DEDUCTIVE FAULT SIMULATION

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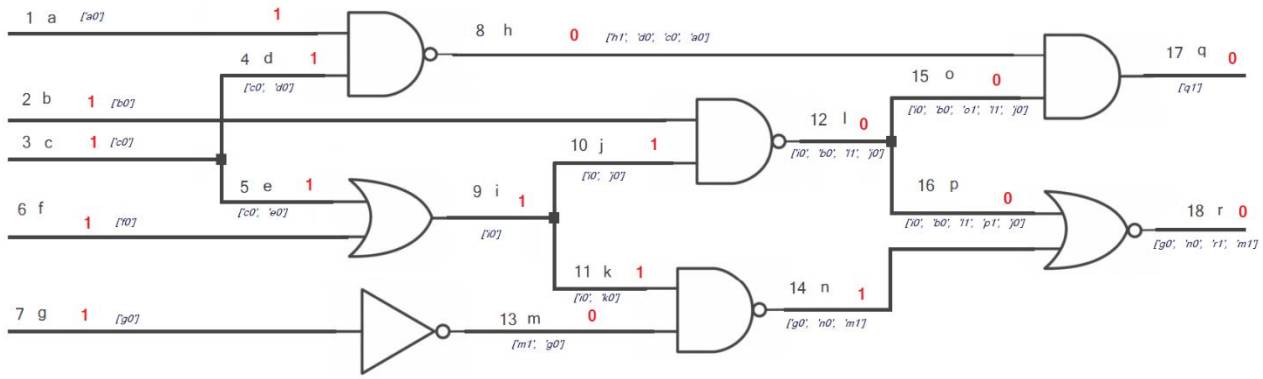
Summary

Deductive Fault Simulation is implemented in Python for a combinational circuit as shown in figure



The netlist of the above circuit is read from “Netlist.txt”. Initially the true values of all the nodes are evaluated for a given test vector. Faults at each net are represented as a list in Python where each element corresponds to the detectable stuck-at faults of corresponding node.

```
Test vector:
 a = 1
 b = 1
 c = 1
 f = 1
 g = 1


faultlist = [['a0'], ['b0'], ['c0'], ['c0', 'd0'], ['e0', 'c0'],
['f0'], ['g0'], ['d0', 'h1', 'c0', 'a0'], ['i0'], ['i0', 'j0'],
['i0', 'k0'], ['i0', 'j0', 'b0', 'l1'], ['m1', 'g0'], ['n0', 'm1',
'g0'], ['i0', 'j0', 'b0', 'l1', 'o1'], ['i0', 'p1', 'j0', 'b0', 'l1'],
['q1'], ['n0', 'r1', 'm1', 'g0']]
```

Using the true values of nets, the faultlist is initialised. Then using the rules for each gate and fanout branches, the faultlist is modified.The output is obtained as a table with Nets, Net names, True Value and Stuck-at Faults detectable at the net for given test vector.

The code works for all the gates and fan-in up to 4 for AND, OR, NAND and NOR gates.

The netlist looks like this:

Format:

```
Gate : <net> <net-name> <type> <fan-out> <fan-in>
       <input1> <input2> etc.
Input: <net> <net-name> inpt <fan-out> 0
Fanout:<net> <net-name> from <source>
```

```
  1     1gat inpt    1   0
  2     2gat inpt    1   0
  3     3gat inpt    2   0
  4     4fan from     3gat
  5     5fan from     3gat
  6     6gat inpt    1   0
  7     7gat inpt    1   0
  8     8gat nand    1   2
   1     4
  9     9gat or    2   2
   5     6
 10    10fan from     9gat
 11    11fan from     9gat
 12    12gat nand    2   2
   2    10
 13    13gat not     1   1
   7
 15    15fan from    12gat
 16    16fan from    12gat
 14    14gat nand    1   2
  11     13
 17    17gat and    0   2
  8    15
 18    18gat nor    0   2
  14    16
```

Output 1

```
==== RESTART: E:\NITK Sem 2\DVTT\Assignment\Deductive Fault Simulation.py ====
Node    Name    Type    Fanin   Inputs

1       a       inpt            --
2       b       inpt            --
3       c       inpt            --
4       d       fanout          3
5       e       fanout          3
6       f       inpt            --
7       g       inpt            --
10      j       fanout          9
11      k       fanout          9
15      o       fanout          12
16      p       fanout          12
8       h       nand    2       [1, 4]
9       i       or      2       [5, 6]
12      l       nand    2       [2, 10]
13      m       not     1       [7]
14      n       nand    2       [11, 13]
17      q       and     2       [8, 15]
18      r       nor     2       [14, 16]


Enter input for net 1 or a: 1
Enter input for net 2 or b: 1
Enter input for net 3 or c: 1
Enter input for net 6 or f: 1
Enter input for net 7 or g: 1

Deductive Fault Simulation


Test vector :
        a = 1
        b = 1
        c = 1
        f = 1
        g = 1


Net number      Net     True value      Faults detectable

1               a       1               ['a0']
2               b       1               ['b0']
3               c       1               ['c0']
4               d       1               ['d0', 'c0']
5               e       1               ['e0', 'c0']
6               f       1               ['f0']
7               g       1               ['g0']
8               h       0               ['h1', 'a0', 'd0', 'c0']
9               i       1               ['i0']
10              j       1               ['j0', 'i0']
11              k       1               ['k0', 'i0']
12              l       0               ['b0', 'l1', 'i0', 'j0']
13              m       0               ['m1', 'g0']
14              n       1               ['m1', 'n0', 'g0']
15              o       0               ['o1', 'b0', 'j0', 'l1', 'i0']
16              p       0               ['b0', 'j0', 'p1', 'l1', 'i0']
17              q       0               ['q1']
18              r       0               ['m1', 'r1', 'n0', 'g0']
>>>
```

Output 2

```
Deductive Fault Simulation


Test vector :
          a = 1
          b = 1
          c = 1
          f = 0
          g = 1


Node number      Node     True value       Faults detectable

1                 a        1                ['a0']
2                 b        1                ['b0']
3                 c        1                ['c0']
4                 d        1                ['d0', 'c0']
5                 e        1                ['e0', 'c0']
6                 f        0                ['f1']
7                 g        1                ['g0']
8                 h        0                ['d0', 'a0', 'c0', 'h1']
9                 i        1                ['i0', 'e0', 'c0']
10                j        1                ['e0', 'j0', 'i0', 'c0']
11                k        1                ['i0', 'k0', 'e0', 'c0']
12                l        0                ['i0', 'e0', 'j0', 'b0', 'c0', 'l1']
13                m        0                ['m1', 'g0']
14                n        1                ['m1', 'n0', 'g0']
15                o        0                ['i0', 'e0', 'j0', 'b0', 'o1', 'c0', 'l1']
16                p        0                ['i0', 'e0', 'p1', 'b0', 'c0', 'l1', 'j0']
17                q        0                ['q1', 'c0']
18                r        0                ['m1', 'r1', 'g0', 'n0']
>>>
```