CS 312: Artificial Intelligence Laboratory

Lab 1 report

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- ## 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 where the start state is (0,0). The goal state is the position of (*) in the grid. The Pac-man is allowed to move UP, DOWN, LEFT and RIGHT (except for boundary). We have performed comparison between above search algorithms on the basis of path length taken by algorithm and number of states explored (visited) during the search, also analysed whether result depends on the order in which neighbours of each node are added or not.

- ## Pseudocode:

 ### a) GoalTest :

```
function GoalTest(current_node) :
     if current_node is * :
          return True
     else :
          return False
```

b) MoveGen :

```
function MoveGen( neighbourDict, current_node):

    if current_node is not lowermost:
        down_node = node below current_node
        if down_node is not obstacle:
            append down_node to neighbourDict

    if current_node is not uppermost:
        up_node = node above current_node
        if up_node is not obstacle:
            append up_node to neighbourDict

    if current_node is not rightmost:
        right_node = node right to current_node
        if right_node is not obstacle:
            append right_node to neighbourDict

    if current_node is not leftmost:
        left_node = node left to current_node
        if left_node is not obstacle:
            append left_node to neighbourDict

    return neighbourDict
```

- **Results:**

1) Order : Down, Up, Right, Left

Algorithm	Statistics (Cell width=3, Cell height=2)			
	Horizontal cells	Vertical cells	States explored	Path length
BFS	2	2	13	10
DFS	2	2	14	10
DFID	2	2	63	10
BFS	3	3	31	25
DFS	3	3	26	25
DFID	3	3	408	25
BFS	4	4	47	28
DFS	4	4	29	28
DFID	4	4	600	28
BFS	5	5	81	45
DFS	5	5	60	45
DFID	5	5	2360	45
BFS	6	6	82	42
DFS	6	6	43	42
DFID	6	6	1311	42

2) Order : *Left, Right, Up, Down*

Algorithm	Statistics (Cell width=3, Cell height=2)			
	Horizontal cells	Vertical cells	States explored	Path length
BFS	2	2	15	10
DFS	2	2	11	10
DFID	2	2	81	10
BFS	3	3	31	25
DFS	3	3	29	29
DFID	3	3	465	29
BFS	4	4	46	28
DFS	4	4	52	32
DFID	4	4	1632	32
BFS	5	5	82	45
DFS	5	5	66	49
DFID	5	5	2544	49
BFS	6	6	82	42
DFS	6	6	114	52
DFID	6	6	7556	52

Conclusion :

The results of the dependence of the path length and number of states explored is as below:

1) For BFS, we observe that the number of explored states is changing for different order of neighbours.But the length of path stays constant.
2) For DFS, we observe that the number of explored states is changing for different order of neighbours. Also, the length of path increases.

3) For DFID, we observe that the increase in the number of explored states is due to the small branching factor. Also, the length of path increases.