Traffic Light Controller

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In our project we designed a Four-Way Traffic Controller that can be used at intersections. A typical traffic controller in North America consists of three lights in a specific order. The top light is Red, followed by Yellow in the middle, and finally Green at the bottom. These three colors in their positions communicate to motorists whether to cross the intersection, slow down, or come to a complete stop.

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Although the main functions are stop, yield, and go, traffic lights can also use other patterns to inform motorists of certain conditions. These include:

- Blinking red is to be treated as a stop sign.
- Blinking yellow is to approach with extra caution.

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Traffic light patterns can also change depending on the time of day to best accommodate traffic. Rush hour traffic can allow certain directions to have longer Green light times for the most efficient flow.

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In the project we will be demonstrating today, all of the previously mentioned traffic light settings that have been programmed for the different conditions, and are controlled completely by manipulating two predetermined switches. The timing for the traffic light cycles have been sped up for demonstration purposes and can be adjusted as desired.

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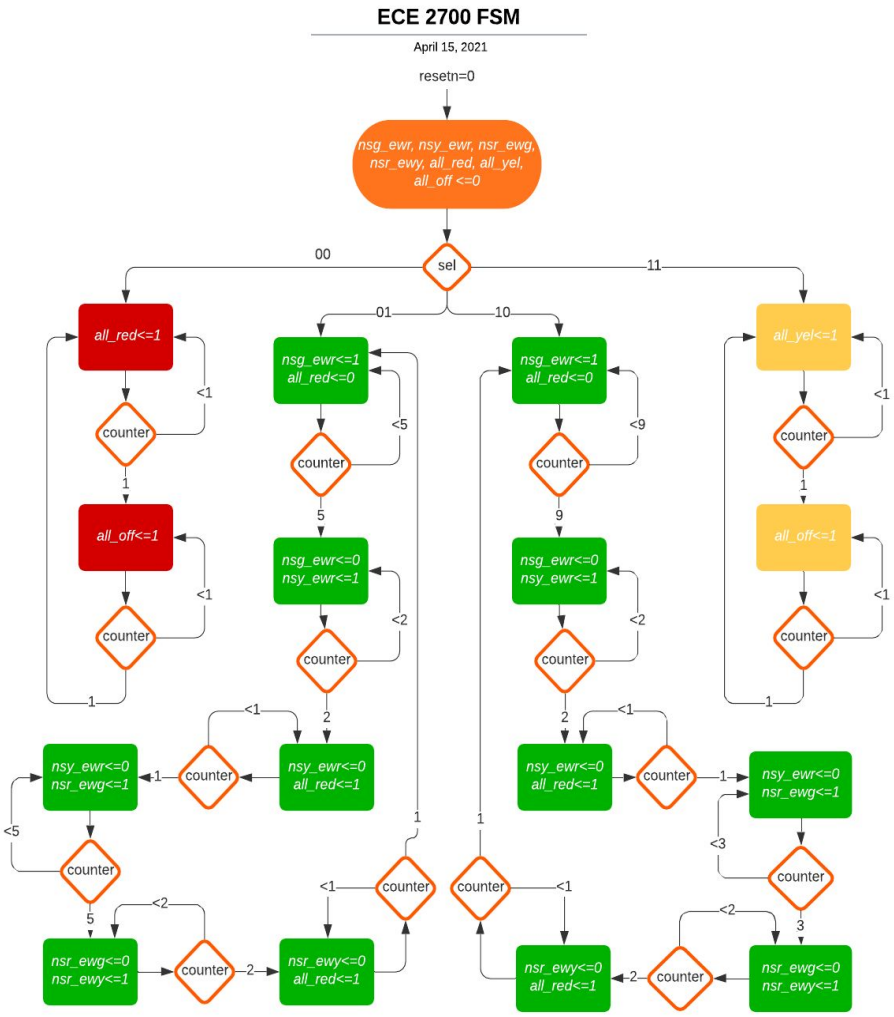
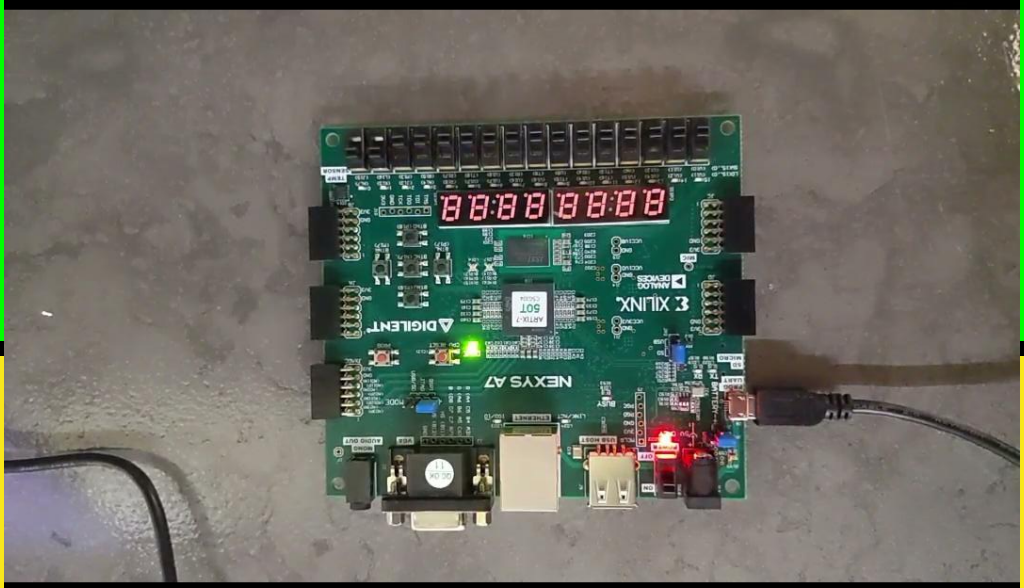
The logic components of this project include a Finite State Machine (FSM) which runs the entire process, a Counter which is used as a timer, and the Internal Clock of the FPGA which runs at 100MHz.


ECE 2700 FSM
April 15, 2021
resetn=0
nsg_ewr, nsy_ewr, nsr_ewg, nsr_ewy, all_red, all_yel, all_off <=0
sel
00
01
10
11
all_red<=1
counter
<1
1
all_off<=1
nsg_ewr<=1 all_red<=0
<5
5
nsg_ewr<=0 nsy_ewr<=1
<2
2
nsy_ewr<=0 all_red<=1
nsy_ewr<=0 nsr_ewg<=1
<5
nsr_ewg<=0 nsr_ewy<=1
nsr_ewy<=0 all_red<=1
nsg_ewr<=1 all_red<=0
<9
9
nsg_ewr<=0 nsy_ewr<=1
nsy_ewr<=0 all_red<=1
nsy_ewr<=0 nsr_ewg<=1
<3
3
nsr_ewg<=0 nsr_ewy<=1
nsr_ewy<=0 all_red<=1
all_yel<=1
all_off<=1

A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What happens in the circuit?

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There are four modes

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Nighttime mode
Normal Traffic Patterns
Rush hour mode &
Hazard Mode

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Lastly, in Hazard Mode, all yellow lights blink indicating either an accident blocking the intersection, or some other factor creating an unsafe condition around the traffic.

When the daytime
mode is on then the signal pass through the data path and turns Green light for North to south traffic and after time interval, it passes signal to turn yellow and then Red to 'Stop' the traffic. Likewise, for the East to west.

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During the nighttime
it turns the red flashing light on to control the traffic.

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Counters in the
circuit counts the number of occurrences of the event and generates the particular time interval between two events.

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Fin.