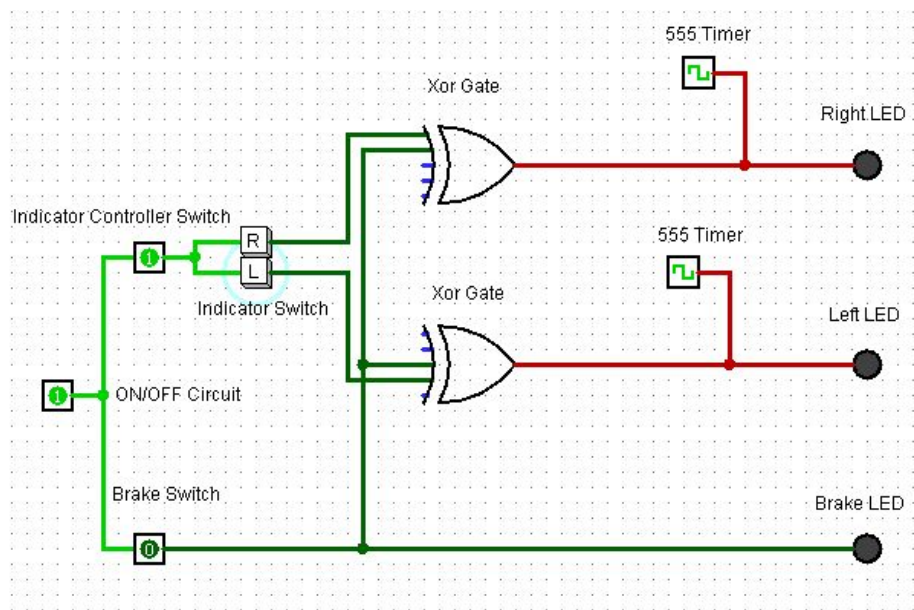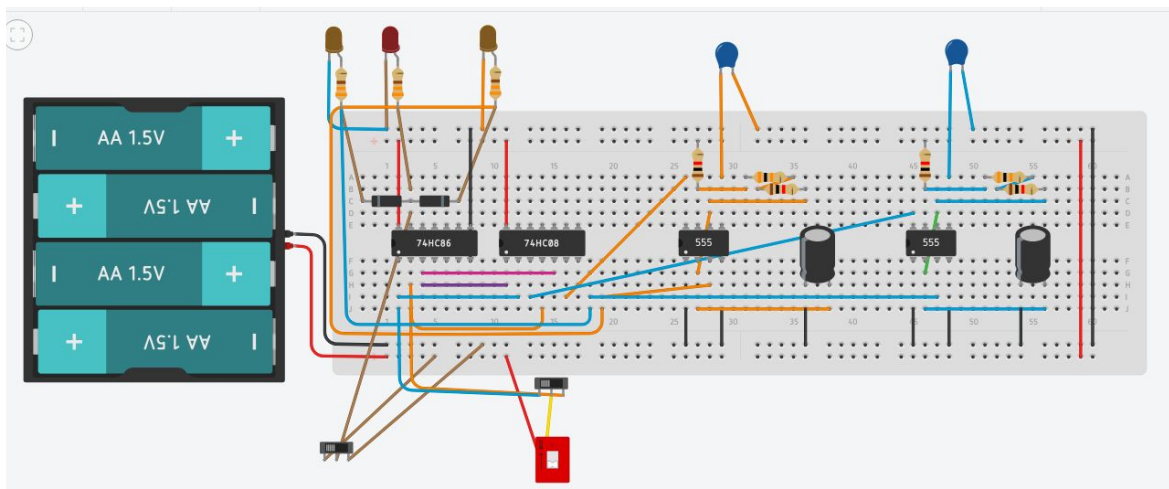# TEJ3M Electronics Culminating Project

Outline

I choose option number 2 as my Electronic Culminating Project, where I have to make a rear turning lights and brake light system for a car. In addition, there are several requirements to make this Electronic Culminating Project. To start with, the first requirement is that when the brake is on, it must override left and right indicators and turn on all three LEDs including brake, left and right indicators. To add on, when the left indicator is on, the right indicator as well as the brake must be off, and when the right indicator is on the left indicator and the brake must be off. Furthermore, when left or right indicators are on they should blink; the blink is accomplished by using a 555 timer. Lastly, the Left and right indicators should be controlled by a DIP switch so that they turn off when needed.
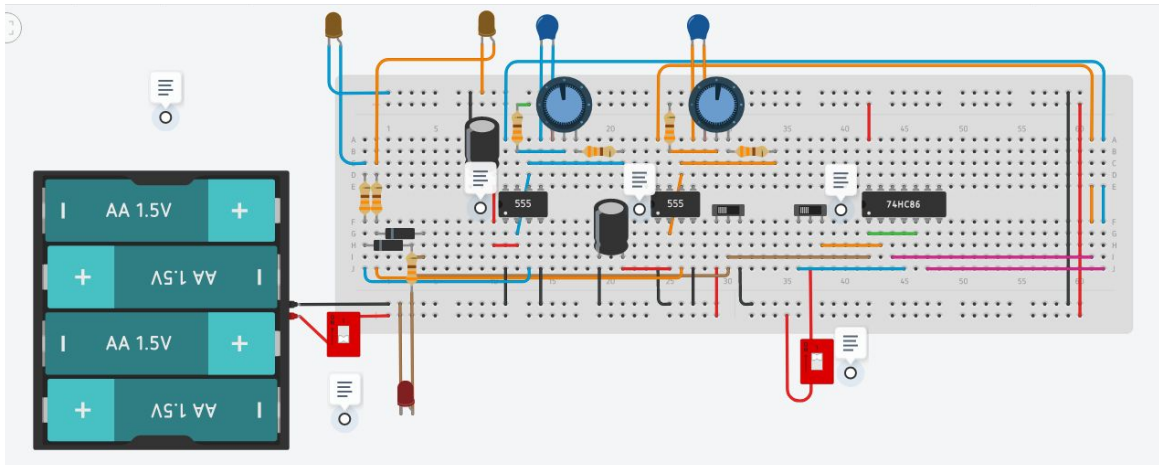
Logisim Circuit Diagram

Tinkercad Circuit

Original Circuit

https://www.tinkercad.com/things/cJCCH7JjDuQ-rough-electronic-culminating-project-gurpreet-singh/editel?sharecode=K8tHpyi44xiBn91RA4I5RUI7fqE2BrQPDkCQk7UrAXE

Modification Circuit

Boolean Expression

Equation of RIght Indicator LED

R LED = R $\oplus$ B

L LED = L $\oplus$ B.

B LED = B LED

Truth Table

Right LED Truth Table

Input Brake	Input Right	Output
1	1	0
1	0	1
0	1	1
0	0	0

Left LED Truth Table

Input Brake	Input Left	Output
1	1	0
1	0	1

0	1	1
0	0	0

Brake LED Truth Table

Brake	Left	Right	ON/OFF Switch	Brake Output	Left output	Right Output
0	0	0	1	0	0	0
0	0	1	0	0	0	0
0	0	1	1	0	0	1
0	1	0	0	0	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	0
0	1	1	1	0	0	0
1	0	0	0	0	0	0
1	0	0	1	1	1	1
1	0	1	0	0	0	0
1	0	1	1	1	1	1
1	1	0	0	0	0	0
1	1	0	1	1	1	1
1	1	1	0	0	0	0
1	1	1	1	1	1	1

Modification Rationale and Testing

My addition to the circuit works as I added a potentiometer instead of a fixed resistor. To start with, a potentiometer is a device with three terminals that adjust the voltage; a potentiometer is more effective and efficient than a fixed resistor as it enables you to adjust the voltage whereas a fixed resistor cannot be changed. In other words, it allows you to control the frequency blinks in the indicators. Furthermore, to make my circuit more optimal, I removed the AND gate from my circuit along with the wires which were set to decipher what indicators were on so that the other does not turn on as well. I added a slide switch instead of a DIP switch so that it will only give current one side or the other, never both. Throughout the project, I had to troubleshoot my project for numerous amounts of time. For example, when I troubleshoot my fixed resistor to make my left and right indicators blink, I found out that my LEDs were blinking way too fast to be noticed, therefore, I had decided to put an potentiometer instead, so that I could control the frequency of the blinks so that the blinks could be seen more clearly. Lastly, while i was trouble

shooting my circuit I also found that there was no way to turn off my circuit completely which is essential for almost any device in real life, therefore to fix that issue, I connected a DIP to the battery's power cable so that I can turn on the entire circuit and shut off the entire circuit. Overall, this project has eminently expanded my knowledge on the electronic field and I feel very proud that I finished this project and was able to learn so much from it.