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ELEN/COEN 21L 47363

Laboratory #2: Design Capture and Simulation

January 28, 2017

Objective

During this lab, we familiarized ourselves with the computer software to design a circuit diagram, test the diagram with the Waveform simulator and, finally, implement the circuit. Based on our Pre-Labs (Figured 1 and 2), we created a more complex light and alarm system as compared to Lab #1 with the addition of more a disable switch. Instead of the breadboards, we worked with the Quartus II program in conjunction with the Altera boards to design the problem statement into a working circuit.
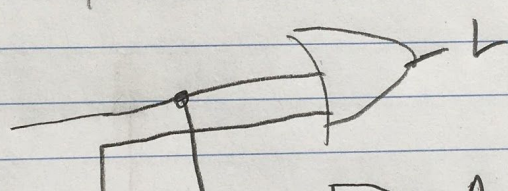
Pre-Lab

Figure 1: Pre-lab for Francesca Narea

Senbao Lu

ELEN 21L

Friday 2:15 pm

Prelab 2

a) Input: S (switch), M1 (motion detector), D (disable switch).
   Output: L (light), A (alarm).

b) Truth table

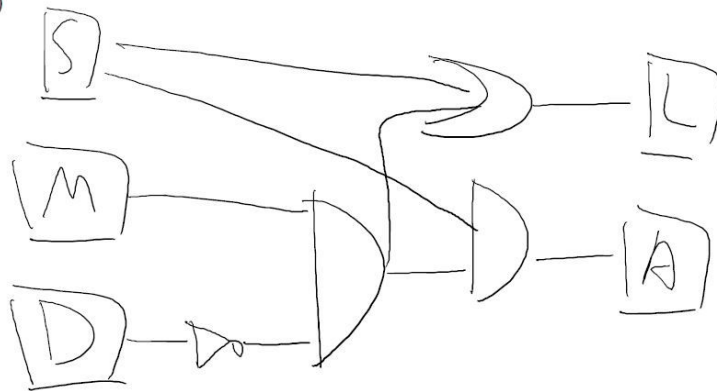| S	M1	D	L	A
0	0	0	0	0
0	1	0	1	0
1	0	0	1	0
1	1	0	1	1
0	0	1	0	0
0	1	1	0	0
1	0	1	1	0
1	1	1	1	0

c)

Figure 2: Pre-lab for Senbao Lu

Procedures

During this lab, we first learned how to use the software Quartus II. After the standard setup on the software, we created a schematic based on the pre-labs (Figure 3). Then we ran the schematic on Waveform Simulator to test if our schematic meets the problem statement (Figure 6). After making sure the simulation matched the truth table from pre-lab, we made pin assignment to use the on-board switches for inputs and the LEDs for outputs (Figure 4). Then we upload this schematic to the FPGA and test if it meets the problem statement (FIgure 5). Finally

we changed the pin assignment for motion detector and alarm and downloaded the schematic to

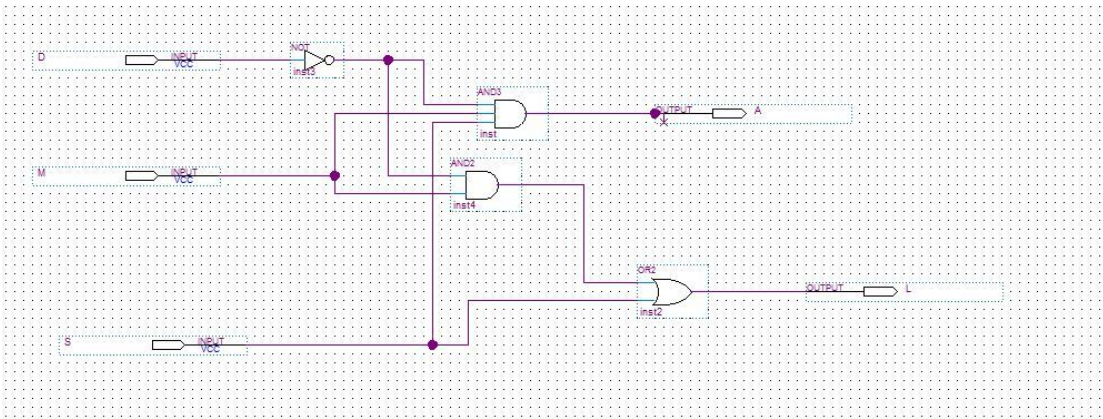FPGA (Figure 7), and again tested the circuit on FPGA (Figure 8).

Figure 3: Schematic Circuit Design

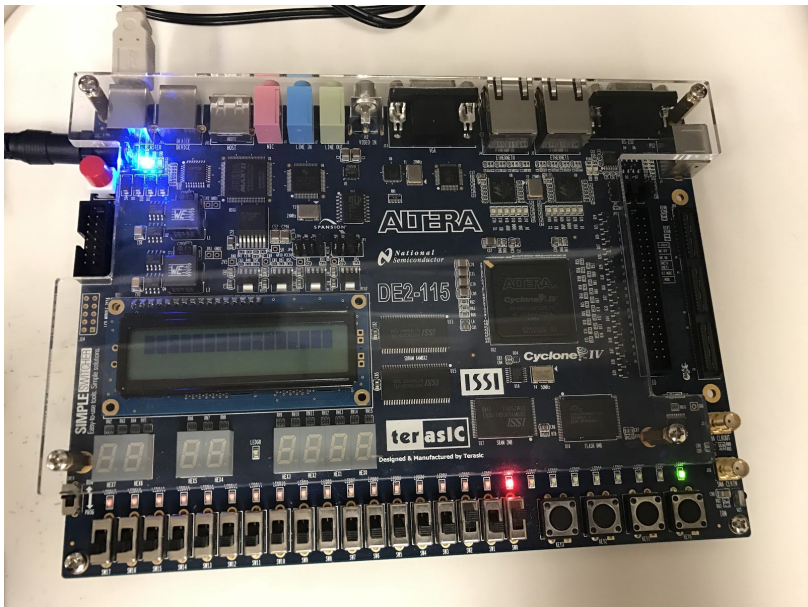|	tatu	From	To	Assignment Name	Value	Enabled	Entity	Comment	Tag
1	✔		out A	Location	PIN_E21	Yes			
2	✔		in D	Location	PIN_AC28	Yes			
3	✔		out L	Location	PIN_G19	Yes			
4	✔		in M	Location	PIN_AC27	Yes			
5	✔		in S	Location	PIN_AB28	Yes			
6		<<new>>	<<new>>	<<new>>					

Figure 4: Pin Assignment

FIgure 5: Successful Testing with two LEDs
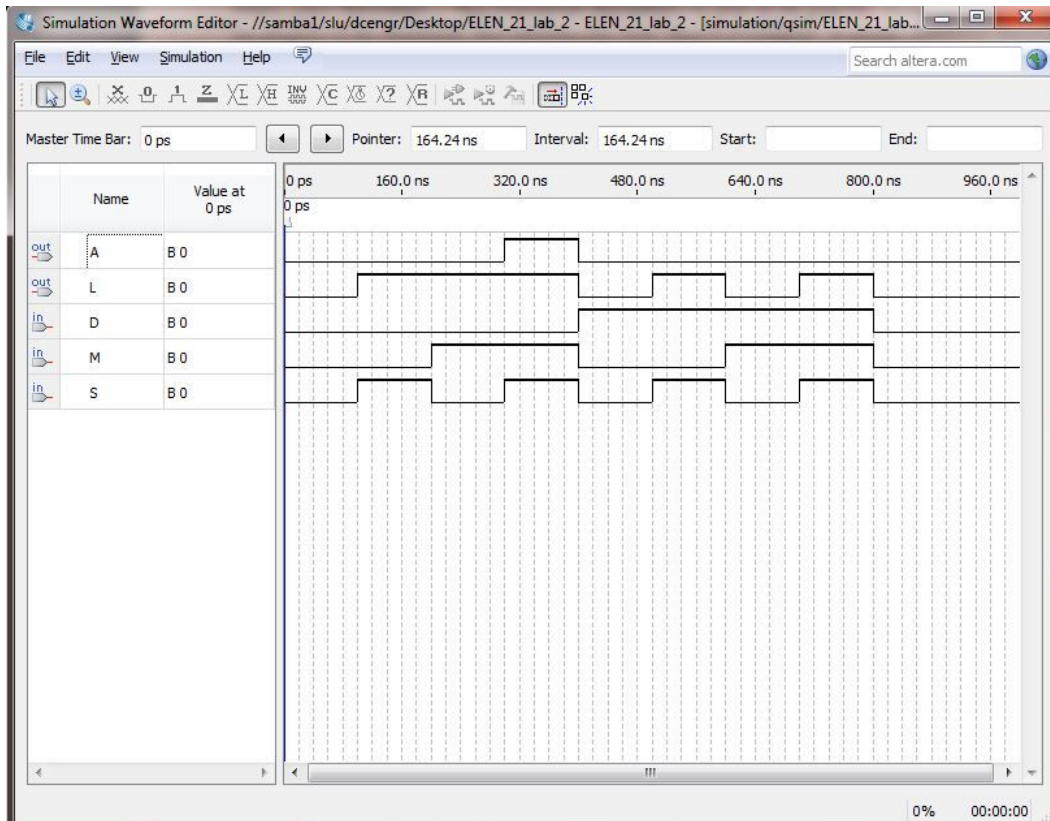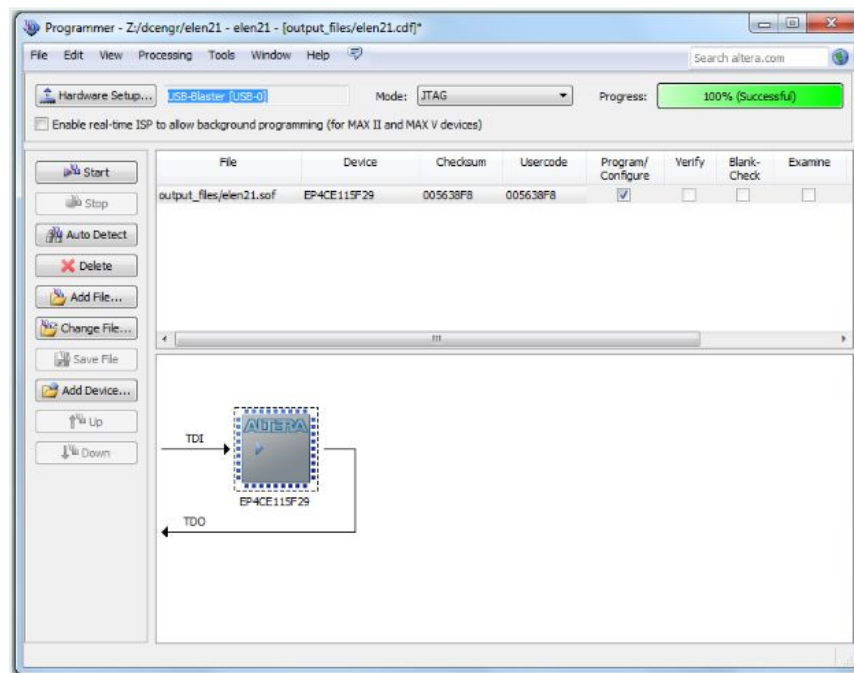
Figure 6: Waveform Simulator (based on truth table)

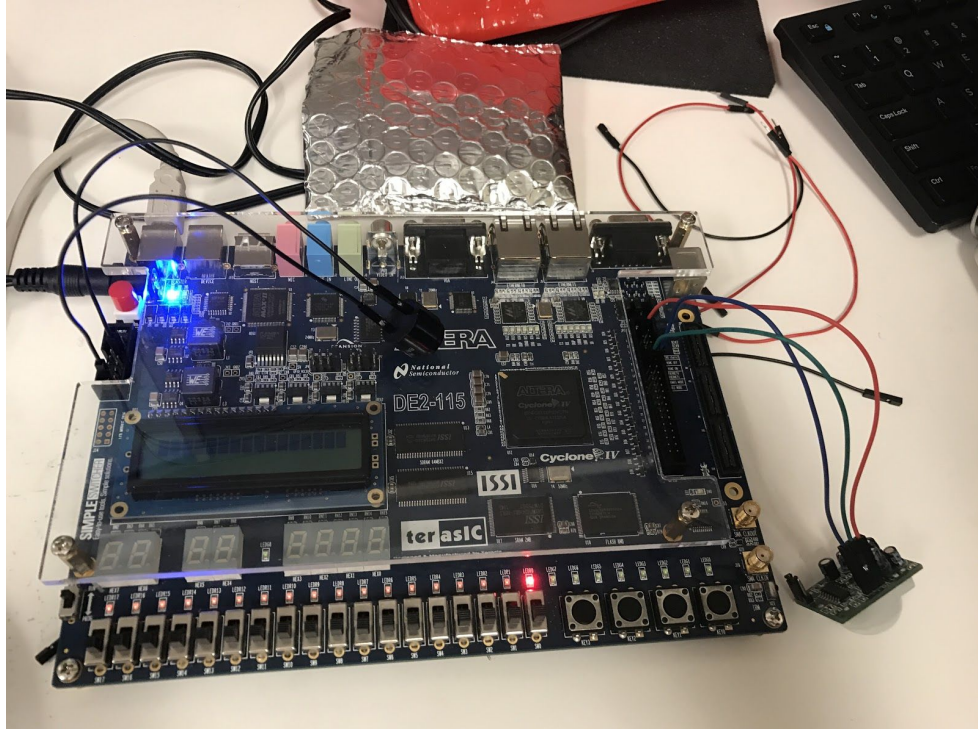Figure 7: Successful Download to FPGA

Figure 8: Successful Test with Motion Detector and Alarm

Conclusion

During this lab, we learned the process of troubleshooting our circuit when it did not

initial sound the alarm and turn on the 2nd LED, so we tested each component separately until

we successfully ran our schematic design. Overall, we learned how to design a more complex

circuit using the computer program Quartus, which allowed us to then implement the switches

and motion detector in order to turn on the alarm and different colored LEDs accordingly.