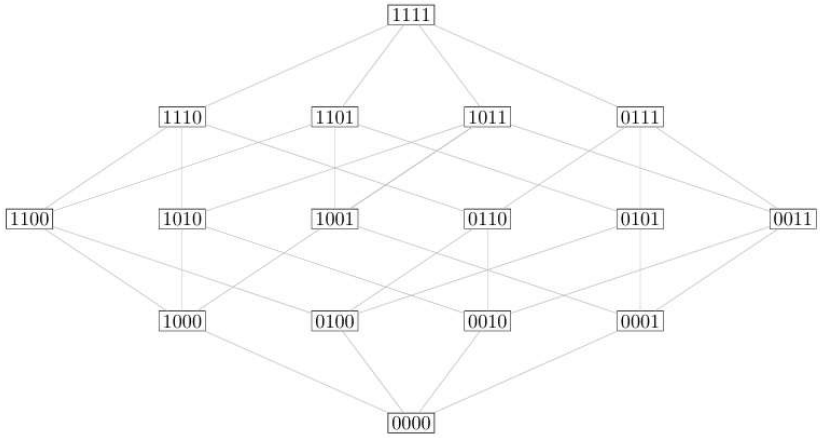
HW5

Friday, October 25, 2024 1:32 PM

1. **Asynchronous automata**. Draw the asynchronous automaton the following Boolean model:

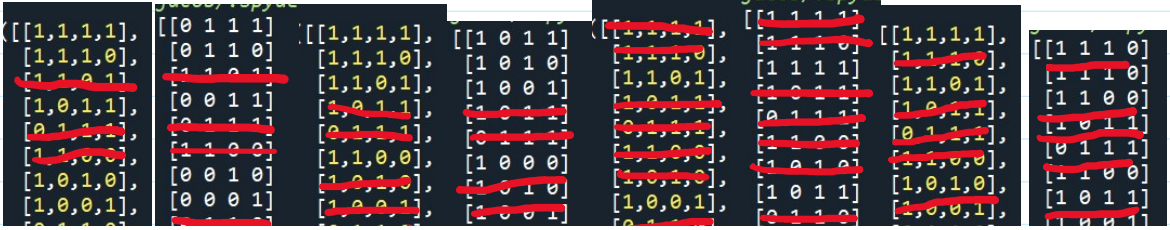
$$(f_1, f_2, f_3, f_4) = (x_2 \wedge \overline{x_3},\ \overline{x_1},\ x_3 \vee x_4,\ x_1 + x_2).$$

Then, partition the nodes into strongly connected components, and draw the acyclic directed graph formed by collapsing the SCCs into single nodes. Find the attractors and classify them by type: fixed point, cyclic attractor, or complex attractor. The Boolean lattice B_4 is shown below.



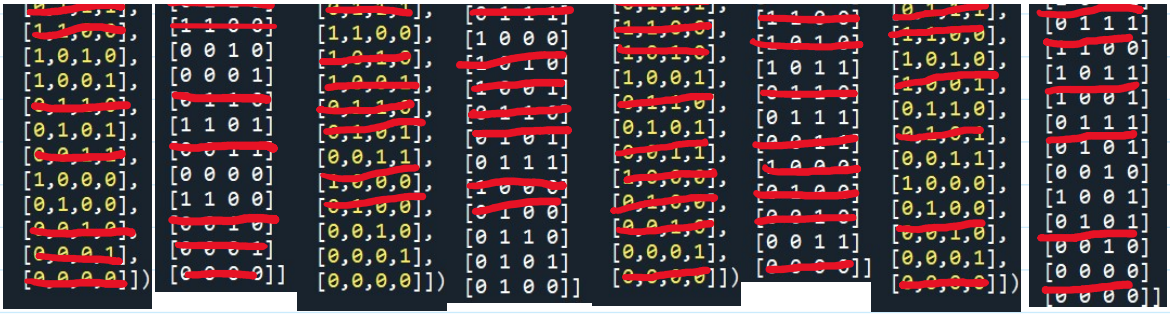

```
import numpy as np

list = np.array([[1,1,1,1],
                 [1,1,1,0],
                 [1,1,0,1],
                 [1,0,1,1],
                 [0,1,1,1],
                 [1,1,0,0],
                 [1,0,1,0],
                 [1,0,0,1],
                 [0,1,1,0],
                 [0,1,0,1],
                 [0,0,1,1],
                 [1,0,0,0],
                 [0,1,0,0],
                 [0,0,1,0],
                 [0,0,0,1],
                 [0,0,0,0]])

#f1
#list[:,0] = list[:,1]*(1+list[:,2])%2

#f2
#list[:,1] = (1+list[:,0])%2

#f3
#list[:,2] = (list[:,2]+list[:,3]+list[:,2]*list[:,3])%2

#f4
#list[:,3] = (list[:,0]+list[:,1])%2

print(list)
```

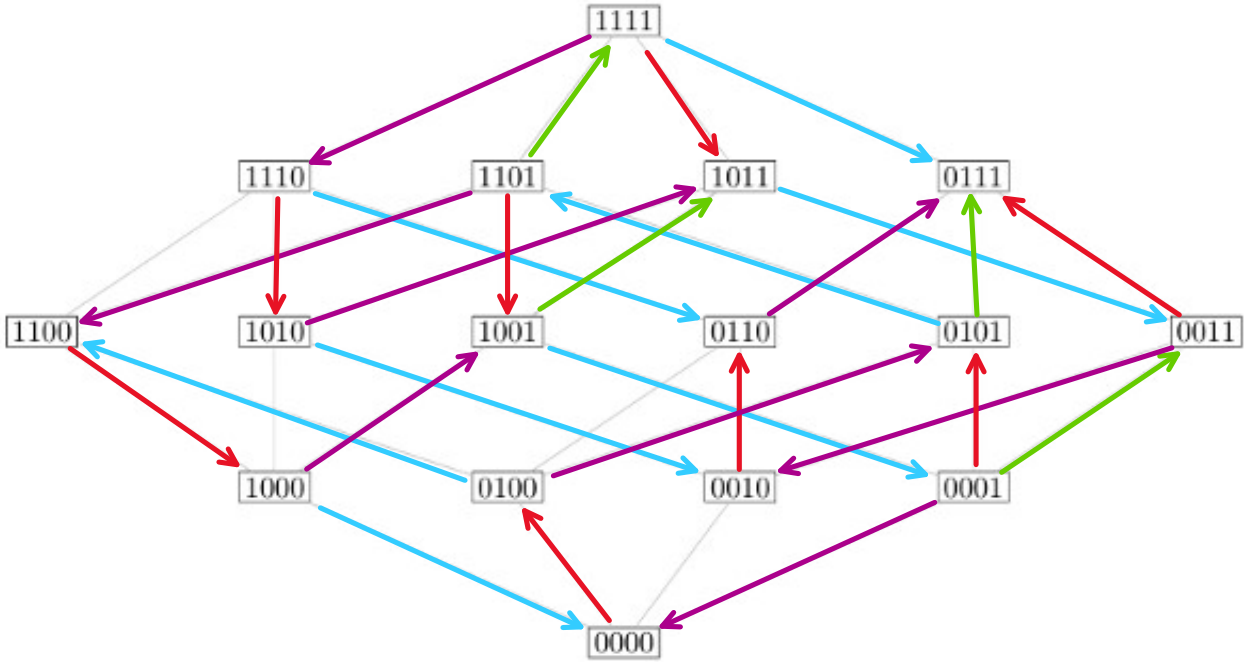
f1 f2 f3 f4

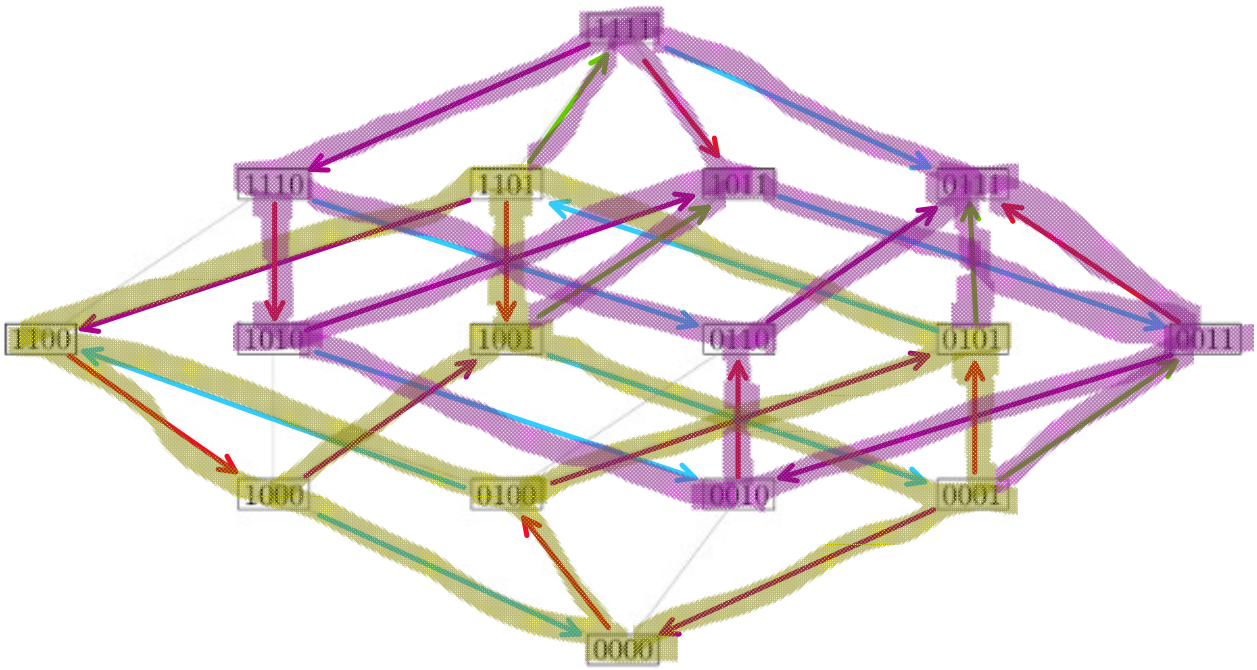


Redlines are ones that didn't change

Change




1111
1110
1101
1011
0111
1100
1010
1001
0110
0101
0011
1000
0100
0010
0001
0000


1111
1110
1101
1011
0111
1100
1010
1001
0110
0101
0011
1000
0100
0010
0001
0000

The yellow part is a complex attractor

0111 is a fixed point. The rest are transient