ECE 255 Lab 2: 3-bit Adder from Components

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Lab 2

ECE 255 Section 001

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Introduction:
The goal of this lab was to use built-in adder components in circuits. Students were then tasked with creating the circuits for those components and implementing those in the original circuits. For Task 1, there are three input pins, and the circuit adds 1 to the input, X. The final, incremented value, is then output. Two constants, 0 and 1, are used as inputs for inputs for the three adders (and is also the cin for adder 0 (FA0). Four LEDs were used as the output. The adder was then built using three input pins and two output pins. For Task 2, instead of incrementing the input by 1, another 3-bit positive integer, Y, was added. There are also four output pins in this task. Constant 0 is still used, but constant 1 is now unused. LEDs were also used as output in Task 2. The motive of this lab was to use built-in adders to achieve the desired result for a circuit but to then build those components "by hand" to achieve the same result when those subcomponents are implemented back into the original circuits. The process of visually showing the connections between the pins, wires, adders, and output(s) verifies the design of the built-in (built into Logisim) adder component.

Methods:
I followed the directions in the Logisim tutorial and in the Lab 2 pdf. I connected wires to pins, adders, and outputs. I verified that the output for the schematics in Tasks 1 and 2 utilizing the built-in components matched the output when those adders were designed "by hand."

Design Description:
(Refer to Logisim schematics)
These schematics show how all possible "poke" combinations in the circuits with built-in adders matched the circuits with the 3-bit adders designed "by hand."

Results:
Tasks 1 and 2 were meant to show that the built-in adder matched the adder designed "by hand." Showing that using the same poke combinations on these two different circuits (for both Tasks 1 and 2) yielded the same results. If the LEDs responded the same for the two different circuits in each task (built-in vs. "by hand"), it is verified that the built-in components work the same as designing the adders "by hand."

Conclusions:
I learned that LEDs, as well as output pins, can simply be used as output devices. I learned that you can make your own components to use in other circuits. I learned that you can change the number of bits on the full adder. In this case, Y (3-bit) was added in Task 2. I learned that adding Y in Task 2 multiplied the number of possible poke combinations by 2^3, just like how X in Task 1 simply had 2^3 poke combinations.