Topological Sort Algorithm Using Source Removal Method

Algorithm topological sort(a,n,s)

Purpose:To obtain the sequence of jobs to be executed resulting in topological order

Input:a:-Adjacency Matrix of the given graph

n: The number of vertices in graph

Output:

S: Indicates the jobs that are to be executed in order.

```
    for j<-0 to n-1 do
            sum<-0
            for i<-0 to n-1 do
                sum<- sum+a[i][j]
            end for
               Indegree[j]<-sum
    end for

  top<- -1
  for i<-0 to n-1 do
        if( indegree[i]=0)
           top<-top+1
           s[top]<-i
        end if
 end for



while top ≠  -1
       u<- s[top]
      top<- top -1
      Add u to solution vector T
           For each vector v adjacent to u
               Decrement indegree[v]  by one
```

```
                    If (indegree[v]=0)
                          Top<- top+1
                           S[top]<-v
                     end if
                end for
end while

            Write T    // Output of toplogical sequence
            Return
```

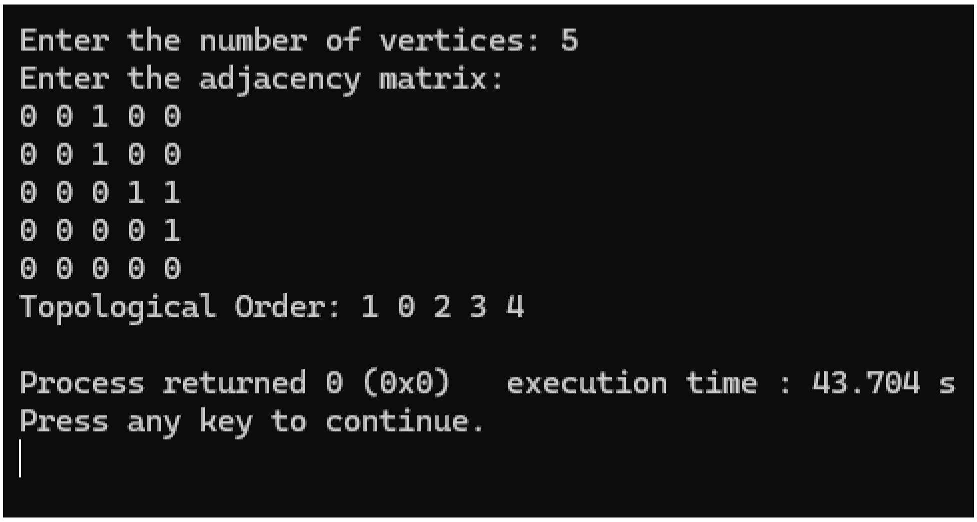
Code:

```
#include <stdio.h>
#include <stdlib.h>
void ts(int **a, int n) {
int indegree[n], s[n], top = -1, T[n], k = 0;
for (int j = 0; j < n; j++) {
int sum = 0;
for (int i = 0; i < n; i++) {
sum += a[i][j];
}
indegree[j] = sum;
}
for (int i = 0; i < n; i++) {
if (indegree[i] == 0) {
s[++top] = i;
}
}
while (top != -1) {
int u = s[top--];
T[k++] = u;
for (int v = 0; v < n; v++) {
if (a[u][v] == 1) {
```

```
indegree[v]--;
if (indegree[v] == 0) {
s[++top] = v;
}
}
}
}
printf("Topological Order: ");
for (int i = 0; i < k; i++) {
printf("%d ", T[i]);
}
printf("\n");
}
int main() {
int n;
printf("Enter the number of vertices: ");
scanf("%d", &n);
int **a = (int **)malloc(n * sizeof(int *));
for (int i = 0; i < n; i++) {
a[i] = (int *)malloc(n * sizeof(int));
}
printf("Enter the adjacency matrix:\n");
for (int i = 0; i < n; i++) {
for (int j = 0; j < n; j++) {
scanf("%d", &a[i][j]);
}
}
ts(a, n);
for (int i = 0; i < n; i++) {
free(a[i]);
```

```
}
free(a);
return 0;
}
```

Output:



```
Enter the number of vertices: 5
Enter the adjacency matrix:
0 0 1 0 0
0 0 1 0 0
0 0 0 1 1
0 0 0 0 1
0 0 0 0 0
Topological Order: 1 0 2 3 4

Process returned 0 (0x0)   execution time : 43.704 s
Press any key to continue.
```

Topological Sort Algorithm Using DFS

```
ALGORITHM  DFS(u,n,a)

//Input  u- From where the DFS traversal   start
//n- the number of vertices in the graph
//a –adjacency matrix

//Global variables
// s –to know what are the nodes visited and which are the nodes that are visited.
// j-  index variable to store the vertices (only those nodes which are dead nodes
     Or those nodes whose nodes are completely explored.
//res-  an array which holds the order in which the vertices are popped.

//Output
             Res-Indicates the vertices in the reverse order that are to be executed.

Step 1:[Visit the vertex u]
            S[u]<-1
```

```
Step 2[Traverse deeper in to the graph till we get dead ends or till all vertices
           Are visited]
        For v<- 0 to n-1 do
            If(a[u][v] = 1 and s[v] =0) then
                    DFS(v,n,a)
            End if
         End For

Step 3: [Store the dead vertex or which is completely explored]
        J<- j+1
         res[j]<- u

Step 4: [Finished]
          Return
```

Algorithm topological_order(n,a)

```
//Input  a- adjacency matrix  of the given graph
            n- the number of vertices in the graph

//Global variables
         s-to know what are the nodes visited and what are the nodes not visited
         j- Index variable to store the vertices (only those nodes which are dead nodes or those
nodes whose nodes are completely explored
        res- an array which holds the order in which the vertices are popped.

//Output
            Res

Step 1 for i<-0 to n-1 do
              S[i]<-0
          End for

         j<-0  //An index to store the vertices which are dead ends and which are completely
explored.

Step 2: [process each vertex in the graph]
      For u<- 0 to n-1 do
               If(s[u]=0) call DFS(u,n,a)
       End for

Step 3 [output the Toplogical sequence  by printing in the reverse order of
          Popped sequence]
       For i<- n-1 down to 0
```

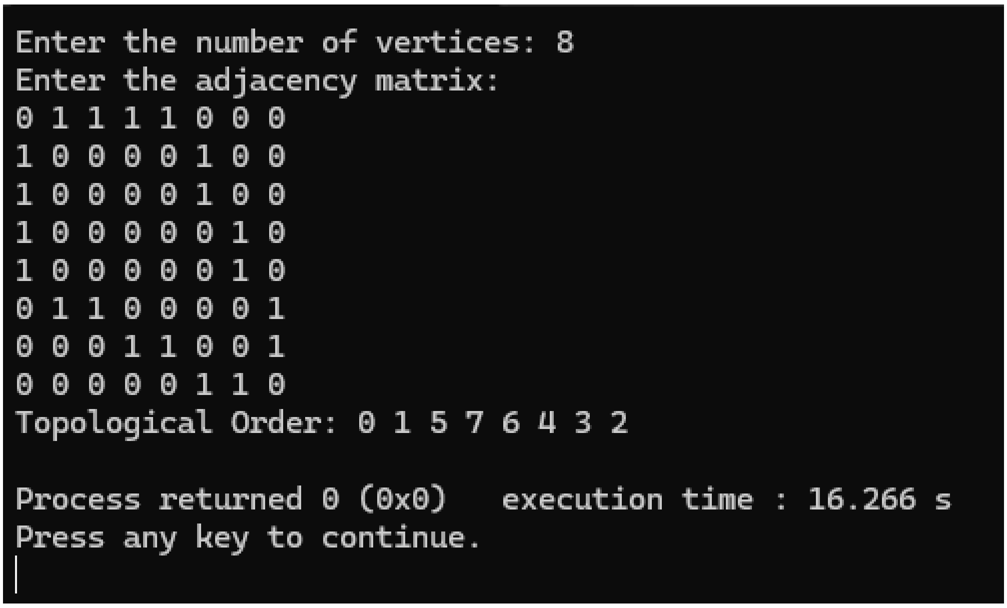
```
        Print res[i]
    End for

Step 4: [Finished]
     return
```

Code:

```
#include <stdio.h>
#include <stdlib.h>
void DFS(int u, int n, int **a, int *s, int *res, int *j) {
s[u] = 1;
for (int v = 0; v < n; v++) {
if (a[u][v] == 1 && s[v] == 0) {
DFS(v, n, a, s, res, j);
}
}
res[(*j)++] = u;
}
void to(int n, int **a) {
int s[n];
int res[n];
int j = 0;
for (int i = 0; i < n; i++) {
s[i] = 0;
}
for (int u = 0; u < n; u++) {
if (s[u] == 0) {
DFS(u, n, a, s, res, &j);
}
}
printf("Topological Order: ");
for (int i = n - 1; i >= 0; i--) {
printf("%d ", res[i]);
}
printf("\n");
}
int main() {
int n;
printf("Enter the number of vertices: ");
scanf("%d", &n);
int **a = (int **)malloc(n * sizeof(int *));
for (int i = 0; i < n; i++) {
a[i] = (int *)malloc(n * sizeof(int));
}
printf("Enter the adjacency matrix:\n");
for (int i = 0; i < n; i++) {
for (int j = 0; j < n; j++) {
scanf("%d", &a[i][j]);
}
}
to(n, a);
for (int i = 0; i < n; i++) {
free(a[i]);
}
free(a);
return 0;
}
```

Output:



```
Enter the number of vertices: 8
Enter the adjacency matrix:
0 1 1 1 1 0 0 0
1 0 0 0 0 1 0 0
1 0 0 0 0 1 0 0
1 0 0 0 0 0 1 0
1 0 0 0 0 0 1 0
0 1 1 0 0 0 0 1
0 0 0 1 1 0 0 1
0 0 0 0 0 1 1 0
Topological Order: 0 1 5 7 6 4 3 2

Process returned 0 (0x0)   execution time : 16.266 s
Press any key to continue.
```