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Lab 4 Video Submission: https://youtu.be/vbEhWIo7ioQ

We designed a physical implementation of a four way street crossing, it is visualized below.

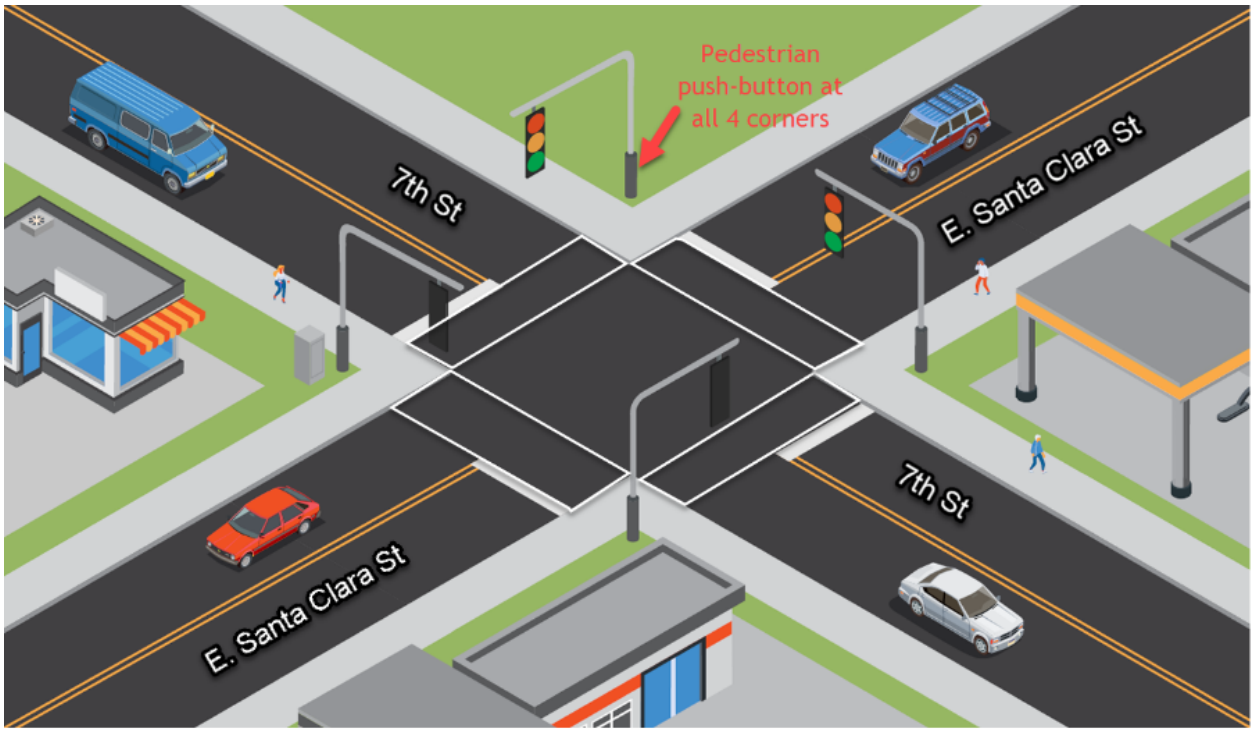

Figure 1. Visualization of the scenario we wish to implement.

This is the visual representation of the circuit we wished to design. The key components used to implement this were a 555 timer, 74LS47 and 74LS90 ICs, along with a seven segment display. With these components and a finite state machine, we aimed to create the above scenario. We implemented a simple design with E. Santa Clara St. being the default green/priority street and starting the change in states when there is a button push from pedestrians or a car is detected. Considering this we get a simple truth table:

Truth Table

Present State	Expected Input	Next State
00	0	00
00	1	01
01	DC	01
11	0	11
11	1	10
10	DC	00

K-Map designed from the truth table:

C\AB	00	01	11	10
0	0	X	X	X
1	1	X	1	X

The resulting equation we have is a sum of products equation that reads:

$$S = A + C + A'B$$

The variable C represents the input and AB the states. Once the input is high, a pedestrian or car initiating the light change, there is a guarantee that the state changes. Once the street light begins changing, once it turns yellow which is the 01 and 10 state for both streets, it will continue on to the next street for simplicity's sake.

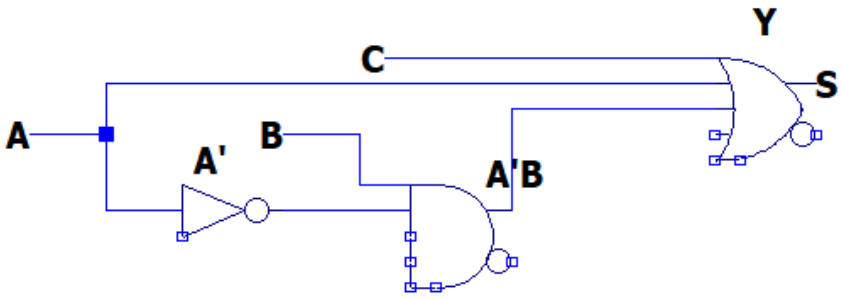

Figure 2. The logic circuit derived from the K-map,

This logic circuit would be attached to the timer and single digit display counter. For the timer, a 555 was used outputting in astable mode, with this video used for reference. For the display counter, this website was used for a reference circuit.

We set out to implement a simple version of a street crossing circuit but we ran into some hardware issues. We were able to get the 555 timer to work, however the display counter circuit was not counting correctly. The display would jump from number to number in one implementation, in another attempt the circuit would start at a non zero number and stall when the button was pressed, not moving from the number displayed. We were able to get the counter to count 0 to 9 on the falling edge of the clock. However, it seemed that the switch would only pause the counter and keep the LED illuminated. Troubleshooting the seven segment display and

difficulty with the logic implementation of the state machine prevented us from building the circuit representation of it.

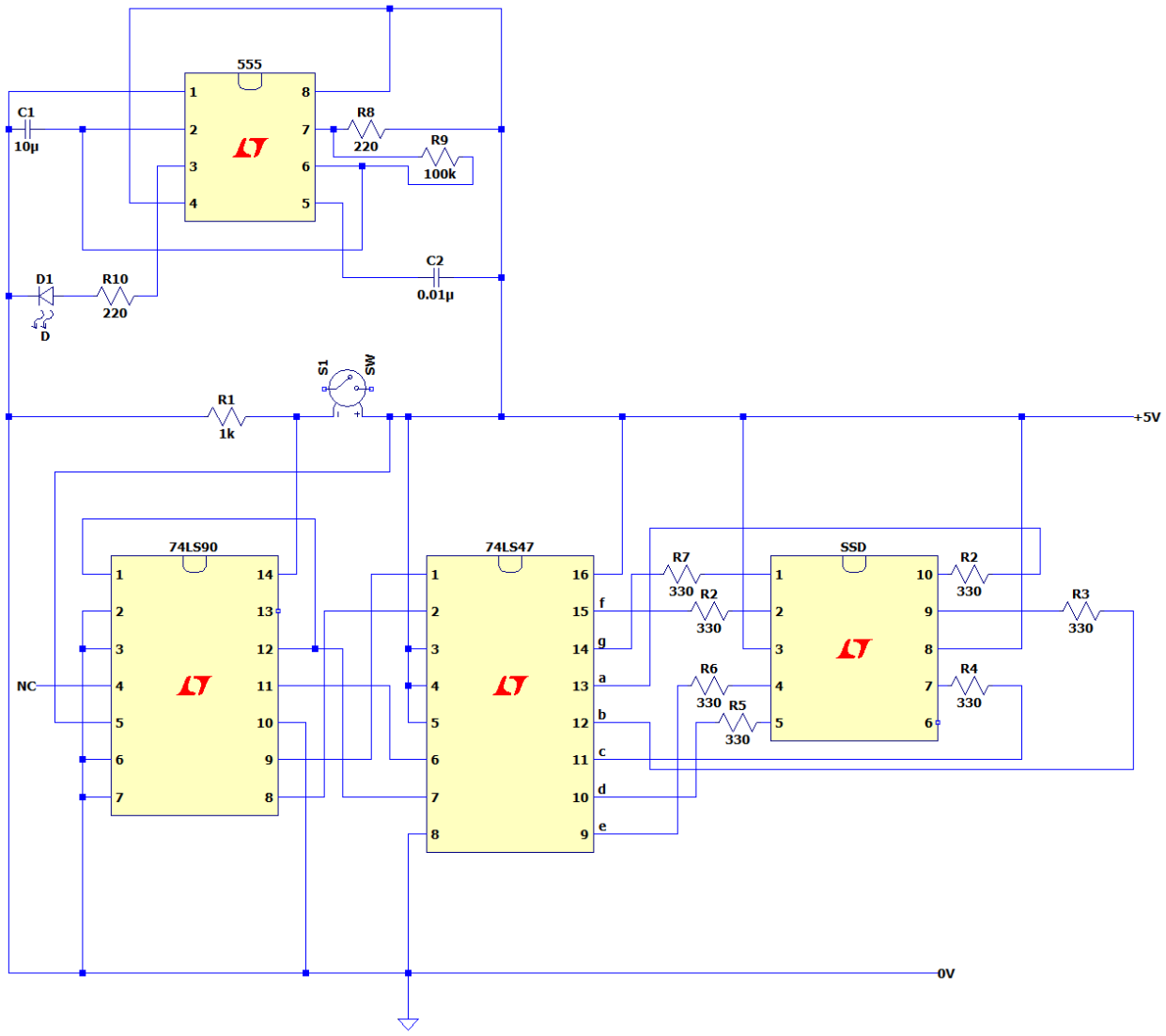

Figure 3: Circuit diagram consisting of 555 timer with 7 segment display counter

References:

555 timer: https://youtu.be/ABWU7FlM1T0?t=628
SSD: https://www.electronics-tutorials.ws/counter/7-segment-display.html