Tugas Kelompok Analisis Algoritma

Disusun Oleh :

Faradilla A - 140810170001

Rividya P A - 140810170047

Haris Putratama - 140810170059

Cryssa Aprilia E P - 140810170063

PROGRAM STUDI TEKNIK INFORMATIKA

FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS PADJADJARAN

2019

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

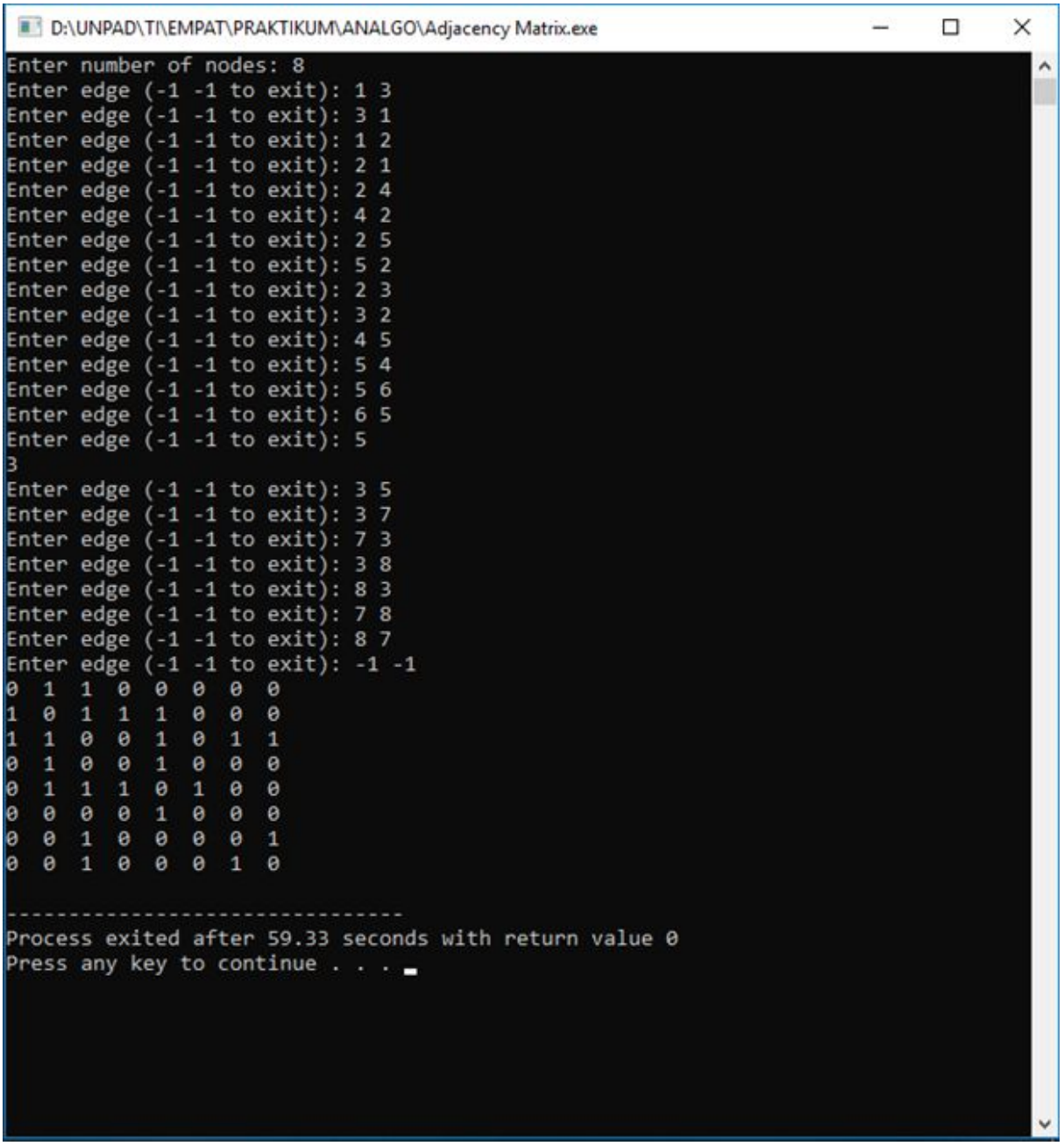
Program :

```
/*
 * 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;
            }
```

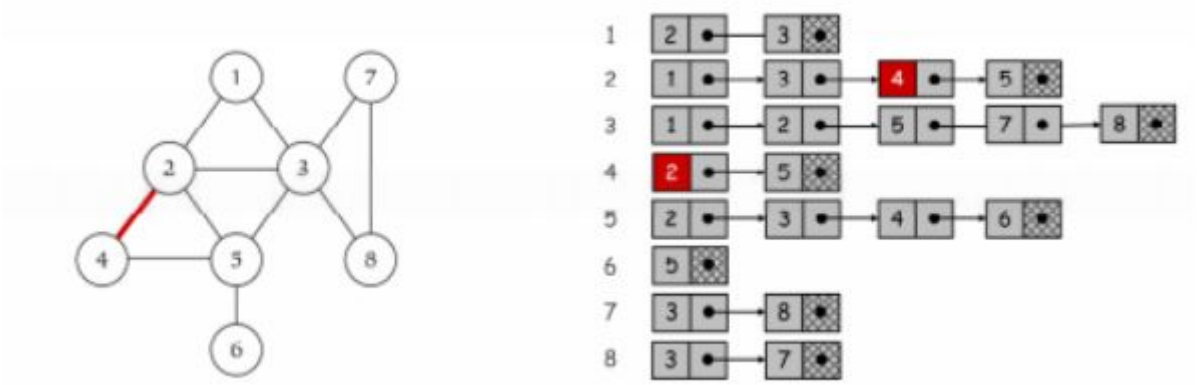
```
            }
        }
        /*
         * Adding Edge to Graph
         */
        void add_edge(int origin, int destin)
        {
            if( origin > n || destin > n || origin < 0 || destin < 0)
            {
                cout<<"Invalid edge!\n";
            }
            else
            {
                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 :


D:\UNPAD\TI\EMPAT\PRAKTIKUM\ANALGO\Adjacency Matrix.exe
Enter number of nodes: 8
Enter edge (-1 -1 to exit): 1 3
Enter edge (-1 -1 to exit): 3 1
Enter edge (-1 -1 to exit): 1 2
Enter edge (-1 -1 to exit): 2 1
Enter edge (-1 -1 to exit): 2 4
Enter edge (-1 -1 to exit): 4 2
Enter edge (-1 -1 to exit): 2 5
Enter edge (-1 -1 to exit): 5 2
Enter edge (-1 -1 to exit): 2 3
Enter edge (-1 -1 to exit): 3 2
Enter edge (-1 -1 to exit): 4 5
Enter edge (-1 -1 to exit): 5 4
Enter edge (-1 -1 to exit): 5 6
Enter edge (-1 -1 to exit): 6 5
Enter edge (-1 -1 to exit): 5
3
Enter edge (-1 -1 to exit): 3 5
Enter edge (-1 -1 to exit): 3 7
Enter edge (-1 -1 to exit): 7 3
Enter edge (-1 -1 to exit): 3 8
Enter edge (-1 -1 to exit): 8 3
Enter edge (-1 -1 to exit): 7 8
Enter edge (-1 -1 to exit): 8 7
Enter edge (-1 -1 to exit): -1 -1
0 1 1 0 0 0 0 0
1 0 1 1 1 0 0 0
1 1 0 0 1 0 1 1
0 1 0 0 1 0 0 0
0 1 1 1 0 1 0 0
0 0 0 0 1 0 0 0
0 0 1 0 0 0 0 1
0 0 1 0 0 0 1 0
Process exited after 59.33 seconds with return value 0
Press any key to continue . . .

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
{
    int dest;
    struct AdjListNode* next;
};

/*
 * Adjacency List
 */
struct AdjList
```

```
{
    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
```

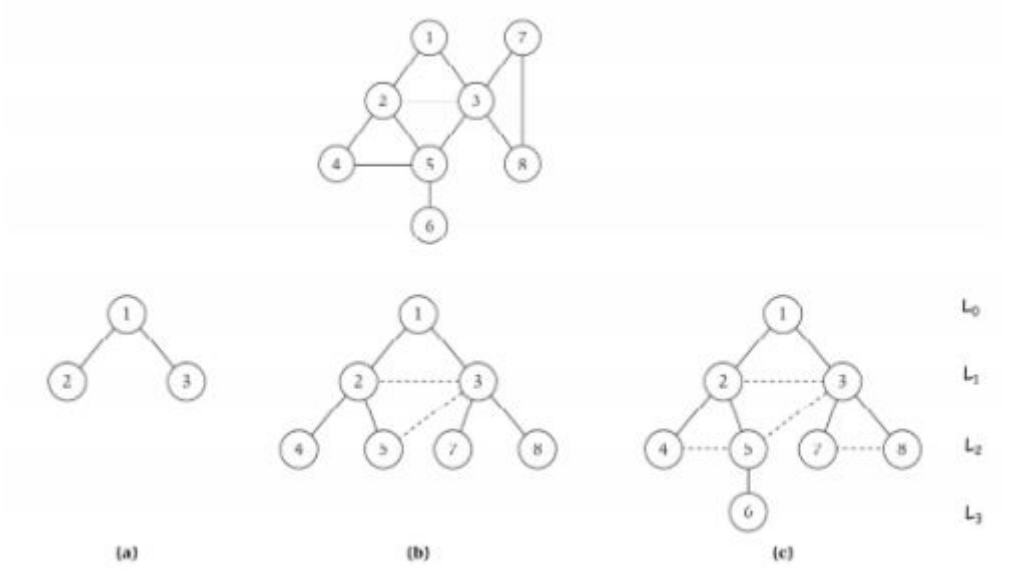
```
     */
    void addEdge(int src, int dest)
    {
        AdjListNode* newNode = newAdjListNode(dest);
        newNode->next = array[src].head;
        array[src].head = newNode;
        newNode = newAdjListNode(src);
        newNode->next = array[dest].head;
        array[dest].head = newNode;
    }
    /*
     * 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
```

```
 */
int main()
{
    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 :

```
Select D:\UNPAD\TI\EMPAT\PRAKTIKUM\ANALGO\Adjacency List.exe

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 :

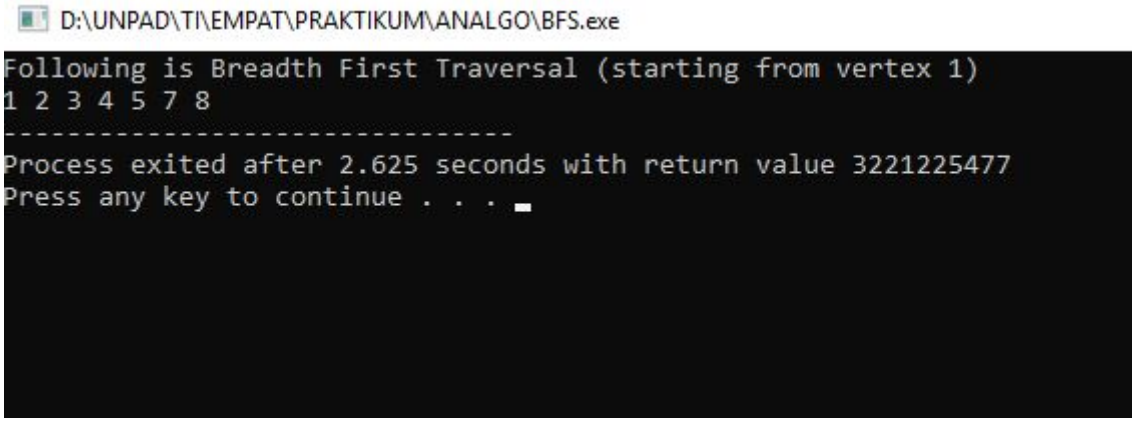
```
// Program to print BFS traversal from a given
// source vertex. BFS(int s) traverses vertices
// reachable from s.
#include<iostream>
#include <list>

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 (!visited[*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;
}
```

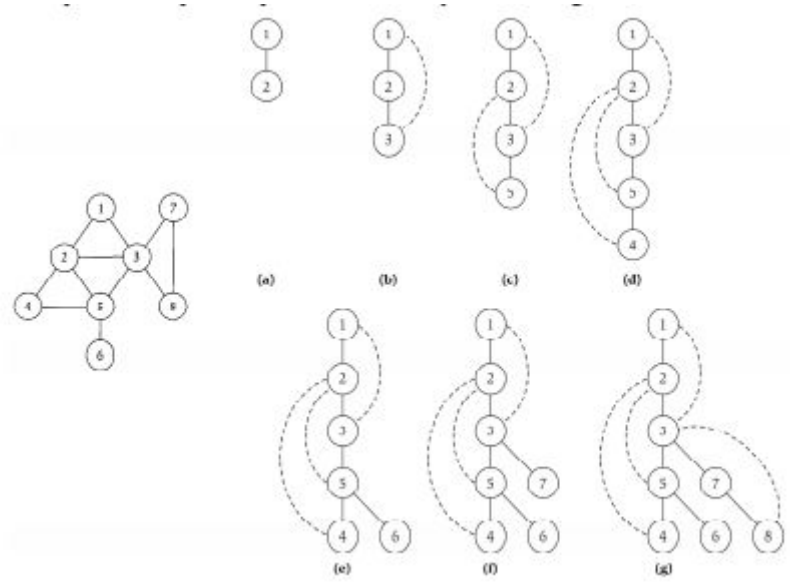
Output :



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<iostream>
#include<list>
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);
}

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 Depth First Traversal"
            " (starting from vertex 1) \n";
    g.DFS(1);


    return 0;
}
```