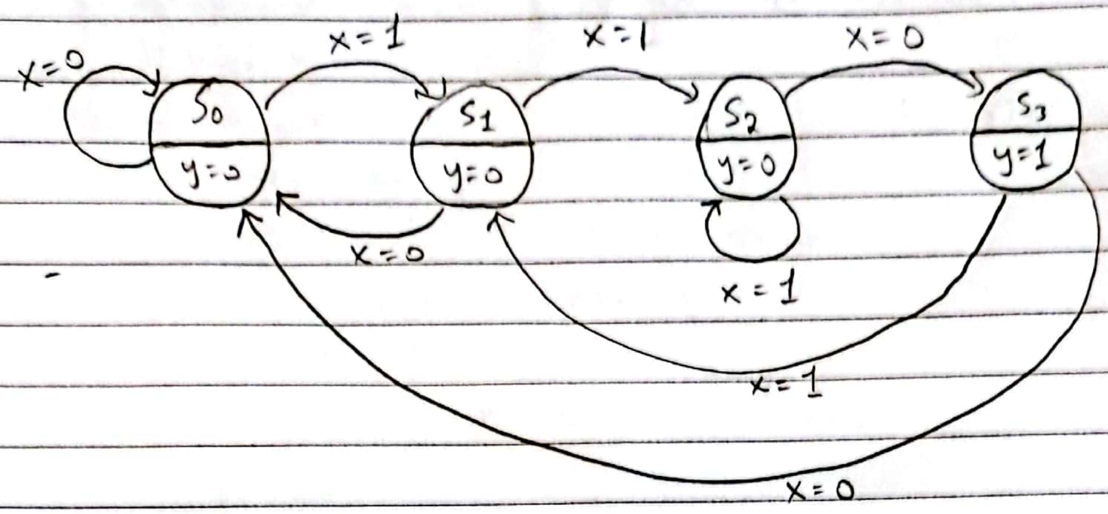
Detect "110"



State Transition Table

S	Input	S'
S_0	0	S_0
S_0	1	S_1
S_1	0	S_0
S_1	1	S_2
S_2	0	S_3
S_2	1	S_2
S_3	0	S_1
S_3	1	S_0

State Encoding

State	Encoding
S_0	00
S_1	01
S_2	10
S_3	11

Output Encoding

Output	Encoding
0	0
1	1

Output Equation

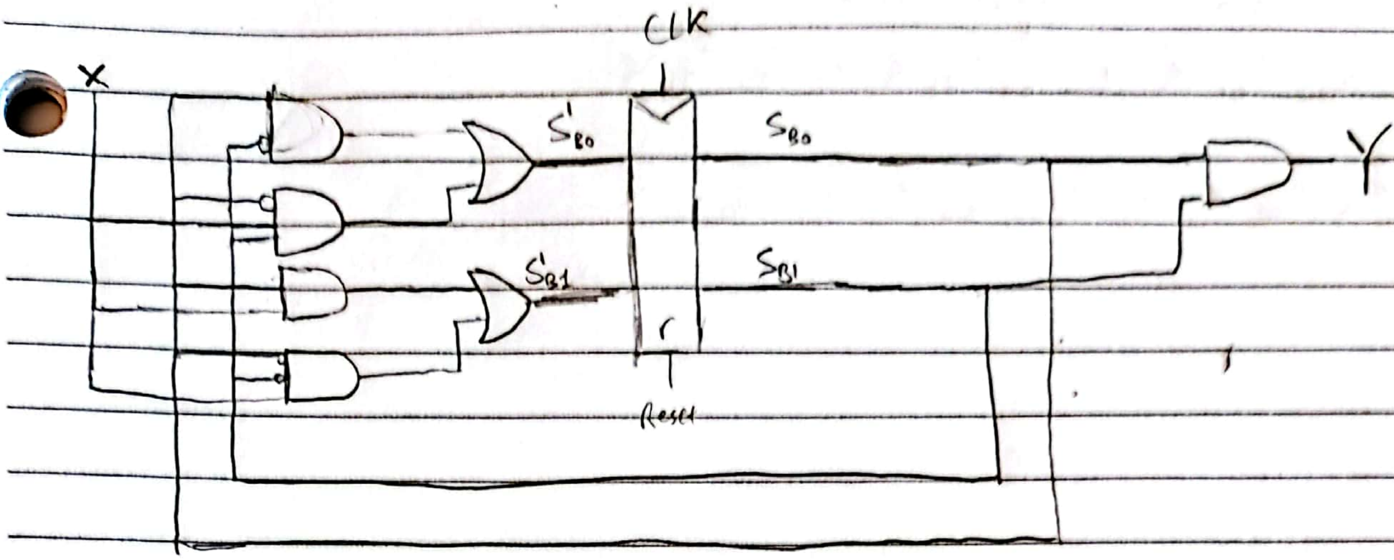
$Y = S_3 = S_{B0} S_{B1}$

State Transitions With Binary Encodings

Current State		Input	Next State	
S_{B0}	S_{B1}	X	S_{B0}'	S_{B1}'
0	0	0	0	0
0	0	1	0	1
0	1	0	0	0
0	1	1	1	0
1	0	0	1	1
1	0	1	1	0
1	1	0	0	1
1	1	1	0	0

$$S_{B0}' = S_{B0} \overline{S_{B1}} \overline{X} + \overline{S_{B0}} S_{B1} X + S_{B0} \overline{S_{B1}} X$$

$$S_{B1}' = \overline{S_{B0}} \overline{S_{B1}} X + S_{B0} \overline{S_{B1}} \overline{X} + S_{B0} S_{B1} \overline{X}$$



See logisim & VHDL for actual implementation

K-Map Simplifications Explained

S'_{B0}

X \ $S_{B0} S_{B1}$	00	01	10	11
0	0	0	0	1
1	0	1	0	1

$$\boxed{S'_{B0} = \bar{S}_{B0} S_{B1} X + S_{B0} \bar{S}_{B1}}$$

S'_{B1}

X \ $S_{B0} S_{B1}$	00	01	10	11
0	0	0	1	1
1	1	0	0	0

$$\boxed{S'_{B1} = S_{B0} \bar{X} + \bar{S}_0 S_1 X}$$