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Project 1
9/9/21

3 Bit Adder

Overview

In this project we are tasked to get familiar with logisim. After this we are to work out the logic and K-maps for a 1 bit and 3 bit full adder. Once we have a minimized version of the full adder logic we will build it in Logisim and simulate it.

K maps and truth tables

The image shows handwritten work on lined paper for a 1-bit full adder. It includes two truth tables, two K-maps, and the resulting logic equations for Sum and Cout.

Truth Table 1: Sum(X, Y, Cin)

X	Y	Cin	Sum
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

Truth Table 2: Cout(X, Y, Cin)

X	Y	Cin	Cout
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

K-map for Sum

X \ Y	Cin	
	0	1
00	0	1
01	1	0
11	0	1
10	1	0

K-map for Cout

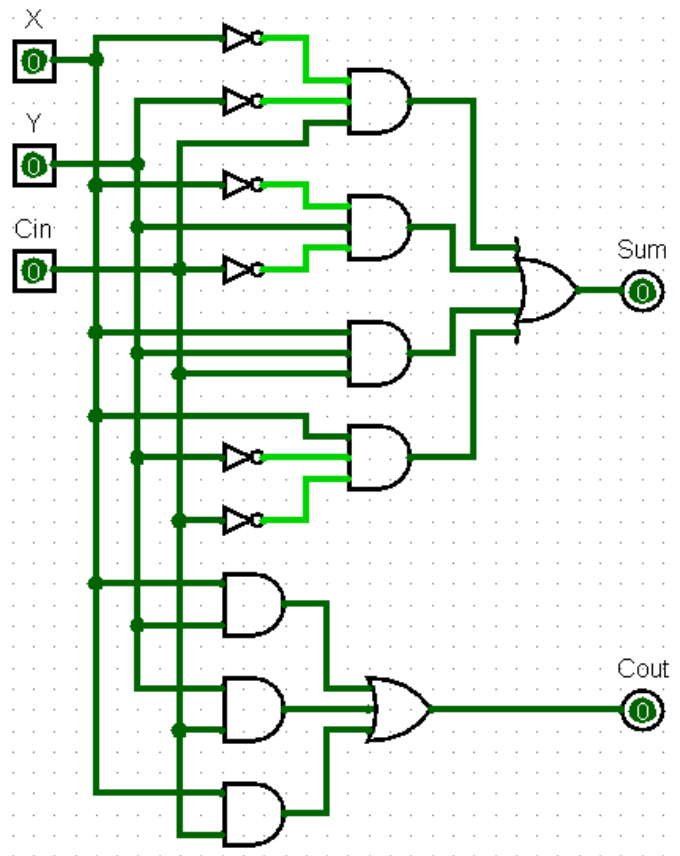
X \ Y	Cin	
	0	1
00	0	0
01	0	1
11	1	1
10	0	1

Logic Equations

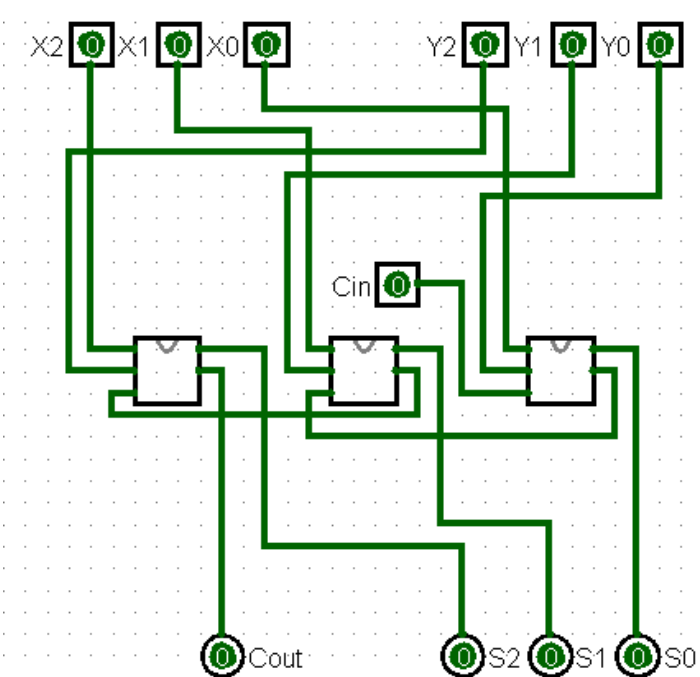
$$\begin{aligned} \text{Sum} &= \overline{X}\overline{Y}C_{in} + \overline{X}Y\overline{C}_{in} + X\overline{Y}C_{in} + XY\overline{C}_{in} \\ &= X(\overline{Y}C_{in} + Y\overline{C}_{in}) + \overline{X}(\overline{Y}C_{in} + Y\overline{C}_{in}) \\ &= X(Y \oplus C_{in}) + \overline{X}(Y \oplus C_{in}) \\ &= Y \oplus C_{in} \end{aligned}$$
$$\text{Cout} = XY + YC_{in} + XC_{in}$$

~~$= XY + YC_{in} + XC_{in}$~~

1 Bit Adder



3 Bit Adder



Conclusion

I think this project was interesting as I have never used Logisim before so I found it very cool. The project was easy, but this is partially because I have already finished my EE part of my degree so digital logic is very easy. I would like to play with logisim some more and would be curious how well making an alu on here would work then work up to a computer.