Digital Design CSCE 2114

Lab 1 Report

Zack Fravel

September 18th, 2015

zpfravel@uark.edu

Abstract

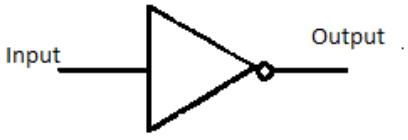
The first lab of the semester began with an introduction to working with VHDL, Integrated circuit (IC) chips, as well as familiarization with the FPGA board. The task at hand was to create some simple logic gates (NOT/AND/OR) that controlled different light/switch combinations, as well as come up with a truth table for a NAND gate.

Introduction

As it is the first lab, the procedure and experimentation was all very base level information. The beginning of the lab had us familiarize ourselves with the FPGA board, explaining how the different rows and columns of connections are interconnected as well as where to plug in for power, ground, etc. Once we were familiarized, the task was to create different switch/light combination circuits using IC chips with various logic functions and observing the results.

Design and Implementation

The first task of the lab was to create a simple connection between the switch, light, and an inverter.



Input	Output
0	1
1	0

An inverter, as seen in the truth table, simply flips the input to the output. Once that was established and we observed the results, it was time to move on to create something a little more complex. This time, the lab required us to wire the circuit so the input passed through three separate NOT gates on the inverter IC chip before getting to the light. The

reason this produced the same result as the previous circuit is because 3 inversions would just be the same as a single inversion.

Once we were done with the NOT gates, it was time to move on to something slightly more complex. The next task was to create the same circuit with an AND gate. With an AND gate, it's different because you have two inputs per one output, so two switches determined the state of the light. Only if both switches were in the "1" position would the light shine. After doing an AND circuit, we made an OR circuit. Works very similarly to the AND gate except if any of the switches are a "1," then the light shines. Finally, we were asked to contemplate how to construct a NAND gate and what the truth table would look like. The logic involved would be an AND gate connected to a NOT gate.

Switch 1	Switch 2	Output
0	0	1
0	1	1
1	0	1
1	1	0

Results

No code or anything complex was required to solve the problems of the first lab. The hardest part was finding the correct labels on the IC chips before wiring up the respective circuits as well as referring to diagrams to make sure the connections were all correct. All the circuits worked as they were explained in the lab. Besides that there weren't really any other issues with the lab.

Conclusion

The original problem of the lab was to familiarize us with circuit designing, FPGA boards, and using IC chips. I think an interesting way to expand on this lab would be to connect multiple IC chips together in a single circuit to observe and record the difference in behavior depending on what is connected.