

TUTORIAL → 5

- ① BFS: sibling nodes are visited first level order traversal
- DFS: children nodes are visited first

Application of DFS

- ① Topological sort used to schedule jobs from given dependencies uses DFS algorithm.
- ② used to find strongly connected components.
- ③ Game development
- ④ Detect cycle in a graph

Application of BFS

- ① Peer to peer network like bit-torrent, BFS is used to find all neighbour nodes.
- ② Search engine crawlers.
- ③ GPS navigation system.

② BFS algorithm traverses a graph in breadthward motion and uses queue to ~~remember~~ remember to get the next vertex to start a search when a dead end occurs in iteration.

DFS uses stack to remember to get the next vertex to start search when dead end occurs in any iteration.

③ Sparse Graph is when $|E| \ll |V|^2$

Dense Graph is when $|E| \sim |V|^2$

→ adjacency list is preferred for sparse graph

→ adjacency matrix ~~is~~ for dense graph.

④ Steps involved in detecting cycles in a directed graph using BFS:-

① Compute in-degree for each of the vertex present in the graph and initialize the count of visited node as 0.

② Pick all the vertices with in-degree as 0 and add them into a queue (enqueue operation)

③ Remove a vertex from the queue (dequeue)

④ Repeat step 3 until the queue is empty

⑤ If count of visited node is not equal to the no. of nodes in the graph, it has cycle otherwise not.

DFS

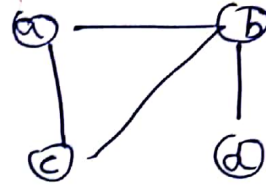
- ① create a graph using the given no. of edges & vertices.
- ② create a recursive function that initialize the current index or vertex, visited and recursion stack.
- ③ Mark the current nodes as visited and also mark the index in recursion stack.
- ④ Find all the vertices which are not visited and are adjacent to the current node. Recursively call the function for those vertices. If the function returns ~~to~~ true, return true.
- ⑤ If the adjacent vertices are already marked in the recursion stack then return true.
- ⑥ Create a wrapper class that calls the recursive function for all the vertices and if any function returns true then return true else false.
- ⑤ The disjoint set can be defined as the subsets where there is no common element b/w 2 sets.
 - making new set
 - union
 - find

⑥ BFS - $A \rightarrow B \rightarrow C \rightarrow D \rightarrow E \rightarrow F$

DFS - $A \rightarrow B \rightarrow E \rightarrow C \rightarrow D \rightarrow F \rightarrow C$

⑦ Connected component - ④

Vertices - 10



⑧ Topological sort $\rightarrow 0-1-2-3-4-5$

DFS $\rightarrow 5 \rightarrow 2 \rightarrow 3 \rightarrow 1 \rightarrow 0$

4 can't be reached

⑨ Yes, heap data structure can be used to create priority queue.

Graph algorithms using priority queue.

- Dijkstra algo to find shortest path.

- Prim's algo

- Huffman algo

⑩ min heap - ~~root~~ root element is the smallest
max heap - root element is the largest.