Daffodil International University

CSE 214

Algorithm

"Assignment-II"

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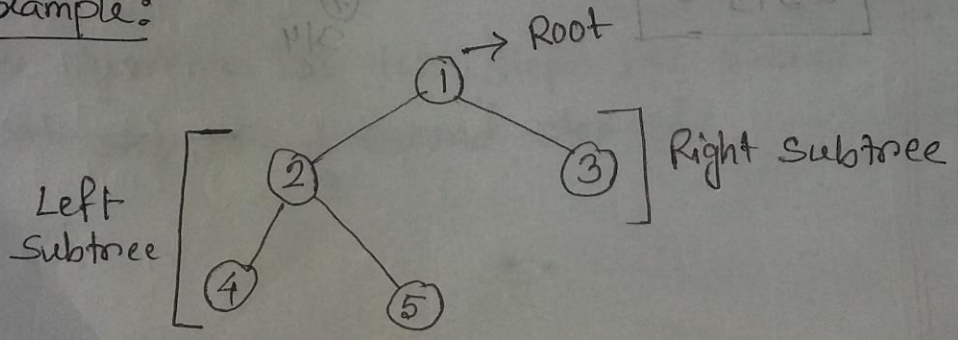
1. Full Tree Traversal

DFS: DFS Technique used for traversing tree or Graph. Here backtracking is used for traversal. In the first traversal the deepest node is visited and then backtracks to its parent node if no sibling of that not exist.

In a tree, we can simply begin from a node then traverse its adjacent without caring about cycles.

Example:



Therefore, DFS Traversal of this tree will be:

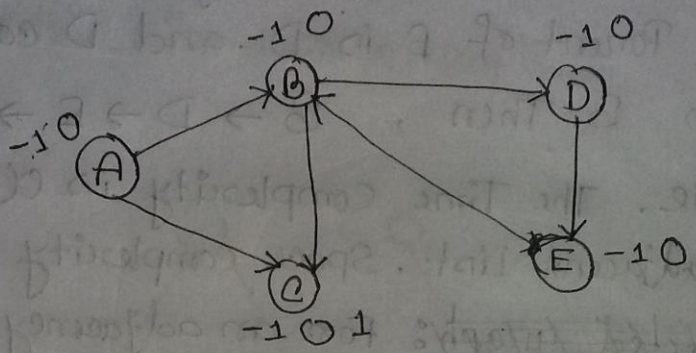
a) Inorder(Left, Root, Right) : 4 2 5 1 3

b) Preorder(Root, Left, Right): 1 2 4 5 3

c) Postorder(Left, Right, Root): 4 5 2 3 1

2. Cycle Finding

D Directed Graph:



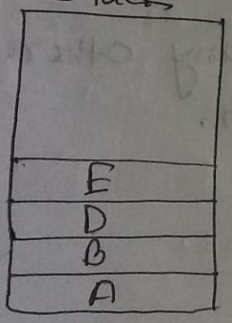
Flag:

-1 = Unvisited

0 = visited and in stack

1 = Visited and poped out from stack

Stack



Visited set

A B C D E

Vertext	Parent
A	–
B	A
C	B
D	B
E	D

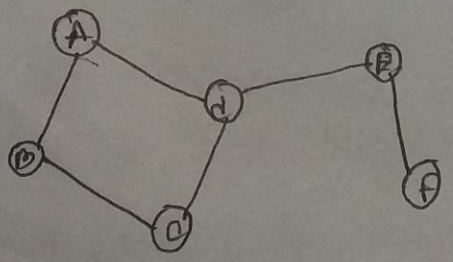
Last visited node E, Now, E → B, that edge should be find out the flag of D and B is already in this stack. So, that edge E to B is a cycle. Parent of E is D. and D comes out from B. Then, B → D → E → B is a cycle. The Time complexity is O(V+E) for an adjacent List. Space complexity is O(V).

~~Undirected graph~~: For an adjacency matrix, both Complexity would be O(V^2)

3. Component Finding

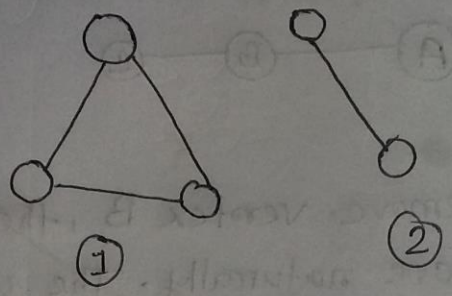
Component is a is a subgraph any two vertices are connected by paths and no vertices are connected with any other vertices in the Super graph.

Here is an example:



This is a graph. Every node is connected with each other. This graph has one connected components.

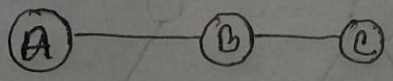
Again, here is at an example.



This is also a graph. But Every node is not connected with each other. This graph has two connected components.

Articulation Points Finding

- Articulation point is such a node or vertex in the graph such that if we remove that vertex then the graph devided into different components.



If, we remove vertex B, then the edges also remove naturally. The we get two components in the graph A and C. Then there are no paths ~~to~~ from A to C. A, C components are disconnected. So, Removing point B the graph devided into different components. B vertex is called as Articulation Points.

5. Topological Sort (DFS)

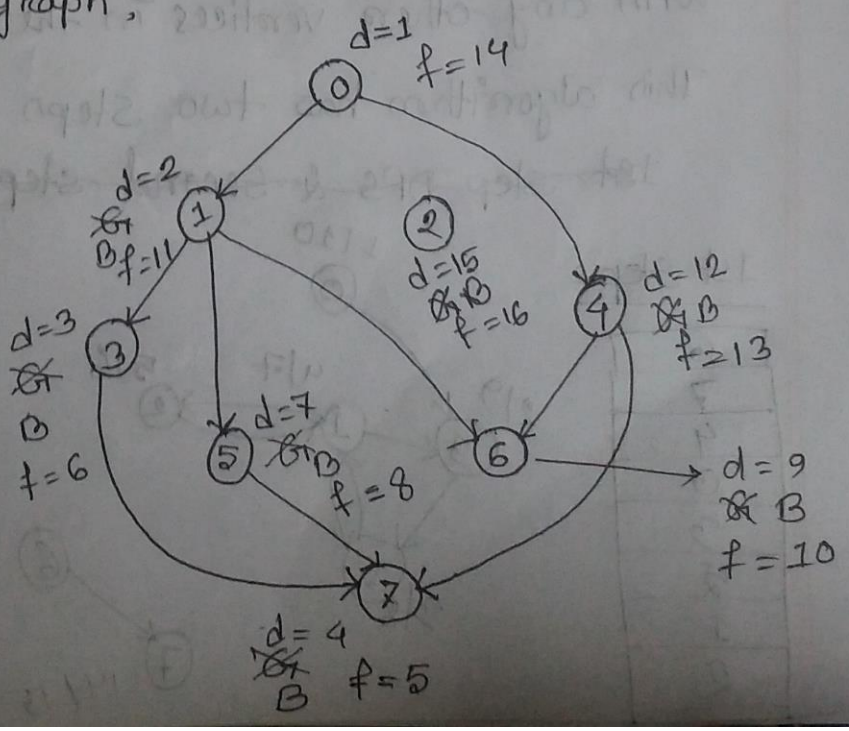
Key points:

1. It is a linear ordering of its vertices such that for every edge uv for vertex u to v, u comes before vertex v in the ordering.
2. Graph should be Directed Acyclic Graph.
3. Every Directed Acycle Graph will have atleast one topological ordering.

Here is a graph;

Stack

2
0
4
1
6
5
3
7



After POP!

topological sort order: 2 0 4 1 6 5 3 7

Total Running time: $O(n+e)$

6. Strongly Connected Components

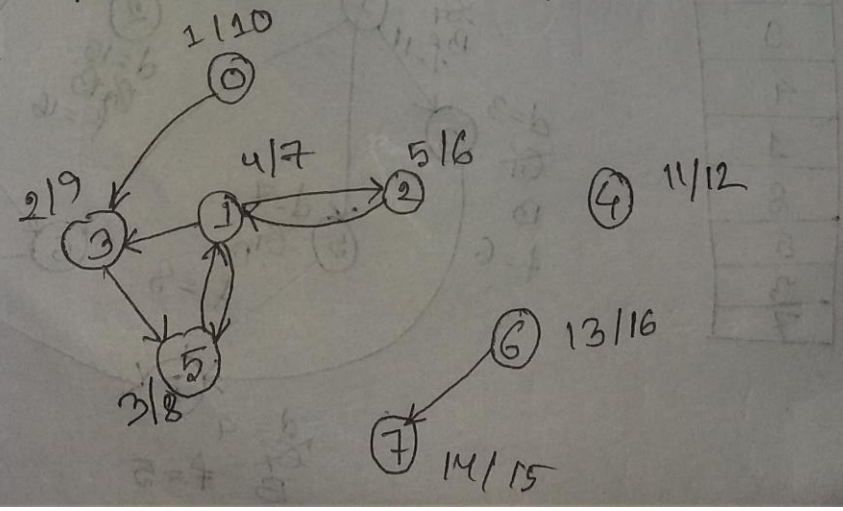
In a graph, Connected component is a sub graph in which any two vertices are connected by paths and no vertices ~~are~~ is connected with any other vertices in the super graph.

This algorithm has two steps DFS ~~& BFS~~.

~~1st step DFS & second step BFS~~.

1st step:

6
7
4
0
3
5
1
2



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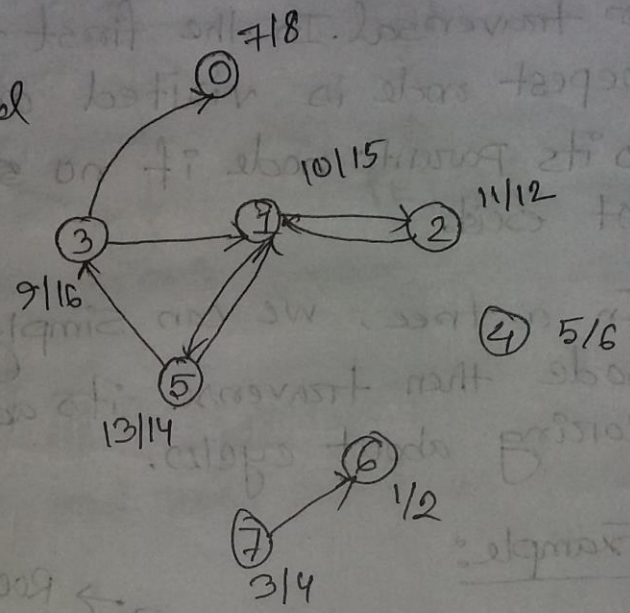
1st DFS Traversal finished.

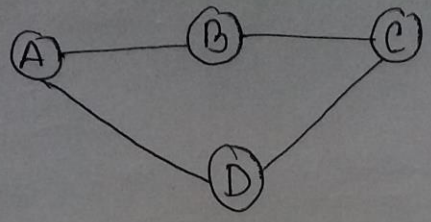
2nd step: Reverse traverse.

After POP:

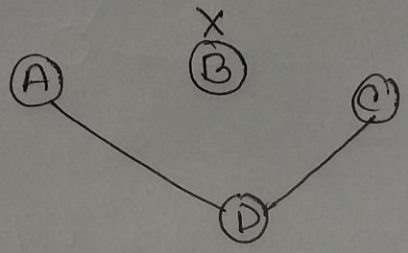
Strongly connected components

6
7
4
0
2 5 1 3





If, we remove B vertex. Then the graph will be.



B is not Articulation Point because the graph Still connected remains. There is a Path from vertex A to vertex C through vertex D. So, B can't be the Articulation poins. In this graph has no Articulation Point.