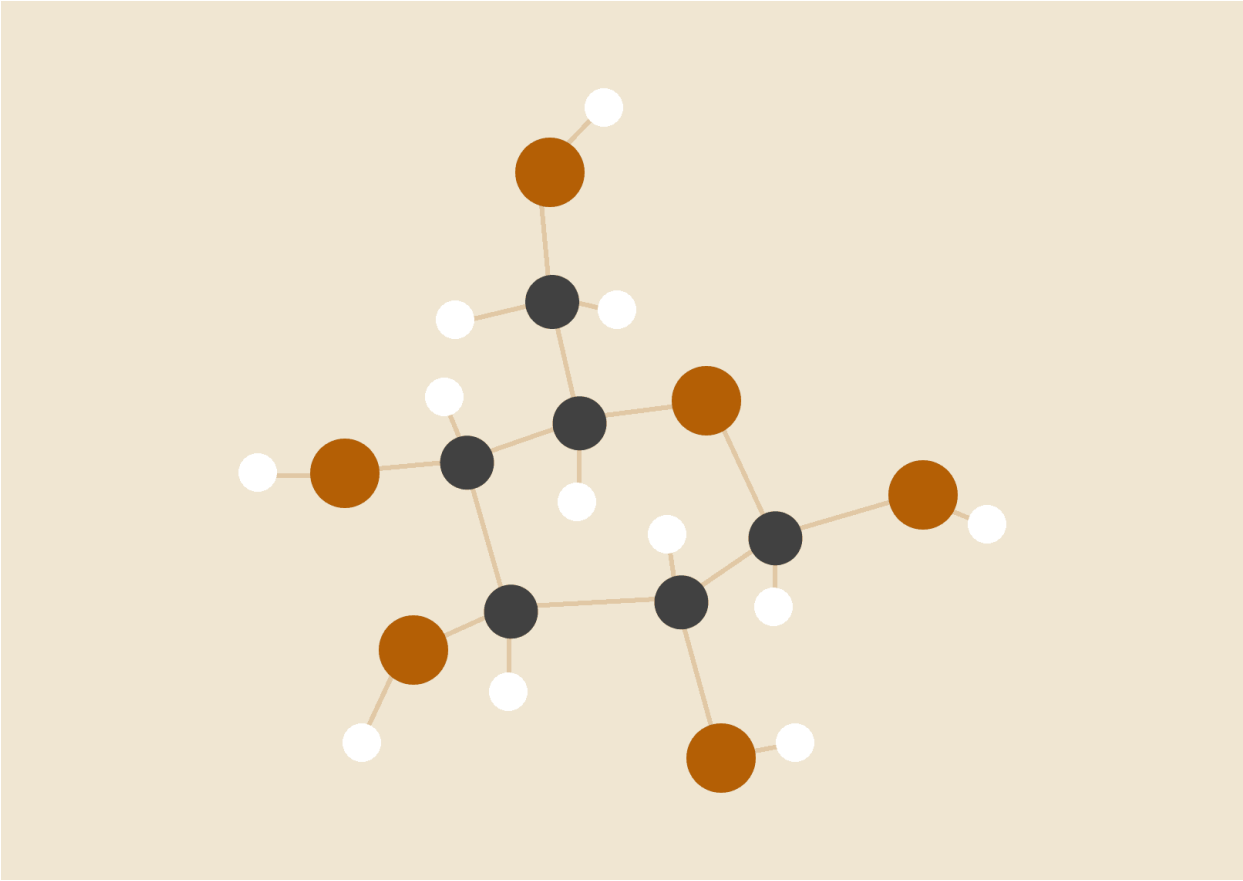
Date of Birth Project



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Digital Electronics

Introduction

For this project, our problem was a lack of an efficient process for storing dates of birth. You would always need a large amount of seven-segment displays, which was much more cost and energy-consuming. This led to a simple binary toggle to switch between dates and display each date on a singular Seven-Segment display.

Input

The input for our project would be three switches, which in combination would allow us to store 8 different numbers, and was dependent on the position of the switches. That means that depending on if the switches were on or off the number on the Sevent-Segment display would differ.

Output

The output for our project would be seven lines that connect to a Seven-Segment display. This would allow for a large combination of numbers on our output and give us an easy way to get started on the project.

Procedure

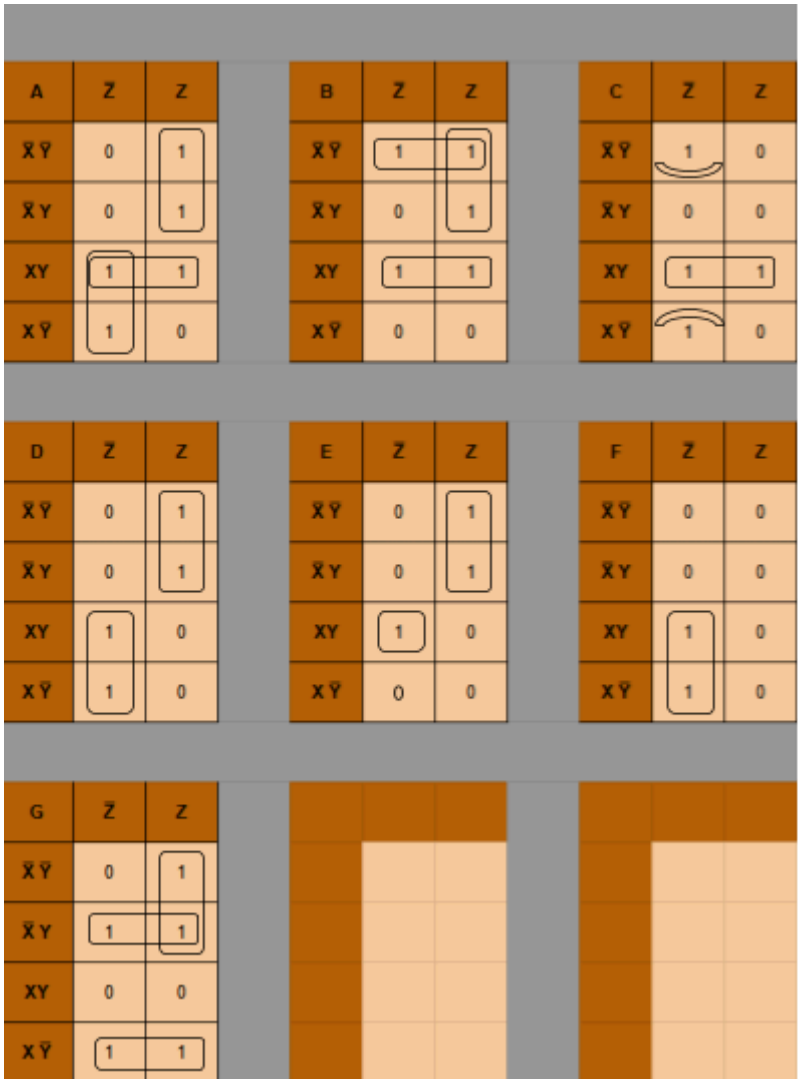
1. Come up with a truth table for our project that can be simplified.
2. Simplify down into a singular equation using K-Map Simplification.
3. Build an AOI version of our circuit online
4. Use NAND and NOR to refine the circuit further
5. Finally, Tinkercad was used to prototype the physical circuit.

Truth Table

X	Y	Z	Display	a	b	c	d	e	f	g
0	0	0	**1**	0	1	1	0	0	0	0
0	0	1	**2**	1	1	0	1	1	0	1
0	1	0	-	0	0	0	0	0	0	1
0	1	1	**2**	1	1	0	1	1	0	1
1	0	0	**5**	1	0	1	1	0	1	1
1	0	1	-	0	0	0	0	0	0	1
1	1	0	**0**	1	1	1	1	1	1	0
1	1	1	**7**	1	1	1	0	0	0	0

The truth table takes all of the numbers we need and puts them into a truth table based on the Seven-Segment display pieces.

Karnough Mapping



Equations

The K-Mapping lets us get all of our equations:

$$A = \overline{X}Z + XY + X\overline{Z}$$

$$B = \overline{X}\,\overline{Y} + YZ + XY$$

$$C = \overline{Y}\,\overline{Z} + XY$$

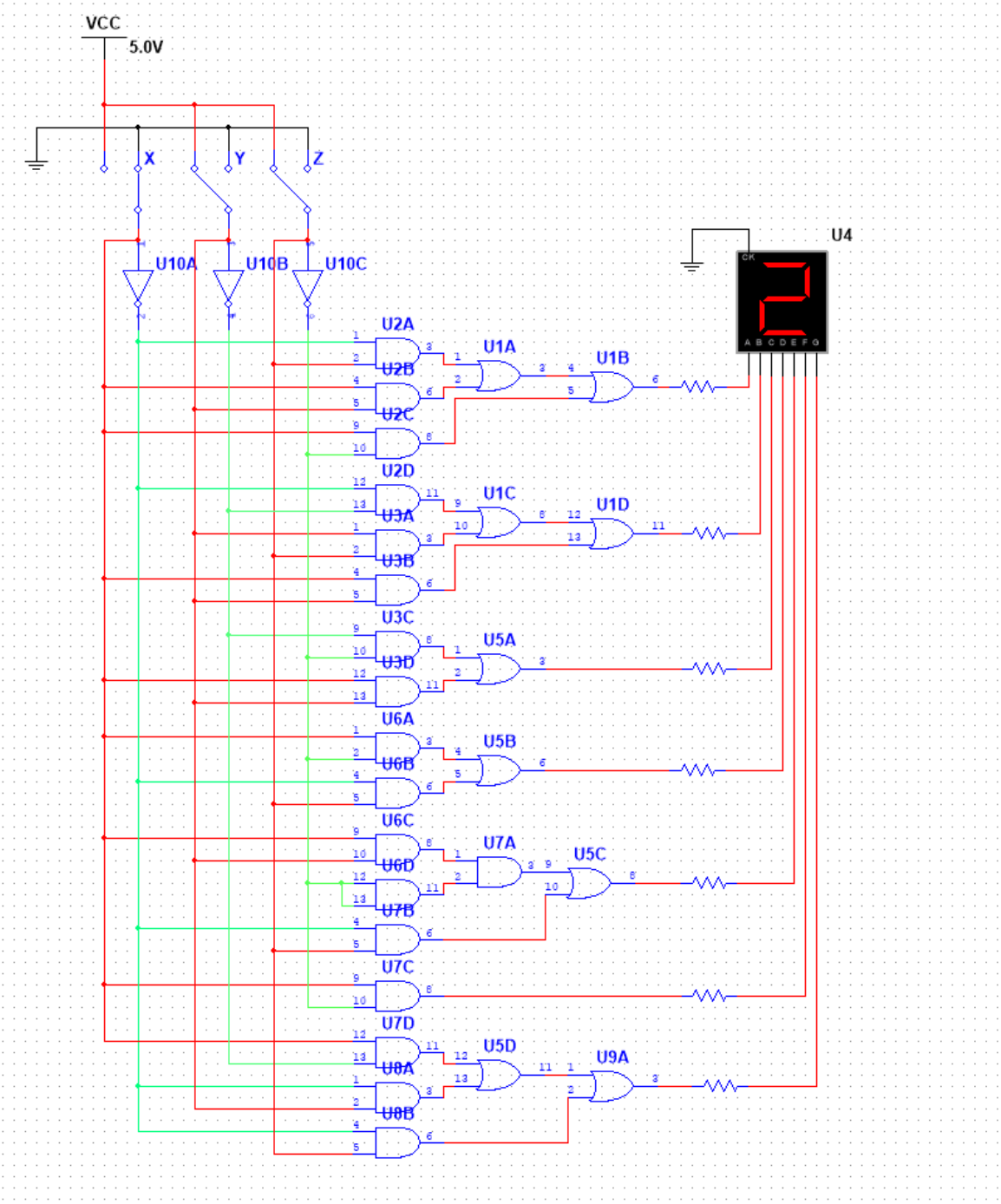
$$D = \overline{X}Z + X\overline{Z}$$

$$E = XY\overline{Z} + \overline{X}Z$$

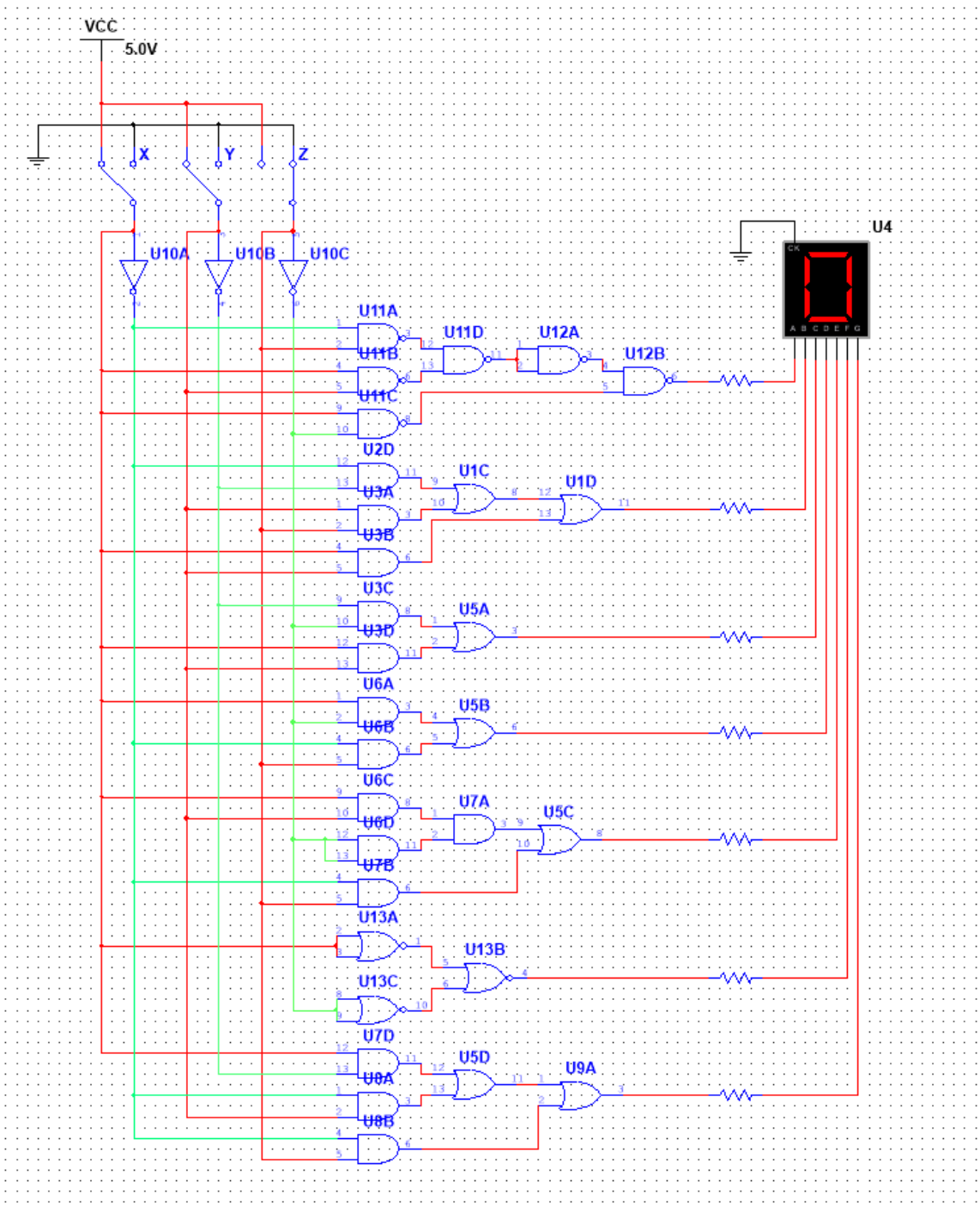
$$F = X\overline{Z}$$

$$G = X\overline{Y} + \overline{X}Y + \overline{X}Z$$

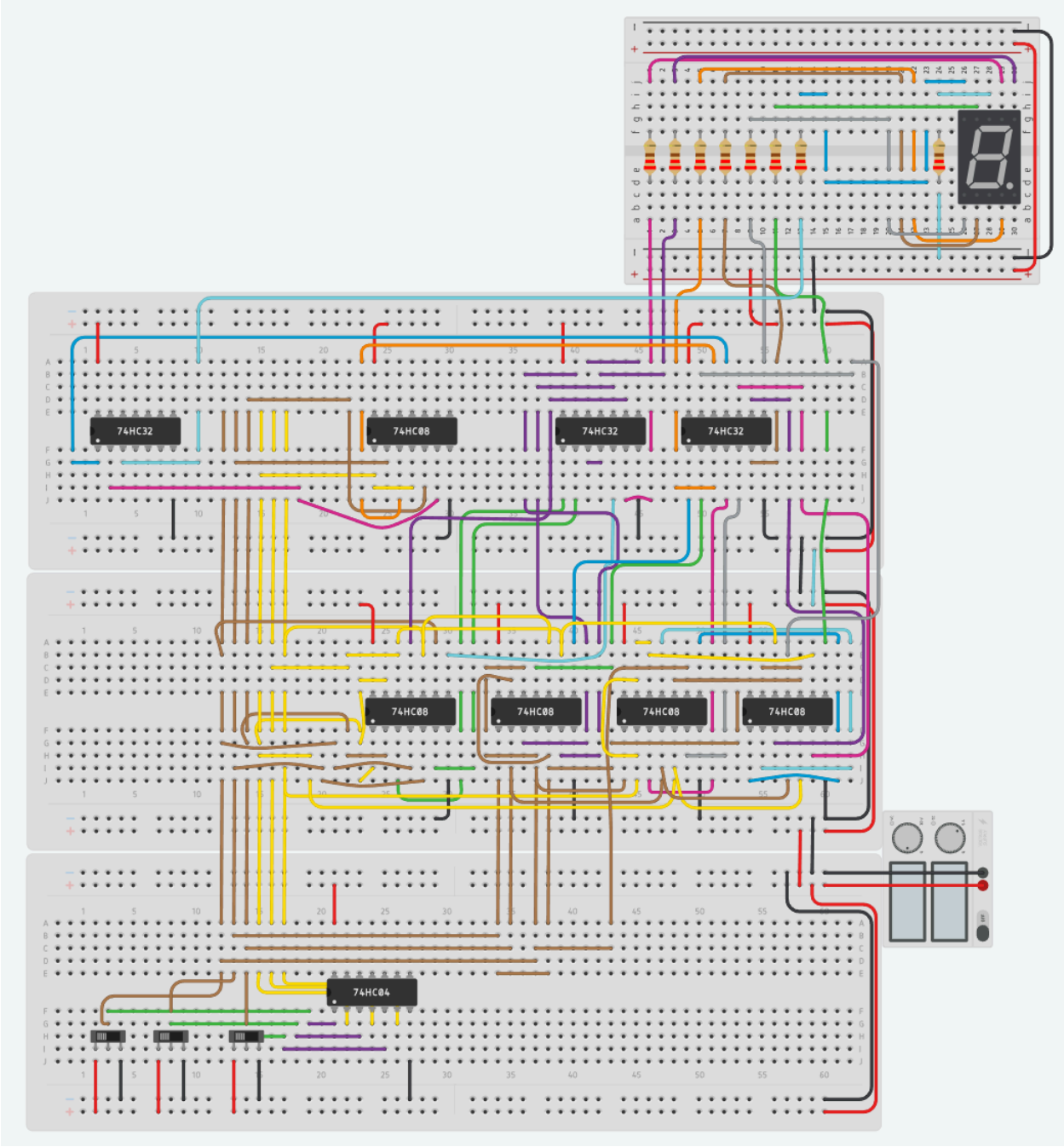
AOI Implementation

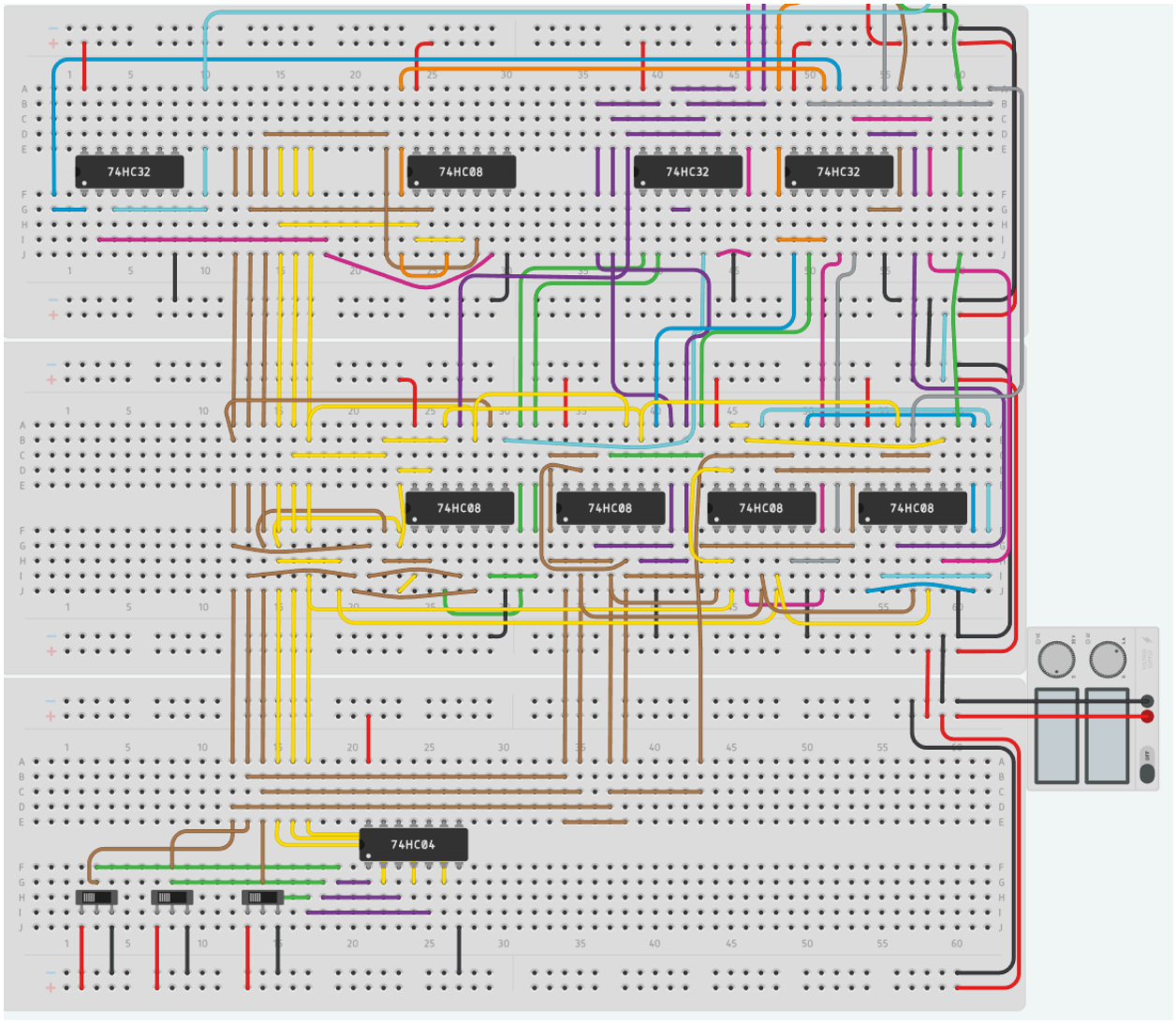


NOR + NAND Implementation



Tinkercad Implementation

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