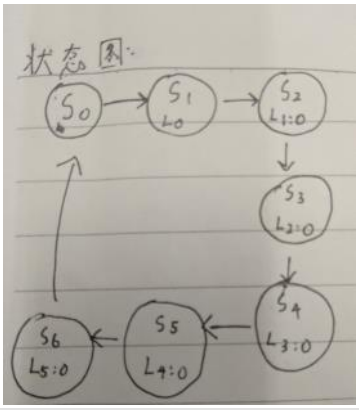
时序逻辑作业

2018年10月17日, 星期三 10:06

状态转换图

其中Si的i代表亮灯数目：



编码前的状态表与输出表：

S	L0	L1	L2	L3	L4	L5	S'
S0	0	0	0	0	0	0	S1
S1	1	0	0	0	0	0	S2
S2	1	1	0	0	0	0	S3
S3	1	1	1	0	0	0	S4
S4	1	1	1	1	0	0	S5
S5	1	1	1	1	1	0	S6
S6	1	1	1	1	1	1	S0

编码：

S	编码
S0	000
S1	001
S2	010
S3	011
S4	100
S5	101
S6	110

编码后的状态转换表：

S0	S1	S2	S1'	S2'	S3'
0	0	0	0	0	1
0	0	1	0	1	0
0	1	0	0	1	1
0	1	1	1	0	0
1	0	0	1	0	1
1	0	1	1	1	0
1	1	0	0	0	0

编码后的输出表：

S0	S1	S2	L0	L1	L2	L3	L4	L5
0	0	0	0	0	0	0	0	0
0	0	1	1	0	0	0	0	0
0	1	0	1	1	0	0	0	0
0	1	1	1	1	1	0	0	0
1	0	0	1	1	1	1	0	0
1	0	1	1	1	1	1	1	0

	1	1	0	1	1	1	1	1	1

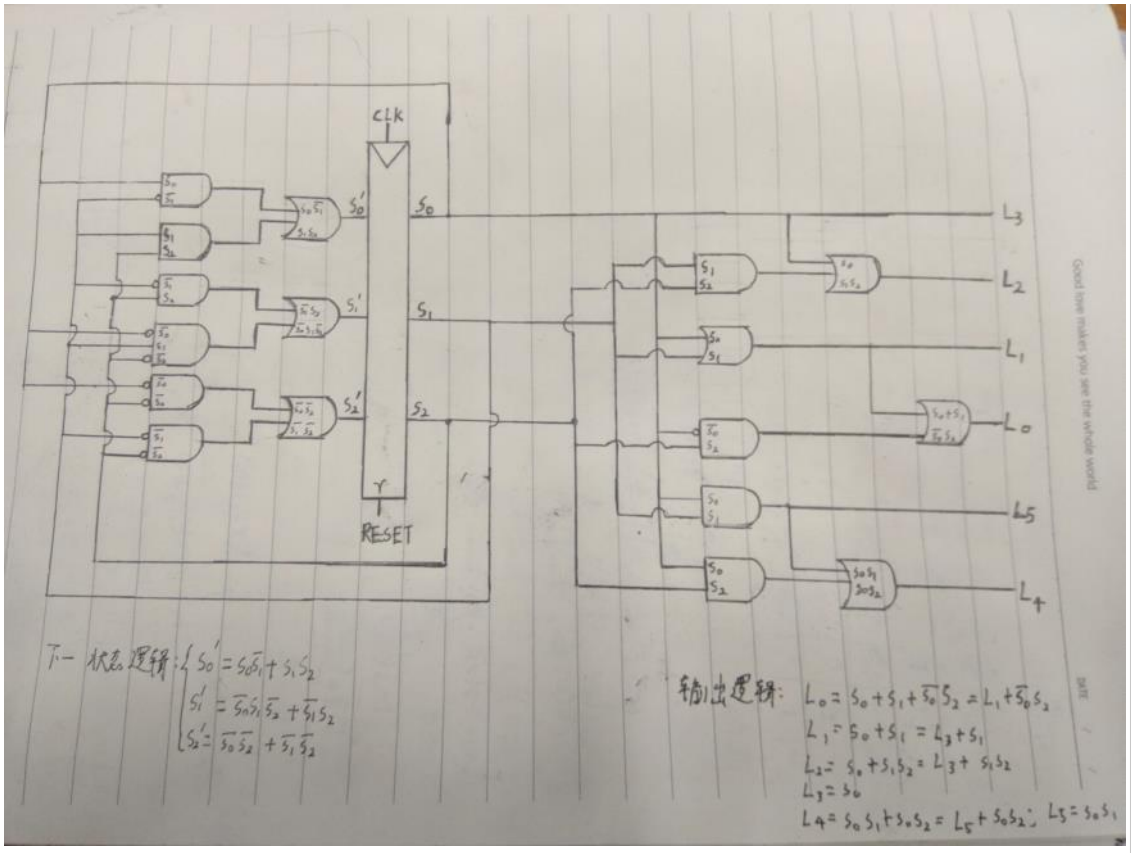
由编码后的表获得下一状态逻辑：

下一状态	卡诺图					表达式
S0'	S2/s0s1	00	01	11	10	$s_0' = s_0\overline{s_1} + s_1 s_2$
	0	0	0	0	1	
	1	0	1	X	1	
S1'	S2/s0s1	00	01	11	10	$s_1' = \overline{s_0}s_1\overline{s_2} + \overline{s_1}s_2$
	0	0	1	0	0	
	1	1	0	X	1	
S2'	S2/s0s1	00	01	11	10	$s_2' = \overline{s_0 s_2} + \overline{s_1 s_2}$
	0	1	1	0	1	
	1	0	0	X	0	

由编码后的表获得输出逻辑：

输出名	卡诺图					表达式
L0	S_2/S_0S_1	00	01	11	10	$L_0 = S_o + S_1 + \overline{S_0}S_2$
	0	0	1	1	1	
	1	1	1	X	1	
L1	S_2/S_0S_1	00	01	11	10	$L_1 = S_o + S_1$
	0	0	1	1	1	
	1	0	1	X	1	
L2	S_2/S_0S_1	00	01	11	10	$L_2 = S_o + S_1S_2$
	0	0	0	1	1	
	1	0	1	X	1	
L3	S_2/S_0S_1	00	01	11	10	$L_3 = S_0$
	0	0	0	1	1	
	1	0	0	X	1	
L4	S_2/S_0S_1	00	01	11	10	$L_4 = S_0S_1 + S_0S_2$
	0	0	0	1	0	
	1	0	0	X	1	
L5	S_2/S_0S_1	00	01	11	10	$L_5 = S_0S_1$
	0	0	0	1	0	
	1	0	0	X	0	

电路图



转换为布尔表达式，先用二位信号进行编码：

State	Encoding
S0	00
S1	01

Output	Encoding
green	00
yellow	01

转换为布尔表达式，先用二位信号进行编码：

State	Encoding
S0	00
S1	01
S2	10
S3	11

Output	Encoding
green	00
yellow	01
red	10

转变为以下表：

Current State		Inputs		Next State	
S_1	S_0	T_A	T_B	S'_1	S'_0
0	0	0	X	0	1
0	0	1	X	0	0
0	1	X	X	1	0
1	0	X	0	1	1
1	0	X	1	1	0
1	1	X	X	0	0

$$S'_1 = S_1 \oplus S_0$$
$$S'_0 = \overline{S_1}\,\overline{S_0}\,\overline{T_A} + S_1\overline{S_0}\,\overline{T_B}$$

由状态绘制输出表

Current State		Outputs			
S_1	S_0	L_{A1}	L_{A0}	L_{B1}	L_{B0}
0	0	0	0	1	0
0	1	0	1	1	0
1	0	1	0	0	0
1	1	1	0	0	1

$$L_{A1} = S_1$$
$$L_{A0} = \overline{S_1}S_0$$
$$L_{B1} = \overline{S_1}$$
$$L_{B0} = S_1S_0$$