

1. Introduction:

A python code is written to extract the gates and information about the interconnects. The gates are considered as nodes and interconnects as edges. After creating a graph for the extracted nodes and edges, partitioning is done by using Simulated Annealing to have minimum cut size and equal size partitioning.

2. Inputs:

The file path of a benchmark file which is a netlist file is given as input. Nodes and edges will be extracted from the benchmark file and the graph will be plotted. Then simulated annealing will be performed.

E.g.

```
inputs, outputs, gate io =  
netlist_graph.extract_gate_io(r"C:\Users\akhil\OneDrive\Documents\SEMESTER 2\VDA\Assignment 1\  
ISCAS89\s27.bench")
```

If the total number of nodes is odd, a dummy node is added as KL algorithm works on partitions of equal sizes.

Below are the parameters considered for simulated annealing:

```
temp = 1000  
rate = 0.95  
frozen_temp = 0.5  
total_attempts = len(node_list) * 100
```

At each temperature, total number of attempts will be maximum of total no. of nodes * 100. The temperature will be updated either after 10 accepted attempts or no. of attempts has reached the maximum limit.

The temperature will be updated to a new temperature by multiplying with rate. The entire process will be continued until frozen temperature is reached or if 3 consecutive failed temperatures are reached.

The cost function is

$$f = C + \lambda B,$$

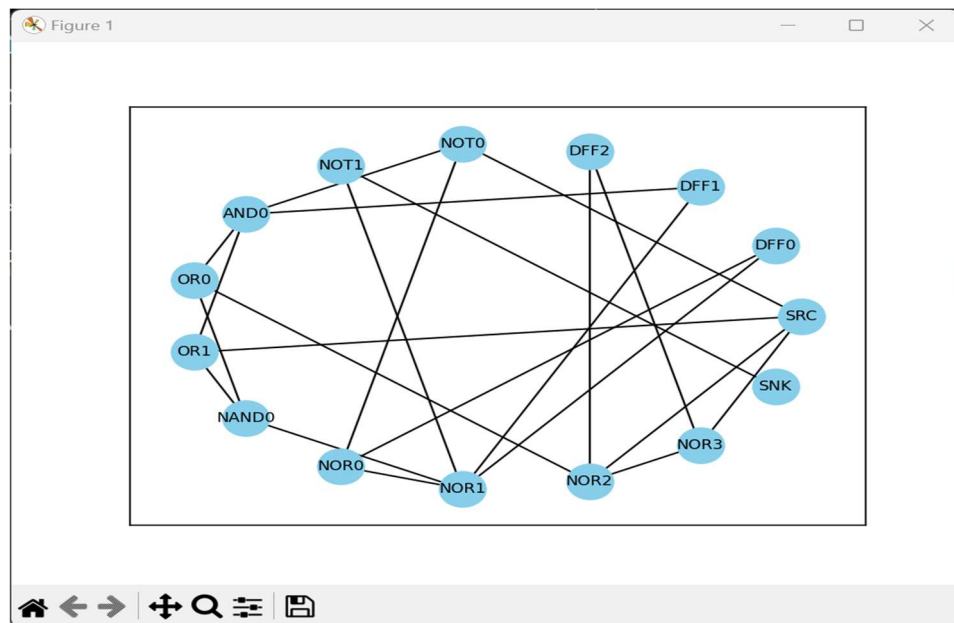
where C is cut size, λ is a constant (considered it to be 1)

$$B = (|S1| - |S2|)^2$$

Where $|S1|$ is the no. of nodes in partition 1 and $|S2|$ is no. of nodes in partition2.

3. Outputs:

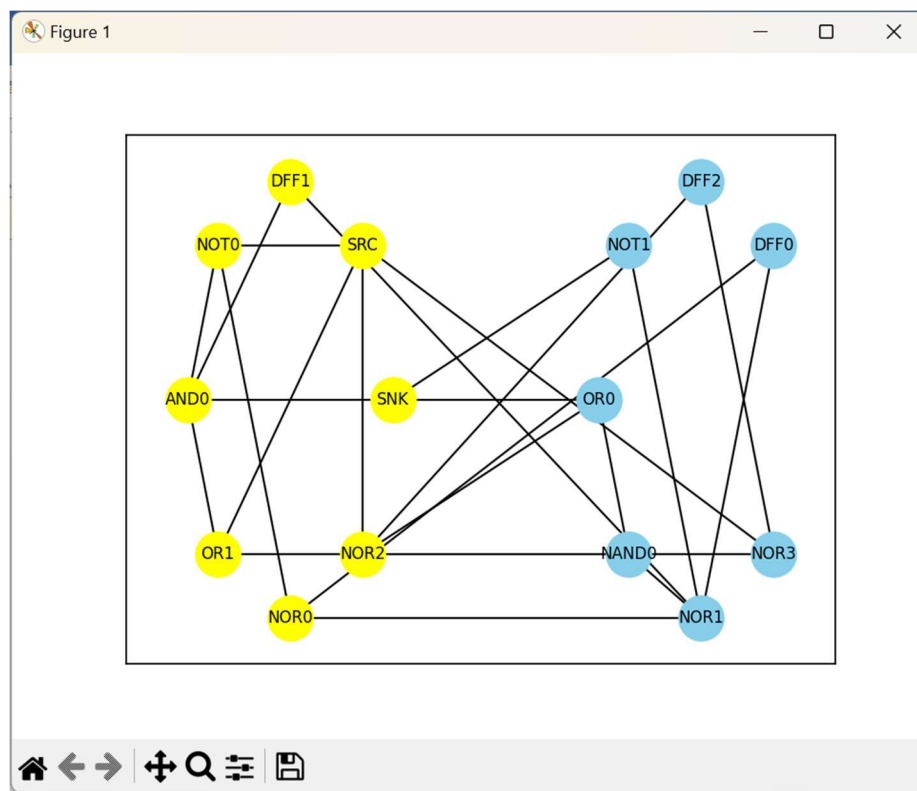
Undirected Graph: -



Partition List and Cost before applying Simulated Annealing: -

```
Starting partitioning of the circuit by Simulated Annealing:
Partitions and cost before partitioning:
Partition 1:
['SRC', 'DFF1', 'NOT0', 'AND0', 'OR1', 'NOR0', 'NOR2', 'SNK']
Partition 2:
['DFF0', 'DFF2', 'NOT1', 'OR0', 'NAND0', 'NOR1', 'NOR3']
Cut size: 10.0
Cost of the partition: 11.0
No. of nodes in Partition 1: 8
No. of nodes in Partition 2: 7
```

Partitioned Graph before applying Simulated Annealing: -



Partition List and Cost after applying Simulated Annealing: -

```
Partitions and cost after partitioning:  
Partition 1:  
['NOT1', 'NOR1', 'SNK', 'DFF0', 'NOR0', 'AND0', 'DFF1', 'NOT0']  
Partition 2:  
['NOR3', 'OR1', 'NAND0', 'SRC', 'DFF2', 'OR0', 'NOR2']  
Cut size: 4.0  
Cost of the partition: 5.0  
No. of nodes in Partition 1: 8  
No. of nodes in Partition 2: 7
```

Partitioned Graph after applying Simulated Annealing: -

