

**Modern Education Society's  
Wadia College of Engineering, Pune-01  
Department of Computer Engineering**

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| <b>NAME OF STUDENT:</b>     | <b>CLASS:</b>              |
| <b>SEMESTER/YEAR:</b>       | <b>ROLL NO:</b>            |
| <b>DATE OF PERFORMANCE:</b> | <b>DATE OF SUBMISSION:</b> |
| <b>EXAMINED BY:</b>         | <b>EXPERIMENT NO: 01</b>   |

**TITLE:** Depth First Search Algorithm And Breadth First Search Algorithm

**PROBLEM STATEMENT:** Implement Depth first search algorithm and Breadth First Search algorithm, use an undirected graph and develop a recursive algorithm for searching all the vertices of a graph or tree data structure.

**OBJECTIVES:**

1. To understand Depth first search and Breadth first search algorithm and its importance.
2. To understand the implementation of a recursive algorithm.

**THEORY:**

Breadth-First Search (BFS) and Depth-First Search (DFS) are two fundamental algorithms used for traversing or searching graphs and trees.

**1. Depth First Search (DFS) :**

- Depth-first search is a recursive algorithm for traversing a tree or graph data structure.
- It is called the depth-first search because it starts from the root node and follows each path to its greatest depth node before moving to the next path.
- DFS uses a stack data structure for its implementation.
- The process of the DFS algorithm is similar to the BFS algorithm.

**Advantage:**

- DFS requires very less memory as it only needs to store a stack of the nodes on the path from root node to the current node.
- It takes less time to reach the goal node than the BFS algorithm (if it traverses in the right path).
- With the help of this we can store the route which is being tracked in memory to save time as it only needs to keep one at a particular time.

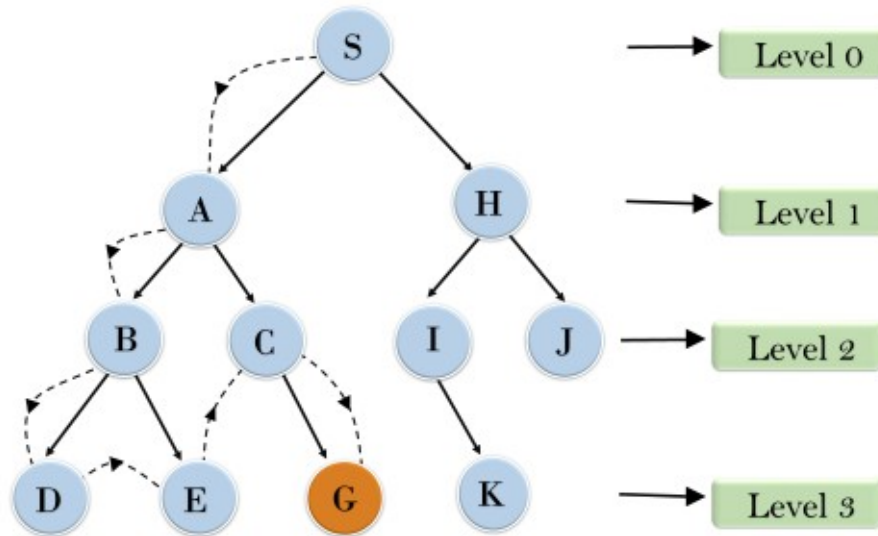
**Disadvantage:**

- There is the possibility that many states keep reoccurring, and there is no guarantee of

finding the solution.

- DFS algorithm goes for deep down searching and sometimes it may go to the infinite loop.
- The depth-first search (DFS) algorithm does not always find the shortest path to a solution.

## Depth First Search



**Output:** S -> A -> B -> D -> E -> C -> G

## 2. Breadth First Search (Level order Search)

- Breadth-first search is the most common search strategy for traversing a tree or graph. This algorithm searches breadthwise in a tree or graph, so it is called breadth-first search.
- BFS algorithm starts searching from the root node of the tree and expands all successor node at the current level before moving to nodes of the next level.
- The breadth-first search algorithm is an example of a general-graph search algorithm.
- Breadth-first search implemented using FIFO queue data structure.

### Advantages:

- BFS will provide a solution if any solution exists.
- If there are more than one solutions for a given problem, then BFS will provide the minimal solution which requires the least number of steps.
- It also helps in finding the shortest path in goal state, since it needs all nodes at the same

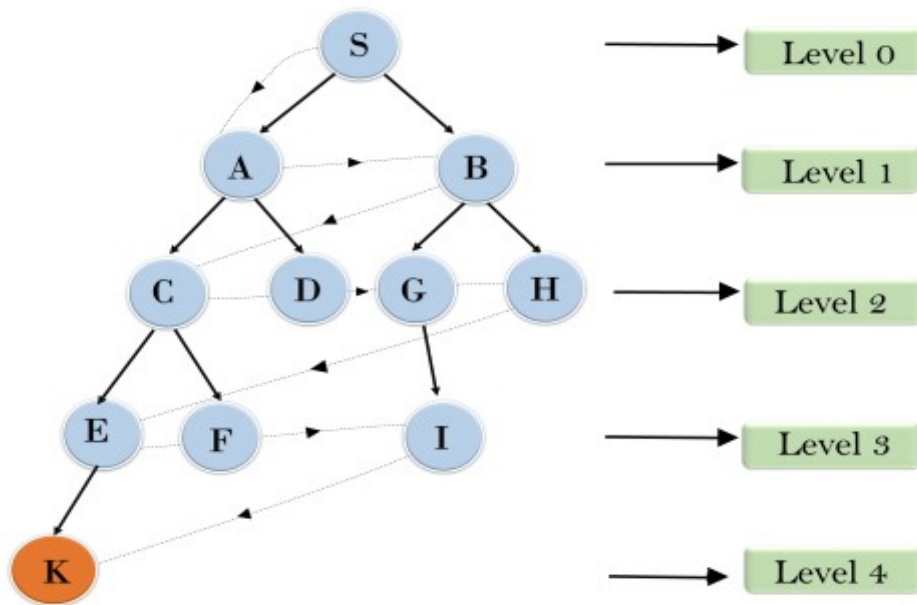
hierarchical level before making a move to nodes at lower levels.

- It is also very easy to comprehend with the help of this we can assign the higher rank among path types.

### Disadvantages:

- It requires lots of memory since each level of the tree must be saved into memory to expand the next level.
- BFS needs lots of time if the solution is far away from the root node.
- It can be a very inefficient approach for searching through deeply layered spaces, as it needs to thoroughly explore all nodes at each level before moving on to the next.

### Breadth First Search



**Output:** S---> A--->B---->C--->D---->G--->H--->E---->F---->I---->K

### Questions:

- 1] Difference between DFS & BFS.
- 2] What is time and space complexity of DFS algorithm?
- 3] What is time space complexity of BFS algorithm?