

Project 2: Counter with Display

CS 200

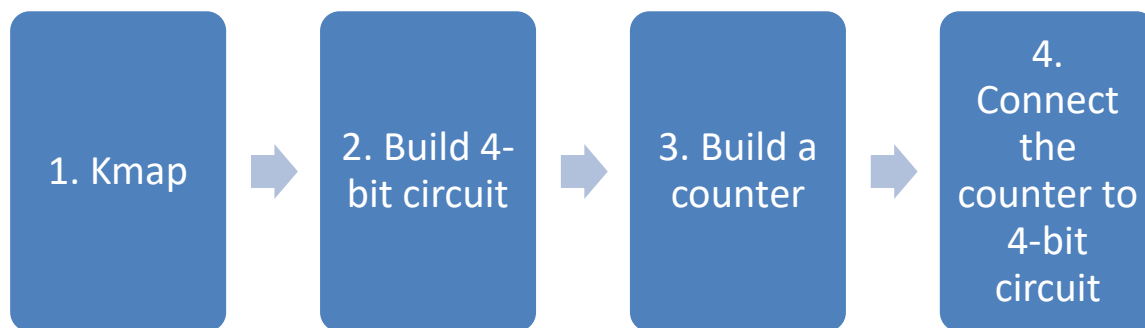
Jennie Butch
9/22/2022

Project Overview

Purpose:

For this project, the problem that I am trying to solve is how I am creating a counter on Logisim. When creating the counter, I must consider my inputs and outputs which were provided. Then implementing a couple of skills, I have learned from the previous homework and project which were how to read a truth table, Karnaugh Maps (aka Kmaps), and how to build a circuit.

Approach:



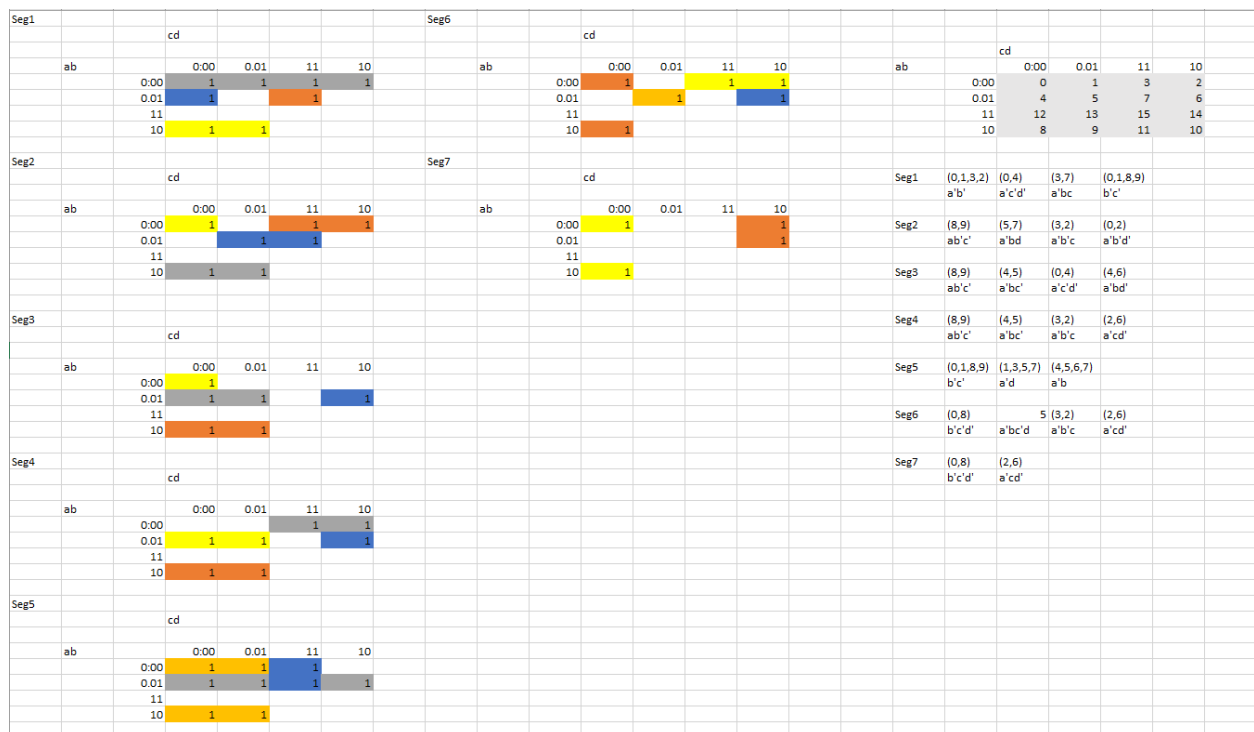
I intend to solve the problem by first doing a Kmap for all seven of my outputs. That way I know all of my equations to help tell my seven-segment display how to display each of my numbers on the truth table. From there I know I do not want to show all seven gates worth of information so I plan on building a circuit that condenses it to smaller rectangle which I plan to connect to the counter once that is built.

To build the counter, I simply place the digital counter then taking my seven connections on the right side of the rectangle, I one by one connect it. Each one I place is going to show me where on the counter it represents of the red lines on it that eventually form a one-digit number.

So as of right now I did the first three steps, for my final step I plan on creating my JK flip flop to tell my counter how many 1's and 0's I need to form the number I want. When it comes to placing my JK flip flops I know I want to place down four of them to represent each

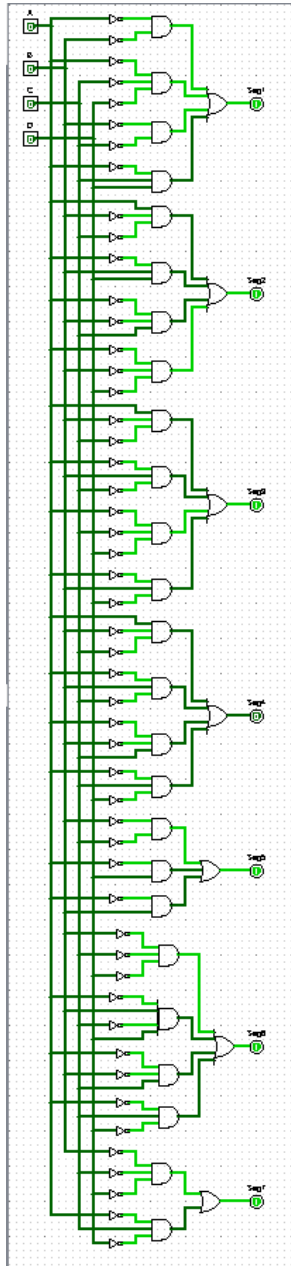
Results

Kmaps + Equations Process:

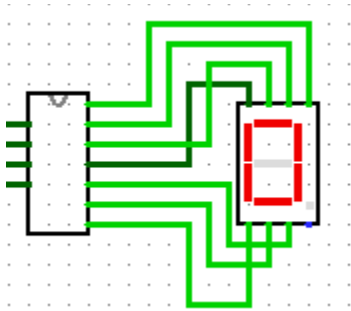


Once I built the circuit, I knew that the display was created when it displayed the whole circuit shown below. Then I went back to my main page to see the circuit below my main. So, I placed my new display next to the counter and used all seven connections on the right side of the rectangle and wired them to the counter. The fourth connection automatically started at zero based on the table that is my original connection for the counter. From there one through three was connected to the top of the counter and five through seven was connected on the bottom.

4-Bit 7 Segment Display:

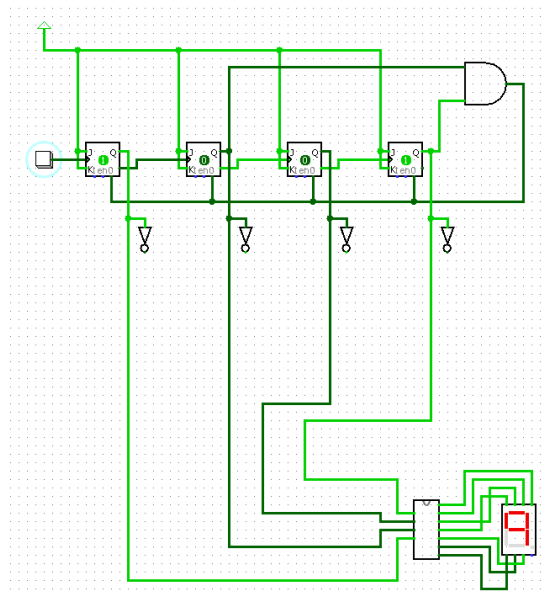


Counter Connection:



From there, I take care of the JK flip flop so that I no longer need an input to click one by one instead I can just click one button to change the counter. In which case, I did follow my plan about using the JK flip flop to be connected to the seven segment so that when it reads the ones and zeros it represents the number it would have been on the truth table. I made sure to connect power to each of the JK flip flops so it would actually operate. In addition, I also adding the AND gate to help the circuit understand the difference between the top and the bottom of the counter's connections. In the image below is the whole circuit that has the JK flip flop and the counter where they were both built separate but once finished connected as one and works.

The Whole Circuit:



Here is the file:

[project 2.circ](#)

Conclusion

This project was a bit more difficult than the previous one. I thought I fully wrapped my head around using Logisim but I was wrong. When it came to this project, I had a difficult start. Once I tried to build the counter first it was not going according to plan. So, I did some research and realize how important it is to build a circuit first before implementing so much more. A part of building the circuit was knowing the kmaps for all seven outputs.

Once I did the kmap things got a bit easier. I felt a bit in my element at this point since I knew how to do the kmap and I knew I had to find my equations from there. That way I can place all that information into the circuit which I thought was cool since if you put different numbers in then the circuit connection can be different. Even just in general, it was cool to build the circuit to help with the overall picture. It condenses it in a unique way so that the image of the 4-bit display does not take up everything instead it's just a small rectangle.

The JK flip flop was challenging to power it the way I wanted it too. I did not even think about having power to them until I was researching about the JK flip flop. Not only that it was the process as a whole to understand the JK flip flop function in Logisim, like I knew the flip flop is basically an on and off switch but I did not think about how exactly I wanted to implement it into Logisim. This project was a lot more research than I expected.

Even if I found this project to be challenging, I did enjoy what I got out of it. I thought it was really cool to basically make a counter off of just ones and zeroes. I felt like also I got more practice out of the kmaps since they can get confusing at certain points for me that's just because I do not want to mess up the numbers, I learned that the hard way in this project when my six on the counter was not forming right and that's just because I put one more one than I needed in the truth table for the 4-bit display.