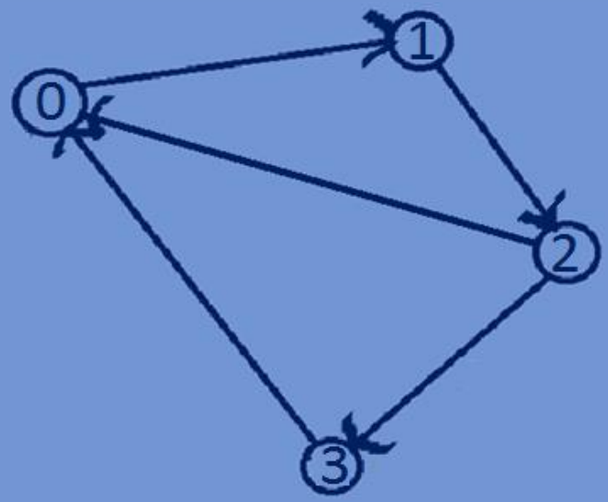
Data Structures

Depth First traversal of a Graph

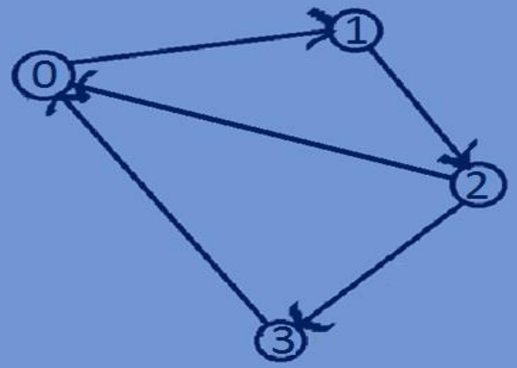
Adjacency Matrix

Depth First Traversal of a graph:

- DFS is an algorithm for traversing all the vertices of a graph.
- Unlike trees,graphs may have cycles so there may be possibility that we visit The same vertex more than once.To avoid visiting the node more than once We use a visited array which keeps track of the visited vertices,if we visit a vertex then we mark it as visited.A vertex that has already been marked will not be selected for traversal.

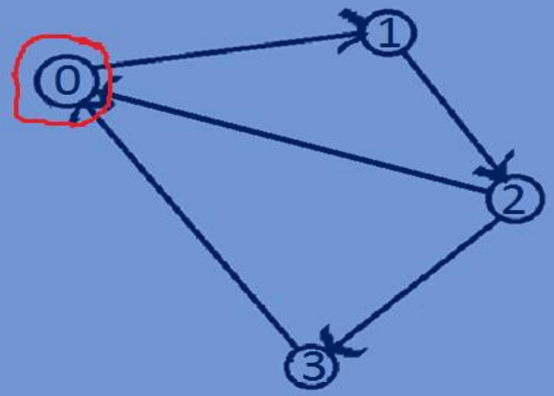


Depth First Traversal of a graph:



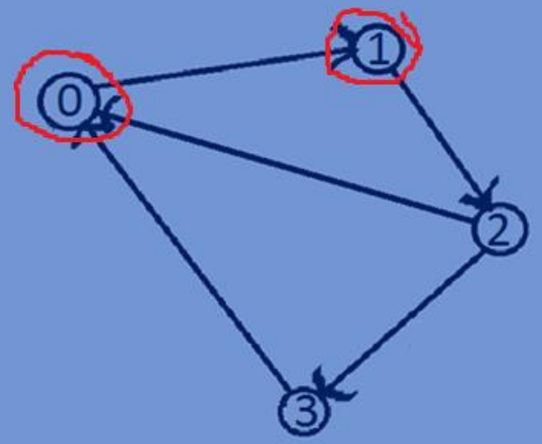
	0	1	2	3
0	0	1	0	0
1	0	0	1	0
2	1	0	0	1
3	1	0	0	0

visited={0,0,0,0}



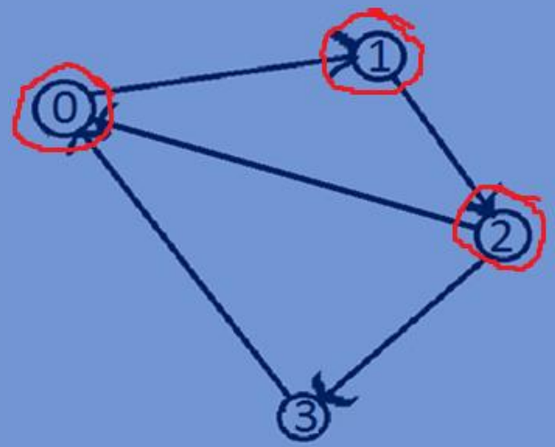
Visited[0]=1;

Visited=>{1,0,0,0}



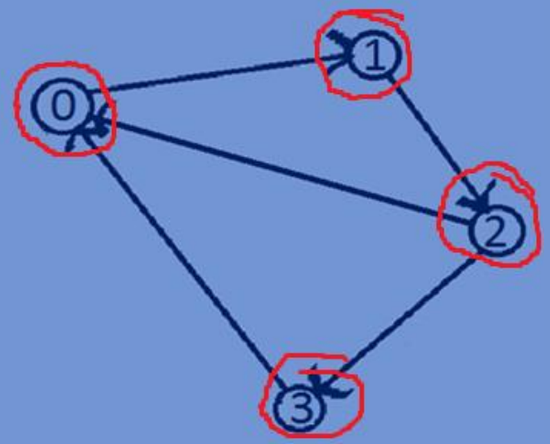
visited[1]=1;

visited=>{1,1,0,0}



Visited[2]=1;

Visited=>{1,1,1,0 }



visited[3]=1;

visited=>{1,1,1,1}

Function for Depth First traversal of a graph:

```
//DFS traversal of a Graph
void DFSTraversal(graph *array,int visited[],int i,int n){
    printf("%d->",i);
    visited[i]=1;
    for(int j=0;j<n;j++){
        if(visited[j]==0 && *(array +i*n+ j)==1){
            DFSTraversal(array,visited,j,n);
        }
    }
}
```

Whole program:

```
#include<stdio.h>
#include<stdlib.h>
#include<time.h>
typedef int graph;
//constructing a weighted undirectedgraph
graph *buildUndirectedGraph (int n) {
    int i,j;
    graph *array = (graph *) malloc(n * n * sizeof(graph));
    srand((unsigned)time(NULL));
    for (i = 0; i < n; i++) {
        for (j = 0; j < n; j++) {
            if (i == j) {
                *(array + i * n + j) = 0;
            } else if (i != j) {
                int temp=rand()%2;
                *(array + i * n + j) =temp;
                *(array + j * n + i) =temp;
            }
        }
```

```
    }
    return array;
}
//constructing a weighted directed graph
graph *buildDirectedGraph(int n){
    int i,j;
    graph *array = (graph *) malloc(n * n * sizeof(graph));
    srand((unsigned)time(NULL));
    for (i = 0; i < n; i++) {
        for (j = 0; j < n; j++) {
            if (i == j) {
                *(array + i * n + j) = 0;
            } else if (i != j) {
                int temp=rand()%2;
                *(array + i * n + j) =temp;
            }
        }
    }
    return array;
}
//DFS traversal of a Graph
void DFSTraversal(graph *array,int visited[],int i,int n){
    printf("%d->",i);
    visited[i]=1;
```

```
    for(int j=0;j<n;j++){
        if(visited[j]==0 && *(array +i*n+ j)==1){
            DFSTraversal(array,visited,j,n);
        }
    }
}
//printing adjacent matrix of a graph
void printAdjacencyMatrix(graph *array,int n){
    for (int i = 0; i < n; i++) {
        for (int j = 0; j < n; j++) {
            printf("%d  ", *(array + i*n + j));
        }
        printf("\n");
    }
}
int main(){
    int n=5;
    int visited[5]={0};
    graph *array;
    array=buildUndirectedGraph(n);
    printAdjacencyMatrix(array,n);
    DFSTraversal(array,visited,0,n);
    int visited1[5]={0};
    array=buildDirectedGraph(n);
```

```
    printAdjacencyMatrix(array,n);
    DFSTraversal(array,visited1,0,n);
    return 0;
}
```

Output:

0 0 0 1 1

0 0 0 1 0

0 0 0 0 1

1 1 0 0 1

1 0 1 1 0

0->3->1->4->2->

0 1 0 1 0

1 0 0 0 1

0 0 0 1 0

1 0 1 0 1

0 0 1 0 0

0->1->4->2->3->