ELEC-5200

Computer Architecture

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CPU Design – Part 6

Introduction

The goal of this final report is to answer three questions about our design and experience. We are asked what we learned from this overall project, anything that we would do differently in design if we were to redo the project, and any advice we would give to someone working on this type of project. After answering these questions, and assuming our CPU design was finished in part 5, we have officially finished designing a 16-bit CPU.

Questions

So to answer what I learned from this project, I would say that I did learn, or more so, gain a full grasp at how a processor works. I learned specifically how assembly instructions are converted into binary words and how those bits are used to process information. Learning how the assembly is converted into machine code was probably the most interesting and helpful thing I learned. When designing, I also gained a better understanding of how a CPU operates. I had a general understanding before, but I believe that I now have a full grasp of how a processor works.

If I were to do anything different on this project, it would probably be to do less decoding. I have learned from others that I could have decoded instructions one time inside instruction memory. Instead of doing this, I decoded in multiple blocks. In a real-world scenario, this would slow down the CPU. I would also have liked more time for a project like this, in order to simplify some of the Verilog code. But overall, I am just happy that I made a working 16-bit CPU as intended.

If someone, like a future student, were to work on a project like this, I would suggest having them give themselves enough time for each assignment. This semester, I had very little time due to classes, and this project can start to overwhelm oneself if enough time is not allotted. I would have this person make sure they have a clear understanding of Verilog and understand what each component in a CPU is expected to do. Once one has a full grasp of how a CPU works, the process of designing your own can become a lot simpler.

This project was very time-consuming and could be quite challenging at times. I am glad to have developed a working CPU in the end and have finished all assignments required for this project. Once I had a clear understanding of how a CPU worked and a strong idea of how to implement each component in Verilog, the project overall came together.