Tugas Kelompok Analisis Algoritma

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PROGRAM STUDI TEKNIK INFORMATIKA

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

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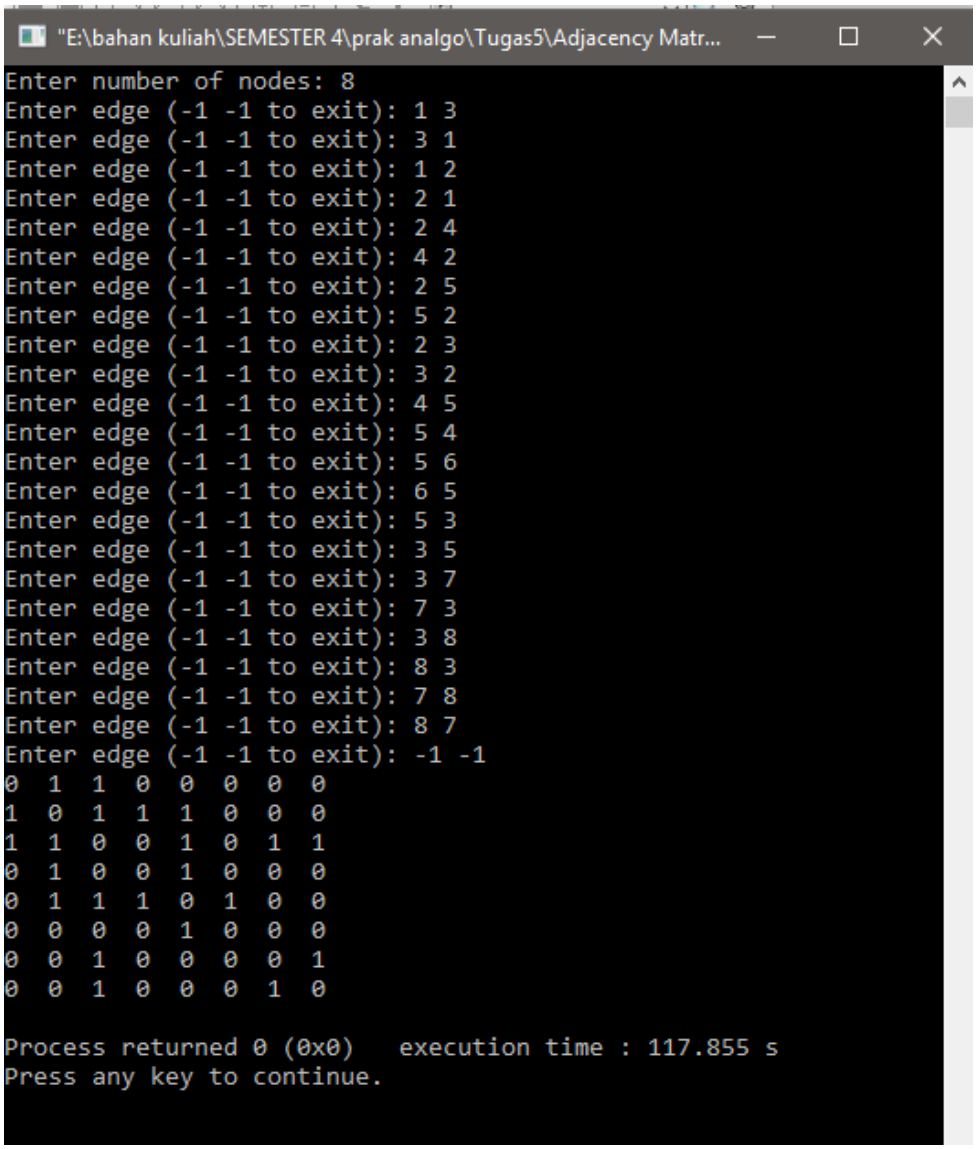
1. **Program Adjacency Matrix dari Undirected Graph Program :**

```
/*
       * C++ Program to Implement Adjacency Matrix
 */
#include <iostream>
#include <cstdlib>
using namespace std;
#define MAX 20
/*
       * Adjacency Matrix Class
 */
class AdjacencyMatrix
{     private:
int n;
int **adj;
bool *visited;
public:
        AdjacencyMatrix(int n)
        {
this->n = n;
visited = new bool [n];
adj = new int* [n];
for (int i = 0; i < n;
i++)
            {
adj[i] = new int [n];
for(int j = 0; j < n; j++)
                {
adj[i][j] = 0;
                }
            }
        }
        /*
         * Adding Edge to Graph
         */
        void add_edge(int origin, int destin)
        {
            if( origin > n || destin > n || origin < 0 || destin < 0)
            {
```

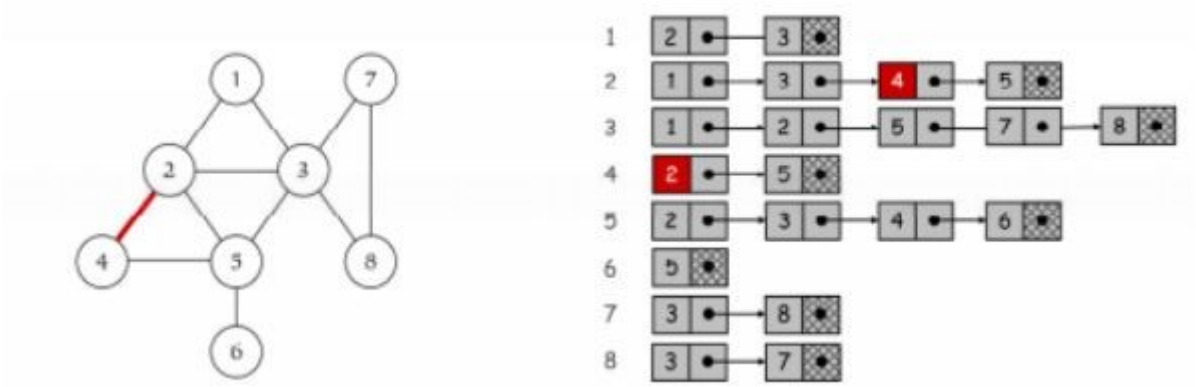
```
                cout<<"Invalid edge!\n";

}
else
            {
                adj[origin - 1][destin - 1] = 1;
            }
        }
        /*
         * Print the graph
         */
void display()
        {
int i,j;
for(i = 0;i < n;i++)
                  {
       for(j = 0; j < n; j++)
       cout<<adj[i][j]<<"   ";
       cout<<endl;
            }
        }
};
/*
 * Main
        */  int main() {      int
       nodes,  max_edges,  origin,
       destin;        cout<<"Enter
       number   of   nodes:   ";
       cin>>nodes;
       AdjacencyMatrix  am(nodes);
       max_edges = nodes * (nodes
       - 1);     for (int i = 0; i
       < max_edges; i++)
    {         cout<<"Enter edge (-1
-1 to exit): ";
cin>>origin>>destin;
if((origin == -1) && (destin == -
1))             break;
am.add_edge(origin, destin);
    }
```

```
    am.display();
return 0;
}
```

Output:



2. **Adjacency List dari Undirected Graph**



Program :

```
/*
* C++ Program to Implement Adjacency List
 */
#include
<iostream>
#include
<cstdlib>
using
namespace std;

/*
* Adjacency List Node
 */
struct AdjListNode
{
i
n
t
d
e
s
t
;
    struct AdjListNode* next;
};
```

```
/*
* Adjacency List
 */
stru
ct
AdjL
ist
{
    struct AdjListNode *head;
};


/*
* Class Graph
 */
class Graph {
private:
int V;
struct AdjList*
array;
public:
Graph(int V)
        {
this->V = V;
array = new AdjList
[V];             for
(int i = 0; i < V;
++i)
array[i].head = NULL;
        }
        /*
* Creating New Adjacency List Node
         */
        AdjListNode* newAdjListNode(int dest)
        {
            AdjListNode* newNode = new
AdjListNode;             newNode->dest
= dest;             newNode->next =
NULL;             return newNode;
        }
```

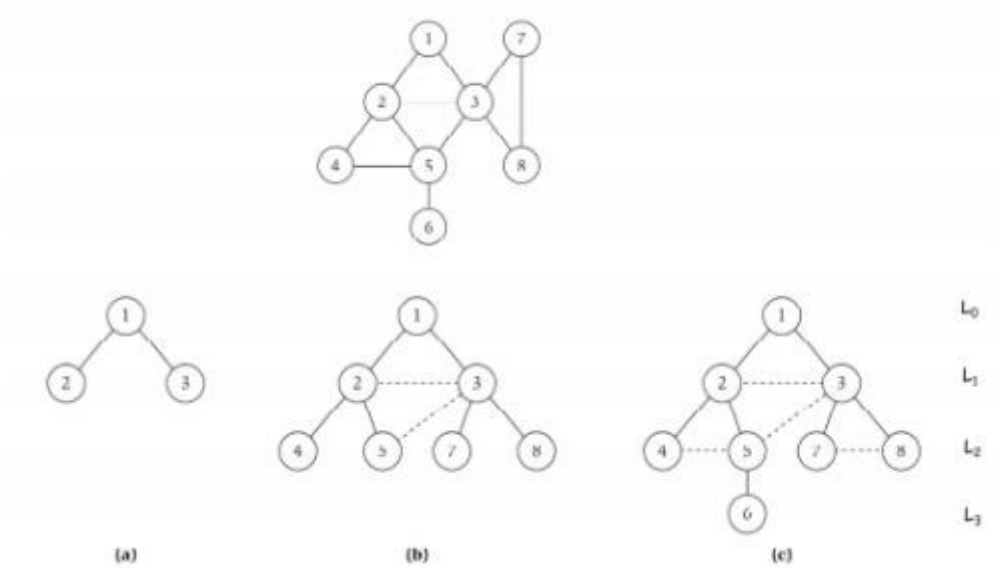
```
        /*
* Adding Edge to Graph
         */
        void addEdge(int src, int dest)
        {
            AdjListNode* newNode =
newAdjListNode(dest);             newNode-
>next = array[src].head;
array[src].head = newNode;
newNode = newAdjListNode(src);
newNode->next = array[dest].head;
array[dest].head = newNode;
        }
        /*
         * Print the graph
         */
        void printGraph()
        {
int v;
for (v = 1; v <= V;
++v)
            {
                AdjListNode* pCrawl =
array[v].head;                 cout<<"\n
Adjacency list of vertex "<<v<<"\n head ";
while (pCrawl)
                {
                    cout<<"->
"<<pCrawl->dest;
pCrawl = pCrawl->next;

}
cout<<endl;
            }
        }
};

/*
 * Main
```

```
*
/
i
n
t
m
a
i
n
(
)
{
    Graph gh(8);
gh.addEdge(1, 2);
gh.addEdge(1, 3);
gh.addEdge(2, 4);
gh.addEdge(2, 5);
gh.addEdge(2, 3);
gh.addEdge(3, 7);
gh.addEdge(3, 8);
gh.addEdge(4, 5);
gh.addEdge(5, 3);
gh.addEdge(5, 6);
gh.addEdge(7, 8);
    // print the adjacency list representation of the above
graph     gh.printGraph();

    return 0;
}
```

Output :

```
Adjacency list of vertex 1
head -> 3-> 2

Adjacency list of vertex 2
head -> 3-> 5-> 4-> 1

Adjacency list of vertex 3
head -> 5-> 8-> 7-> 2-> 1

Adjacency list of vertex 4
head -> 5-> 2

Adjacency list of vertex 5
head -> 6-> 3-> 4-> 2

Adjacency list of vertex 6
head -> 5

Adjacency list of vertex 7
head -> 8-> 3

Adjacency list of vertex 8
head -> 7-> 3
--------------------------------
Process exited after 5.362 seconds with return value 3221225477
Press any key to continue . . .
```

3. **. Program BFS dari Undirected Graph**



Program :

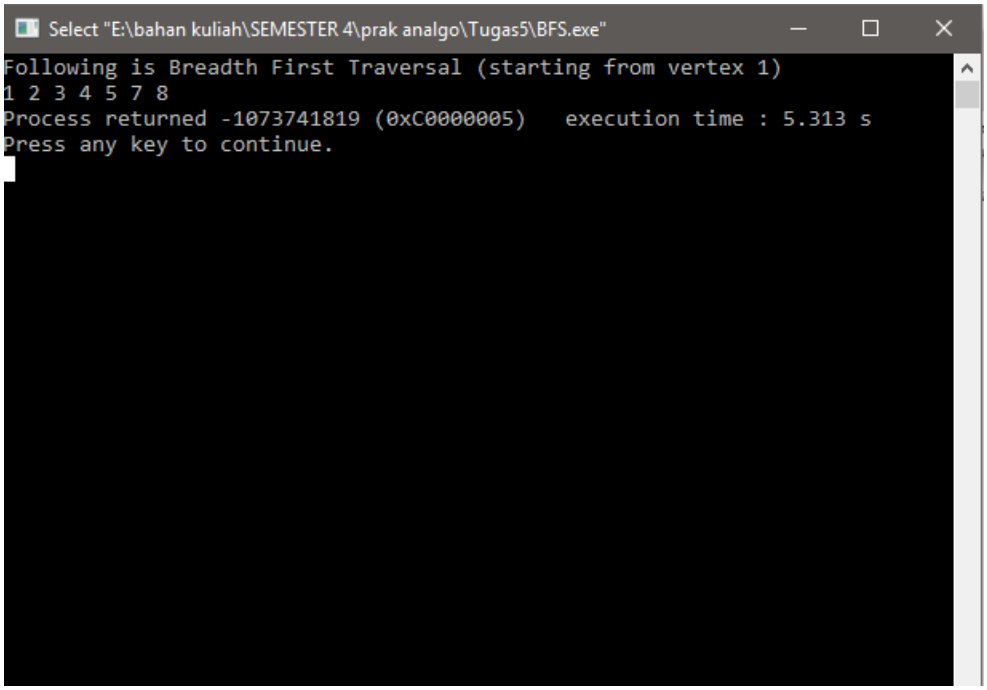
```
// Program to print BFS traversal from a given
// source vertex. BFS(int s)
traverses vertices  // reachable
from s.
#include<iostream>
#include <list>

using namespace std;
```

```
// This class represents a
directed graph using  //
adjacency list representation
class Graph
{  int V; // No. of
       vertices

// Pointer to an array containing adjacency
// lists
list<int>
*adj;
public:
Graph(int V); // Constructor

// function to add an edge to
graph  void addEdge(int v, int w);

// prints BFS traversal from a given source
s  void BFS(int s);
};

Graph::Graph(int V)
{  this->V = V;
       adj = new
       list<int>[V]
       ;
}

void Graph::addEdge(int v, int w)
{  adj[v].push_back(w); // Add w to
       v’s list.
}

void
Graph::BFS(int
s)  {
// Mark all the vertices as not
visited  bool *visited = new
bool[V];  for(int i = 0; i < V;
i++)  visited[i] = false;
```

```
// Create a queue for BFS
list<int> queue;

// Mark the current node as visited and
enqueue it  visited[s] = true;
queue.push_back(s);

// 'i' will be used to get all
adjacent  // vertices of a
vertex  list<int>::iterator i;

while(!queue.empty())
{
              // Dequeue a vertex from queue
              and print it  s =
              queue.front();  cout << s << "
              ";  queue.pop_front();

         // Get all adjacent vertices of the
                                  dequeued
              // vertex s. If a adjacent has
              not been visited,  // then mark
              it visited and enqueue it  for
              (i = adj[s].begin(); i !=
              adj[s].end(); ++i)
              {  if
                    (!vis
                    ited[
                    *i])
                    {  visited[*i] =
                          true;
                          queue.push_
                          back(*i);
                    }
              }
}
}

// Driver program to test methods
of graph class  int main()  {
// Create a graph given in the above diagram
Graph g(8);
```

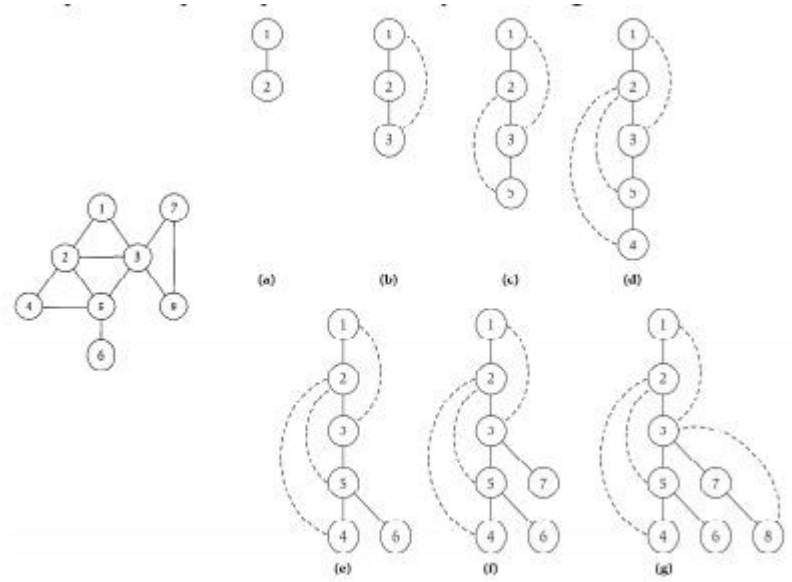
```
    g.addEdge(1, 2);
    g.addEdge(1, 3);
g.addEdge(2, 4);
      g.addEdge(2, 5);
      g.addEdge(2, 3);
      g.addEdge(3, 7);
      g.addEdge(3, 8);
      g.addEdge(4, 5);
      g.addEdge(5, 3);
      g.addEdge(5, 6);
      g.addEdge(7, 8);

cout << "Following is Breadth First Traversal "
             << "(starting from vertex 1) \n";
g.BFS(1);

return 0;
}
```

Output :



Karena Big-O dari BFS adalah O(V+E) dimana V itu jumlah vector dan E itu adalah jumlah edges maka Big-O = O(n) dimana n = v+e
Maka dari itu Big-Θ nya adalah Θ(n).

4. **Program DFS undirected Graph**

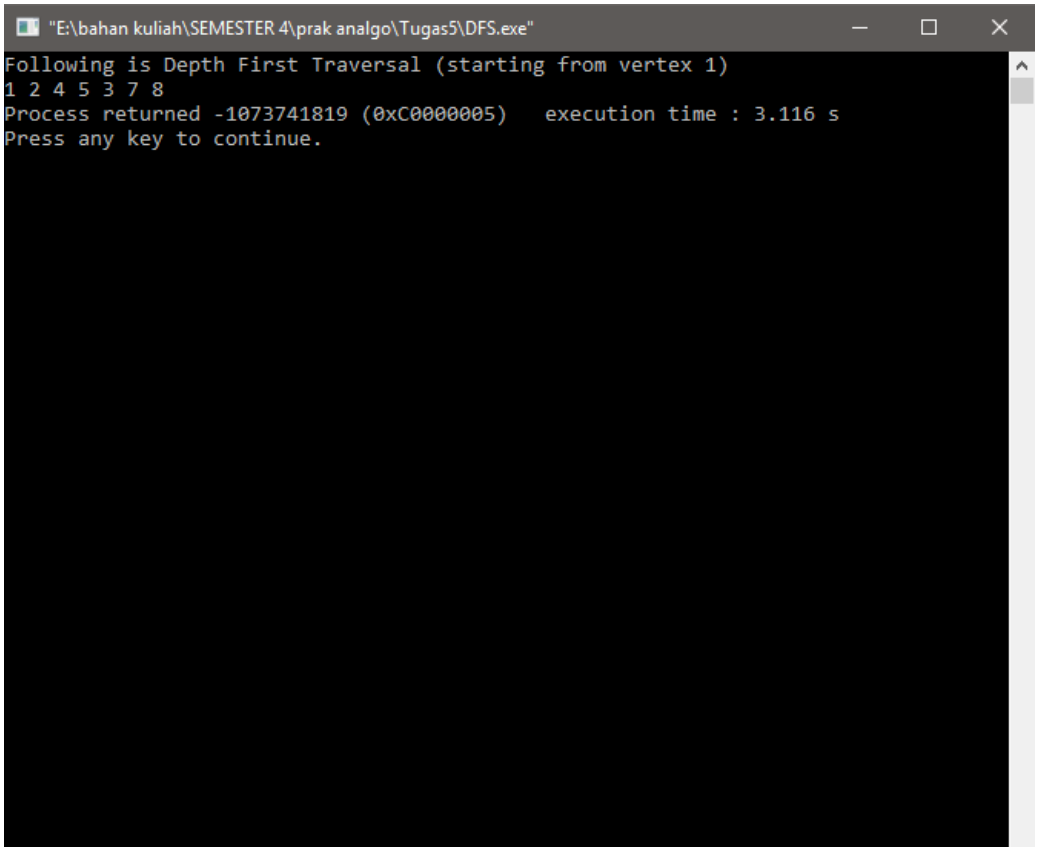


Program

```
// C++ program to print DFS traversal from
// a given vertex in a given graph
#include<ios
tream>
#include<lis
t> using
namespace
std;

// Graph class represents a
directed graph // using adjacency
list representation class Graph {
int V; // No. of vertices

    // Pointer to an array
containing     // adjacency
lists     list<int> *adj;

    // A recursive function used by
DFS     void DFSUtil(int v, bool
visited[]); public:
    Graph(int V); // Constructor
```

```
    // function to add an edge to
graph     void addEdge(int v, int
w);

    // DFS traversal of the
vertices     // reachable
from v     void DFS(int v);
};

Graph::Graph(int V)
{     this->V = V;
adj = new
list<int>[V];
}  void
Graph::addEdge(int v, int
w)
{     adj[v].push_back(w); // Add w to
v’s list.
}  void Graph::DFSUtil(int v, bool
visited[])
{
    // Mark the current node as visited and
    // print it
visited[v] = true;
cout << v << " ";

    // Recur for all the vertices adjacent
// to this vertex     list<int>::iterator i;
for (i = adj[v].begin(); i != adj[v].end();
++i)         if (!visited[*i])
DFSUtil(*i, visited);
}

// DFS traversal of the vertices reachable
from v.
// It uses recursive
DFSUtil() void
Graph::DFS(int v)
{
    // Mark all the vertices as not
visited     bool *visited = new
```

```
bool[V];     for (int i = 0; i < V;
i++)         visited[i] = false;

    // Call the recursive helper function
    // to print DFS traversal
    DFSUtil(v, visited);
}
in
t
ma
in
()
{
    // Create a graph given in the above
diagram
        Graph g(8);
       g.addEdge(1, 2);
       g.addEdge(1, 3);
g.addEdge(2, 4);
       g.addEdge(2, 5);
       g.addEdge(2, 3);
       g.addEdge(3, 7);
       g.addEdge(3, 8);
       g.addEdge(4, 5);
       g.addEdge(5, 3);
       g.addEdge(5, 6);
       g.addEdge(7, 8);
     cout << "Following is Depth First
Traversal"             " (starting from
vertex 1) \n";
    g.DFS(1);

retur
n 0;
}
```



Kompleksitas waktu O (V+E) , saat diimplementasikan menggunakan adjacency list.