

**Date** : 26th - Oct- 2020

**Morning Session** : 9am – 11.00 PM

**By** ~ Rohan Kumar

## **Topics: Graph traversal Algo**

### **Breadth First Search**

Traversal means visiting all the nodes of a graph. Breadth First Traversal or Breadth First Search is a recursive algorithm for searching all the vertices of a graph or tree data structure.

#### **BFS algorithm**

A standard BFS implementation puts each vertex of the graph into one of two categories:

1. Visited
2. Not Visited

The purpose of the algorithm is to mark each vertex as visited while avoiding cycles.

The algorithm works as follows:

1. Start by putting any one of the graph's vertices at the back of a queue.
2. Take the front item of the queue and add it to the visited list.
3. Create a list of that vertex's adjacent nodes. Add the ones which aren't in the visited list to the back of the queue.
4. Keep repeating steps 2 and 3 until the queue is empty.

The graph might have two different disconnected parts so to make sure that we cover every vertex, we can also run the BFS algorithm on every node

## BFS Algorithm Complexity

The time complexity of the BFS algorithm is represented in the form of  $O(V + E)$ , where  $V$  is the number of nodes and  $E$  is the number of edges.

The space complexity of the algorithm is  $O(V)$ .

## BFS Algorithm Applications

1. To build index by search index
2. For GPS navigation
3. Path finding algorithms
4. In Ford-Fulkerson algorithm to find maximum flow in a network
5. Cycle detection in an undirected graph
6. In minimum spanning tree

**Please go through the Recorded lecture for Program implementation**

### [Record Lecture](#)

#### **MCQ's:**

1. Breadth First Search is equivalent to which of the traversal in the Binary Trees?
- a) Pre-order Traversal
  - b) Post-order Traversal
  - c) Level-order Traversal
  - d) In-order Traversal

**Answer: C**

2. Time Complexity of Breadth First Search is? ( $V$  – number of vertices,  $E$  – number of edges)

- a)  $O(V + E)$
- b)  $O(V)$
- c)  $O(E)$
- d)  $O(V * E)$

**Answer: A**

3. The Data structure used in standard implementation of Breadth First Search is?

- a) Stack
- b) Queue
- c) Linked List
- d) Tree

**Answer: B**

## Depth First Search

Traversal means visiting all the nodes of a graph. Depth first traversal or Depth first Search is a recursive algorithm for searching all the vertices of a graph or tree data structure.

## DFS algorithm

A standard DFS implementation puts each vertex of the graph into one of two categories:

1. Visited
2. Not Visited

The purpose of the algorithm is to mark each vertex as visited while avoiding cycles.

The DFS algorithm works as follows:

1. Start by putting any one of the graph's vertices on top of a stack.

2. Take the top item of the stack and add it to the visited list.
3. Create a list of that vertex's adjacent nodes. Add the ones which aren't in the visited list to the top of the stack.
4. Keep repeating steps 2 and 3 until the stack is empty.

## DFS Algorithm Complexity

The time complexity of the DFS algorithm is represented in the form of  $O(V + E)$ , where  $V$  is the number of nodes and  $E$  is the number of edges.

The space complexity of the algorithm is  $O(V)$ .

## DFS Algorithm Applications

1. For finding the path
2. To test if the graph is bipartite
3. For finding the strongly connected components of a graph
4. For detecting cycles in a graph

**Please go through the Recorded lecture for Program implementation**

[Record Lecture](#)

**MCQ's:**

4. Depth First Search is equivalent to which of the traversal in the Binary Trees?
- a) Pre-order Traversal
  - b) Post-order Traversal
  - c) Level-order Traversal
  - d) In-order Traversal

**Answer: A**

5 Time Complexity of DFS is? ( $V$  – number of vertices,  $E$  – number of edges)

- a)  $O(V + E)$
- b)  $O(V)$
- c)  $O(E)$
- d)  $O(V * E)$

**Answer: A**

7. A person wants to visit some places. He starts from a vertex and then wants to visit every place connected to this vertex and so on. What algorithm he should use?

- a) Depth First Search
- b) Breadth First Search
- c) Prim's algorithm
- d) Kruskal's algorithm

**Answer: B**

8. A person wants to visit some places. He starts from a vertex and then wants to visit every vertex till it finishes from one vertex, backtracks and then explores other vertex from same vertex. What algorithm he should use?

- a) Depth First Search
- b) Breadth First Search
- c) Prim's algorithm
- d) Kruskal's Algorithm

**Answer: A**

**guys go through these links before coming to tomorrow's class.**

<https://www.geeksforgeeks.org/dijkstras-shortest-path-algorithm-greedy-algo-7/>

<https://www.geeksforgeeks.org/bellman-ford-algorithm-dp-23/>