第四章　组合逻辑电路设计（二）

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4.5 logisim的基本使用

例 设计一个比较两个三位二进制数是否相等的数值比较器。

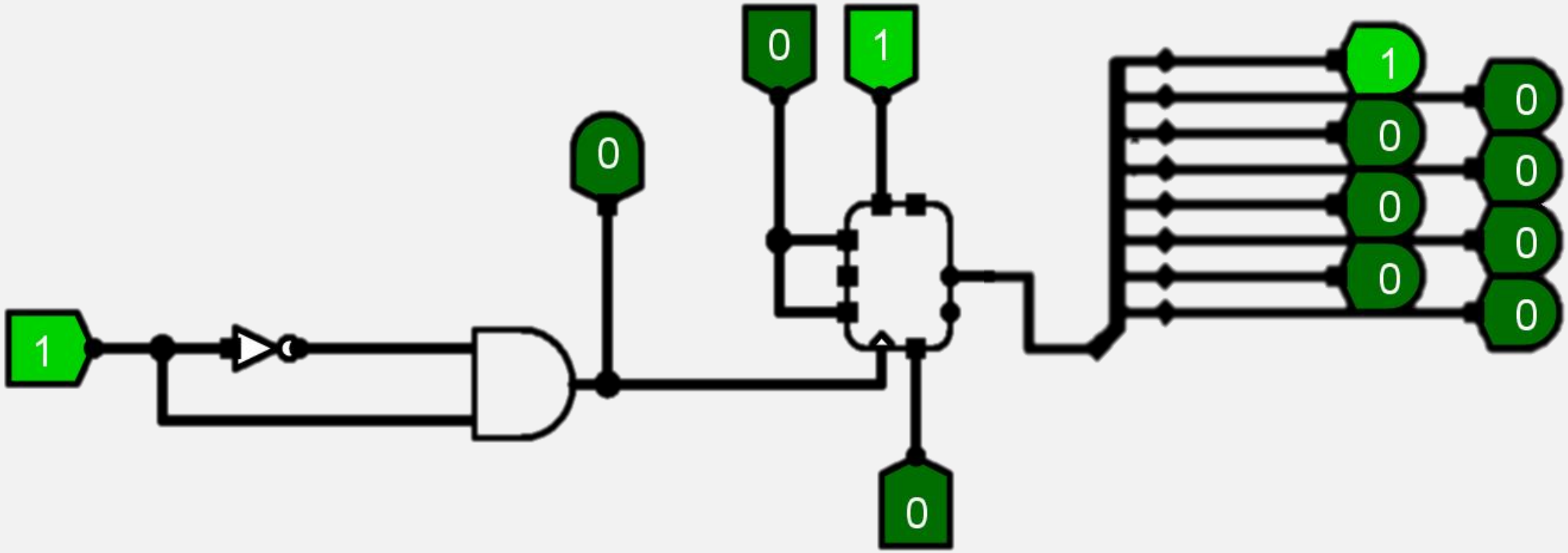
（两个3位二进制数分别为A = $a_3a_2a_1$，B = $b_3b_2b_1$）

$$F_{=} = (\overline{a_3} \cdot \overline{b_3} + a_3b_3) \cdot (\overline{a_2} \cdot \overline{b_2} + a_2b_2) \cdot (\overline{a_1} \cdot \overline{b_1} + a_1b_1)$$

$$F_{A>B} = A_3\overline{B_3} + (A_3B_3 + \overline{A_3}\,\overline{B_3})(A_2\overline{B_2}) + (A_3B_3 + \overline{A_3}\,\overline{B_3})(A_2B_2 + \overline{A_2}\,\overline{B_2})(A_1\overline{B_1})$$

$$F_{A<B} = \overline{A_3}B_3 + (A_3B_3 + \overline{A_3}\,\overline{B_3})(\overline{A_2}B_2) + (A_3B_3 + \overline{A_3}\,\overline{B_3})(A_2B_2 + \overline{A_2}\,\overline{B_2})(\overline{A_1}B_1)$$

4.5 logisim的基本使用



险像实验演示

1. 一位全加器FA设计

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  1 1
+ 1 1
  1 0
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1 1 0
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加数X_i	加数Y_i	低位进位C_i	和数S_i	进位C_{i+1}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

$$S_i = X_i \oplus Y_i \oplus C_i$$

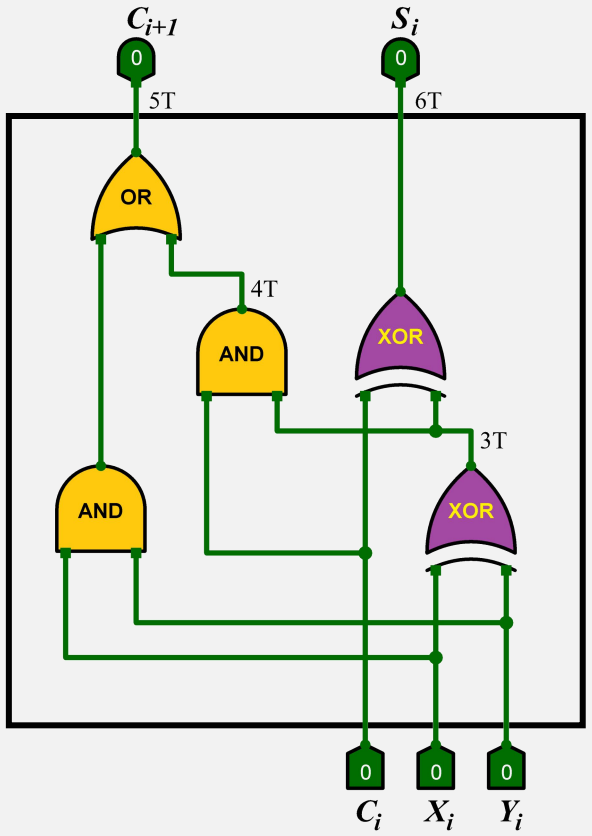
$$C_{i+1} = X_i Y_i + (X_i \oplus Y_i) C_i$$

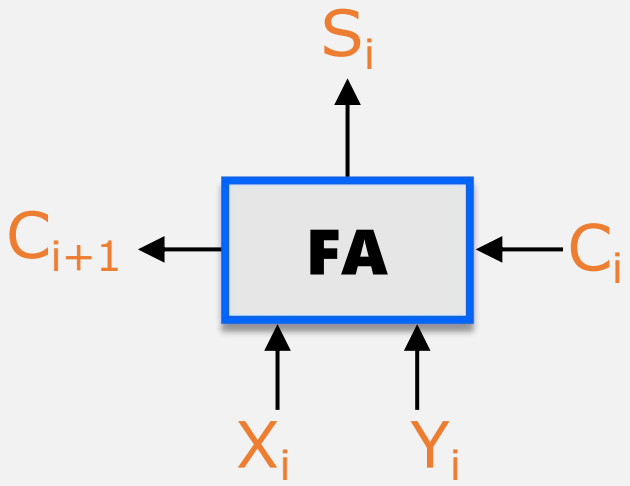
$$C_{i+1} = X_i Y_i + (X_i + Y_i) C_i$$

4.6 基本组合逻辑功能部件设计

$$S_i = X_i \oplus Y_i \oplus C_i$$

$$C_{i+1} = X_i Y_i + (X_i \oplus Y_i) C_i$$





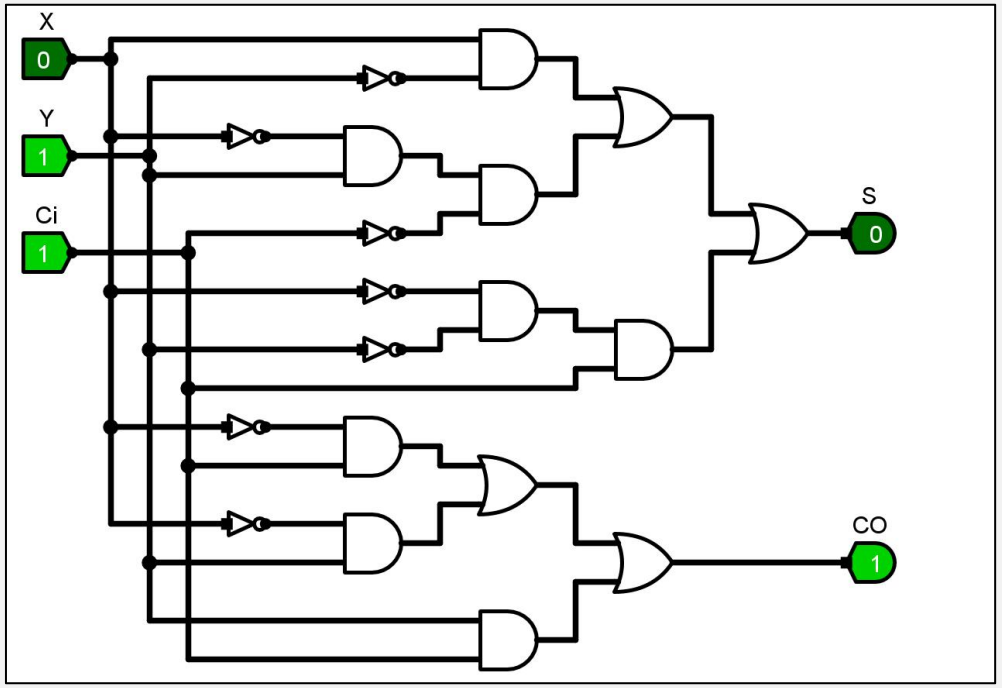
2. 一位全减器的设计

加数X_i	加数Y_i	低位进位C_i	和数S_i	进位C_{i+1}
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

被减数X_i	减数Y_i	低位借位C_i	差S_i	借位C_{i+1}
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

4.6 基本组合逻辑功能部件设计

被减数X_i	减数Y_i	低位借位C_i	差S_i	借位C_{i+1}
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1



$$S_i = \overline{X}\overline{Y}C + \overline{X}Y\overline{C} + X\overline{Y}\overline{C} + XYC$$

$$= \overline{X}\overline{Y}C + \overline{X}Y\overline{C} + X\overline{Y}$$

$$C_{i+1} = \overline{X}\overline{Y}C + \overline{X}Y\overline{C} + \overline{X}YC + XYC$$

$$= \overline{X}Y + YC + \overline{X}C$$