

Name - Rahul Ranjan
Roll - 16010121
Branch - CSE
Subject - Graph (Advance algorithm)

In this assignment our target is to convert one graph representation to another (here I have considered for undirected graph representation)-

1. Adjacency matrix to Incidence matrix
2. Adjacency list to adjacency matrix
3. Adjacency matrix to adjacency list
4. Adjacency list to incidence matrix
5. Incidence matrix to adjacency matrix
6. Incidence matrix to adjacency list

This assignment is implemented using python programming language and can be executed on any platform.

To run the program, we need to just choose the suitable option to transform the result from one form to another representation form as input to the programme already provided.

For basic understanding refer below definitions -

1. Adjacency list - An adjacency list represents a graph as an array of linked list and can be represented as -

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

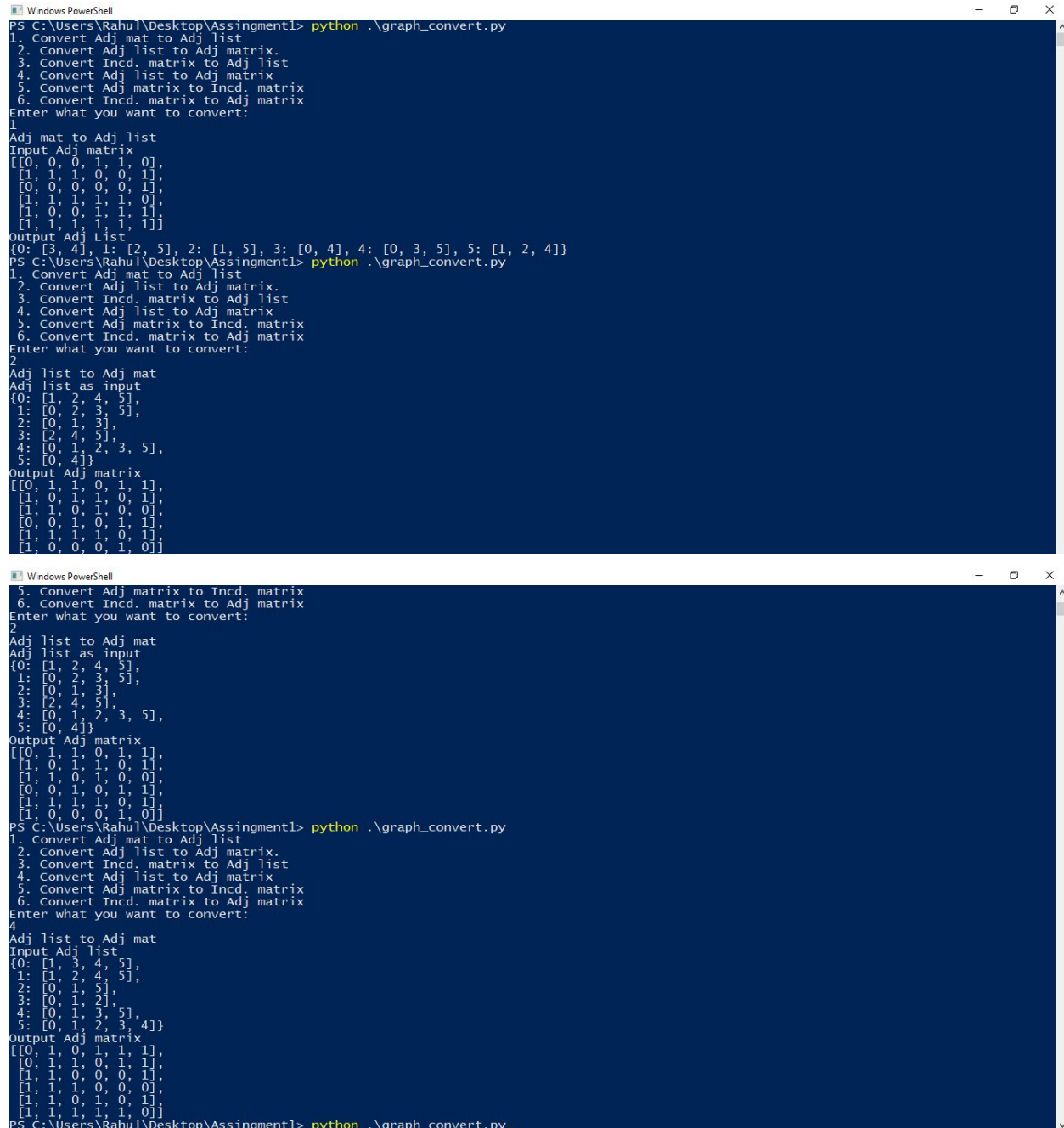
2. Adjacency matrix - The unoriented incidence matrix (or simply incidence matrix) of an undirected graph is a $n \times m$ matrix B , where n and m are the numbers of vertices and edges respectively, such that $B_{i,j} = 1$ if the vertex v_i and edge e_j are incident and 0 otherwise. adjacency matrix allows representing a graph with a $V \times V$ matrix $M = [f(i, j)]$ where each element $f(i, j)$ contains the attributes of the edge (i, j) and can be represented as -

0 0 0 1
0 1 0 1
1 0 0 0
1 0 1 0

3. Incidence matrix - The incidence matrix of an undirected graph is a $n \times m$ matrix B , where n and m are the numbers of vertices and edges respectively, such that $B_{i,j} = 1$ if the vertex v_i and edge e_j are incident and 0 otherwise and can be represented as

1 1 1 0 0 0
1 0 0 1 1 0
0 1 0 1 0 1

The code can be executed in the command prompt as shown below in the figures which will print the desired output -



```
PS C:\Users\Rahul\Desktop\Assingment1> python .\graph_convert.py
1. Convert Adj mat to Adj list
2. Convert Adj list to Adj matrix.
3. Convert Incd. matrix to Adj list
4. Convert Adj list to Adj matrix
5. Convert Adj matrix to Incd. matrix
6. Convert Incd. matrix to Adj matrix
Enter what you want to convert:
1
Adj mat to Adj list
Input Adj matrix
[[0, 0, 0, 1, 1, 0],
 [1, 1, 1, 0, 0, 1],
 [0, 0, 0, 0, 0, 1],
 [1, 1, 1, 1, 1, 0],
 [1, 0, 0, 1, 1, 1],
 [1, 1, 1, 1, 1, 1]]
Output Adj List
{0: [3, 4], 1: [2, 5], 2: [1, 5], 3: [0, 4], 4: [0, 3, 5], 5: [1, 2, 4]}
PS C:\Users\Rahul\Desktop\Assingment1> python .\graph_convert.py
1. Convert Adj mat to Adj list
2. Convert Adj list to Adj matrix.
3. Convert Incd. matrix to Adj list
4. Convert Adj list to Adj matrix
5. Convert Adj matrix to Incd. matrix
6. Convert Incd. matrix to Adj matrix
Enter what you want to convert:
2
Adj list to Adj mat
Adj list as input
{0: [1, 2, 4, 5],
 1: [0, 2, 3, 5],
 2: [0, 1, 3],
 3: [2, 4, 5],
 4: [0, 1, 2, 3, 5],
 5: [0, 4]}
Output Adj matrix
[[0, 1, 1, 0, 1, 1],
 [1, 0, 1, 1, 0, 1],
 [1, 1, 0, 1, 0, 0],
 [0, 0, 1, 0, 1, 1],
 [1, 1, 1, 1, 0, 1],
 [1, 0, 0, 0, 1, 0]]
PS C:\Users\Rahul\Desktop\Assingment1> python .\graph_convert.py
5. Convert Adj matrix to Incd. matrix
6. Convert Incd. matrix to Adj matrix
Enter what you want to convert:
2
Adj list to Adj mat
Adj list as input
{0: [1, 2, 4, 5],
 1: [0, 2, 3, 5],
 2: [0, 1, 3],
 3: [2, 4, 5],
 4: [0, 1, 2, 3, 5],
 5: [0, 4]}
Output Adj matrix
[[0, 1, 1, 0, 1, 1],
 [1, 0, 1, 1, 0, 1],
 [1, 1, 0, 1, 0, 0],
 [0, 0, 1, 0, 1, 1],
 [1, 1, 1, 1, 0, 1],
 [1, 0, 0, 0, 1, 0]]
PS C:\Users\Rahul\Desktop\Assingment1> python .\graph_convert.py
1. Convert Adj mat to Adj list
2. Convert Adj list to Adj matrix.
3. Convert Incd. matrix to Adj list
4. Convert Adj list to Adj matrix
5. Convert Adj matrix to Incd. matrix
6. Convert Incd. matrix to Adj matrix
Enter what you want to convert:
4
Adj list to Adj mat
Input Adj list
{0: [1, 3, 4, 5],
 1: [1, 2, 4, 5],
 2: [0, 1, 5],
 3: [0, 1, 2],
 4: [0, 1, 3, 5],
 5: [0, 1, 2, 3, 4]}
Output Adj matrix
[[0, 1, 0, 1, 1, 1],
 [0, 1, 1, 0, 1, 1],
 [1, 1, 0, 0, 0, 1],
 [1, 1, 1, 0, 0, 0],
 [1, 1, 0, 1, 0, 1],
 [1, 1, 1, 1, 1, 0]]
PS C:\Users\Rahul\Desktop\Assingment1> python .\graph_convert.py
```

