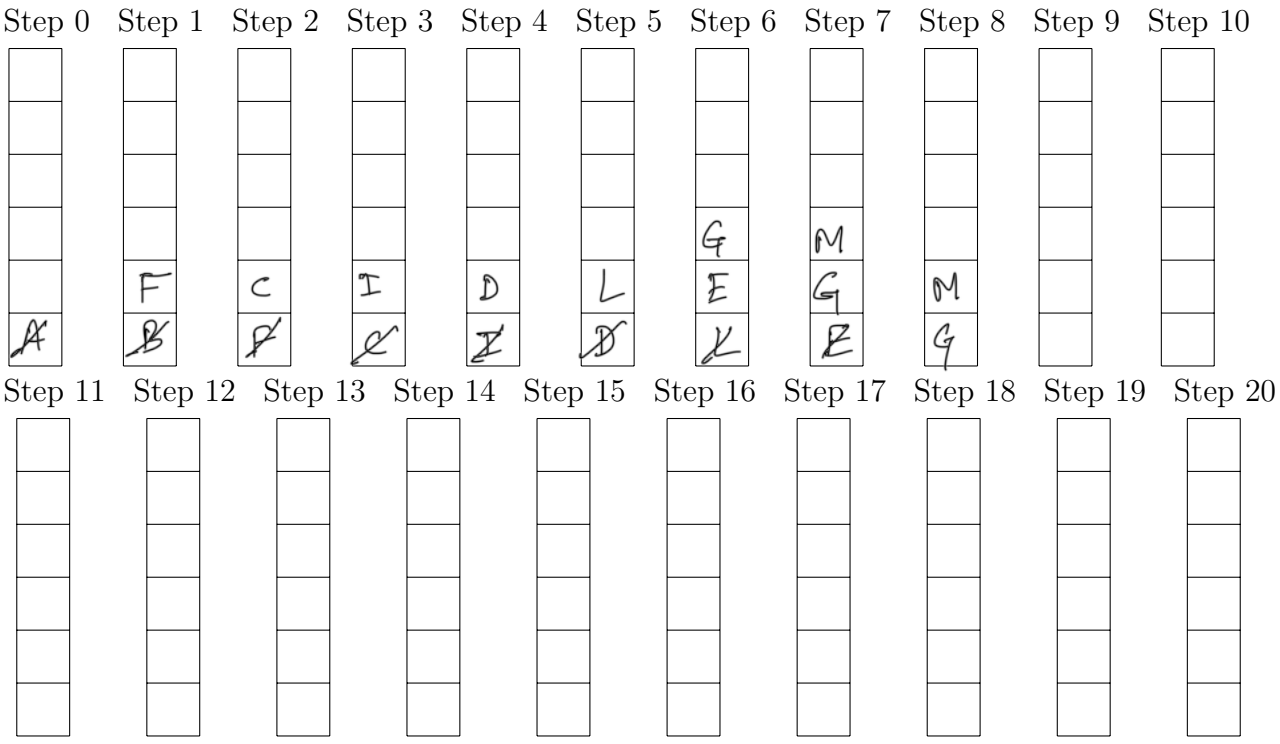
A F I L M N O P K H E

Problem 2: Breadth-First Search

* It is complete
* It is optimal; the path returned is the shortest one

Question 2.1. Repeat question 1.1, but using BFS.

↓ 3 L	← 4 M	N	O	P
↓ 2 I		J		K
↓ 1 F			↓ 4 G	↓ 5 H
0 **A**	← 1 B	← 2 C	← 3 D	← 4 **E**



Question 2.2. Give the sequence of letters corresponding to the path found from A to E.

A B C D E

* BFS :- All nodes at a distance d are expanded before any node at distance d+1

Problem 3: A star (A*)

Question optional 3.1. Find the path from node **A** to node O using an 8-connected neighborhood.

priority queue using estimated cost

3 L 4.0	M 3.0	N 2.0		O 0.0
2 I 4.12		4.28 J 2.24		4.28 K 1.0
1 F 4.47			3.14 G 2.24	4.14 H 2.0
0 A 5.0	B 1 4.24	C 2 3.61	D 3 3.16	4.28 E 3.0

Step 0	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
					O 6.52					
					K 5.28					
					H 6.14					
				C 5.38	E 1.28					
	F 5.47	C 5.61	I 6.12	D 6.16	D 6.16					
A 5.0	B 5.24	F 5.47	C 5.61	I 6.12	I 6.12					

Step 11	Step 12	Step 13	Step 14	Step 15	Step 16	Step 17	Step 18	Step 19