CS 312: Artificial Intelligence Laboratory Lab 1 Report

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1 Introduction

The objective of this task is to simulate breadth-first search, depth-first search, and DFID in the state space. The state-space consists of an m x n grid. The start state is (0,0). The goal state is the position of (*) in the grid. The Pacman is allowed to move UP, DOWN, LEFT and RIGHT (except for boundary). A comparison of the path length and the number of states explored between the different search methods and, also between the orders in which neighbours are added, are performed.

2 Pseudo Code

2.1 MoveGen(state)

The function takes a state as input and returns a set of states that are reachable from the input state in one step.

Algorithm 1 moveGen(state)

1: **procedure** MOVEGEN(state)
2:     $nextStates \leftarrow ()$ ▷ initialize nextStates to empty set
3:     **for** neighbour n of $state$ in order(DOWN,UP,RIGHT,LEFT) **do**
4:         **if** n is not boundary **then**
5:             $nextStates.append(n)$
6:     **return** $nextStates$ ▷ nextStates are required moves generated

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2.2 GoalTest(state)

Returns true if the input state is goal and false otherwise.

Algorithm 2 goalTest(state)

1: **procedure** GOALTEST(state)
2:     **if** $state.value == '*'$ **then**
3:         **return** $true$
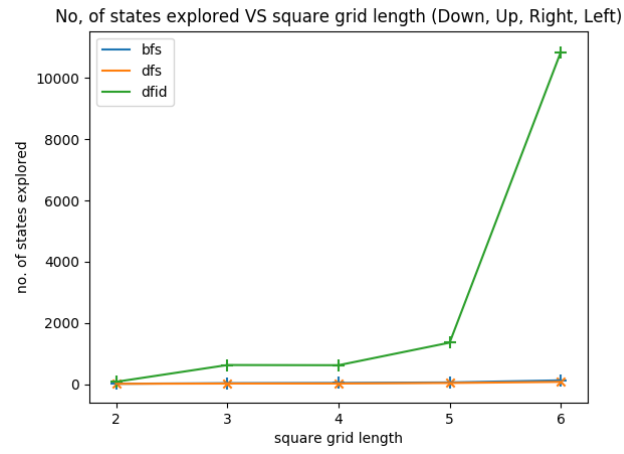4:   **return** $false$ ▷ state is not goal

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3 Results, Statistics and Plots

3.1 Order: Down, Up, Right, Left

Algorithm	Statistics (cell width=3,cell height=2)			
	No. horizontal cells	No. vertical cells	No. states explored	Path length
BFS	2	2	15	10
DFS	2	2	14	10
DFID	2	2	80	10
BFS	3	3	35	23
DFS	3	3	23	23
DFID	3	3	627	23
BFS	4	4	42	24
DFS	4	4	24	24
DFID	4	4	621	24
BFS	5	5	59	33
DFS	5	5	41	33
DFID	5	5	1358	33
BFS	6	6	127	50
DFS	6	6	77	50
DFID	6	6	10846	50

3.2 Order: Left, Right, Up, Down

Algorithm	Statistics (cell width=3, cell height=2)			
	No. horizontal cells	No. vertical cells	No. states explored	Path length
BFS	2	2	13	10
DFS	2	2	11	10
DFID	2	2	81	10
BFS	3	3	35	23
DFS	3	3	29	29
DFID	3	3	832	23
BFS	4	4	42	24
DFS	4	4	46	26
DFID	4	4	862	24
BFS	5	5	59	33
DFS	5	5	82	37
DFID	5	5	2172	33
BFS	6	6	127	50
DFS	6	6	92	62
DFID	6	6	11274	50

(a) Coffee.
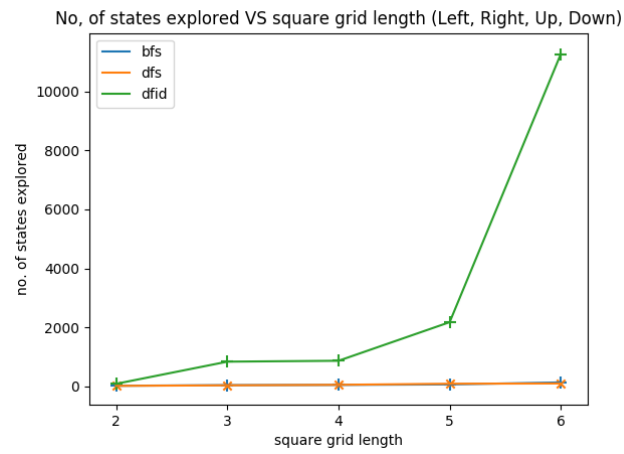
(b) More coffee.

Figure 1: The same cup of coffee. Two times.

4   Conclusion

The results of the dependence of the path length and number of states explored, as seen in the previous section, are summarized in the table below.

Algorithm	Dependence on order of neighbours added	
	No. States Explored	Path Length
BFS	True	False
DFS	True	True
DFID	True	False

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