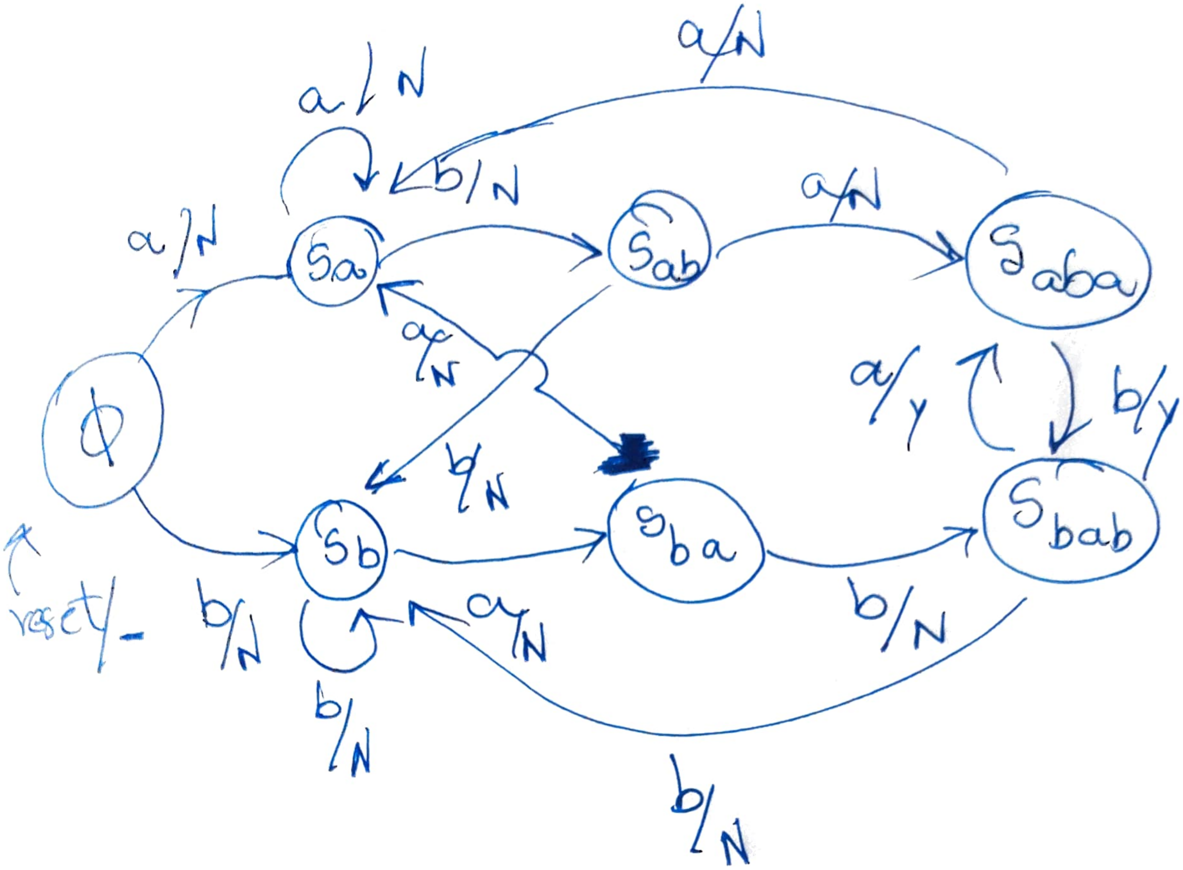

State transition diagram

$Q = \{\phi, S_a, S_b, S_{ab}, S_{ba}, S_{aba}, S_{bab}\}$

$\Sigma = \{a, b, reset\}$

$\Lambda = \{Y, N\}$

$\delta : \Sigma \times Q \to Q$

$\lambda : \Sigma \times Q \to \Lambda$

Binary Encoding (compact encoding)

- For input

x_1	x_0	Symbol
0	0	b
0	1	a
1	0	reset

~~Don't care~~

- For output

y_0	Symbol
0	N
1	Y

- For State

q_2	q_1	q_0	Symbol
0	0	0	ϕ
0	0	1	S_a
0	1	0	S_b
0	1	1	S_{ab}
1	0	0	S_{ba}
1	0	1	S_{aba}
1	1	0	S_{bab}
1	1	1	

When input is reset output is zero

Binary Encoding (One hot encoding)

Not used later in design

- For input

x_1	x_0	Symbol
0	0	Reset
0	1	a
1	0	b

- For output

y_1	y_0	symbol
0	1	N
1	0	Y

- For state

q_6	q_5	q_4	q_3	q_2	q_1	q_0	Symbol
							ϕ
0	0	0	0	0	0	1	S_a
0	0	0	0	0	1	0	S_b
0	0	0	0	1	0	0	S_{ab}
0	0	0	1	0	0	0	S_{ba}
0	0	1	0	0	0	0	S_{aba}
0	1	0	0	0	0	0	S_{bab}
1	0	0	0	0	0	0	

When input is reset output is zero

This can be done by taking $\underset{\text{reset}}{\downarrow}$ NOR with $\underbrace{\text{output}}$

~~So~~, where output depends on only $\underline{x_0}$

Then final output = x_1 NOR output

Same thing can be done for state transition $\underline{\text{function}}$

NOR $\underbrace{\text{output}}_{q_2, q_1, q_0}$ with x_1

State functions & Output functions

Present state q_2	q_1	q_0	Input x_0	Next State q_2'	q_1'	q_0'	Output y_0
0	0	0	0	0	1	0	0
0	0	0	1	0	0	1	0
0	0	1	0	0	1	1	0
0	0	1	1	0	0	1	0
0	1	0	0	0	1	0	0
0	1	0	1	1	0	0	0
0	1	1	0	0	1	0	0
0	1	1	1	1	0	1	0
1	0	0	0	1	1	0	0
1	0	0	1	0	0	1	0
1	0	1	0	1	1	0	1
1	0	1	1	0	0	1	0
1	1	0	0	0	1	0	0
1	1	0	1	1	0	1	1

δ for q_2

$q_2q_1 \backslash q_0x_0$	00	01	11	10
00	0_0	0_1	0_3	0_2
01	0_4	1_5	1_7	0_6
11	0_{12}	1_{13}	X_{15}	X_{14}
10	1_8	0_9	0_{11}	1_{10}

Quad + Pair

$$\therefore \delta_{q_2} = q_1x_0 + q_2\overline{q}_1\overline{x}_0$$

δ for q_1

$q_2q_1 \backslash q_0x_0$	00	01	11	10
00	1_0	0_1	0_3	1_2
01	1_4	0_5	0_7	1_6
11	1_{12}	0_{13}	X_{15}	X_{14}
10	1_8	0_9	0_{11}	1_{10}

Octet

$$\delta q_1 = \overline{x}_0$$

δ for q_0

$q_2q_1 \backslash q_0x_0$	00	01	11	10
00	0_0	1_1	1_3	1_2
01	0_4	0_5	1_7	0_6
11	0_{12}	1_{13}	X_{15}	X_{14}
10	0_8	1_9	1_{11}	0_{10}

2 Quad
2 Pair

$$\delta q_0 = q_2x_0 + q_0x_0 + \overline{q}_2\overline{q}_1x_0 + \overline{q}_2\overline{q}_1q_0$$

for output y

$q_2q_1 \backslash q_0x_0$	00	01	11	10
00	0_0	0_1	0_3	0_2
01	0_4	0_5	0_7	0_6
11	0_{12}	1_{13}	X_{15}	X_{14}
10	0_8	0_9	0_{11}	1_{10}

2 Pairs

$$\lambda = q_2 q_1 x_0 + q_2 q_1 \overline{x_0}$$

To accomodate reset

$\therefore \lambda_{final} = x_1$ NOR (λ)

δ_{final} $=$ $\cancel{\delta}$ x_1 NOR $\delta_{q_2 q_1 q_0}$ respectied

for each q_2, q_1, q_0

To implement AND we can do NAND then NOT

To implement OR we can do NOR then NOT

Final design