Art of Engineering: CE / CS Dept. Project
Simulation of a Very Simple Microprocessor Core

Instructor
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Introduction

In this project, we will explore some of the main tools and techniques of computer engineering to implement a simulation of a very simple microprocessor, using Logisim. Computer engineering is an exciting field at the intersection of hardware and software design, and in this project, you will get to experience a little of each. We will also employ two classic design principles used in computer engineering: abstraction and design hierarchy. By the completion of the project, you will get a taste of...

- the way computer engineers *analyze* systems.
- the types of *design* problems faced by computer engineers.
- the style of *design tools* used by computer engineers for both hardware and software design.

More specifically, you will be able to...

- recognize both *how* and *why* computer engineers use *abstraction* and *design hierarchy* in the design of hardware and software systems.

Finally, you will have a sense of whether you would like to continue learning about computer engineering. It is meant to be fun!

Prerequisites and Context

The goal of this project is not to teach you how to design a microprocessor. If you continue with computer engineering, you will take at least one whole class on this! We do not expect that you will understand the whole design; we simply want to give you a sense of what it would be like to study computer engineering or computer science.

No background in programming is necessary, and we will be programming very close to the hardware, in machine language -- i.e. directly using 0's and 1's. Students who have completed the project have remarked that it is closer to CE than CS, but even if you think you want to stick to software, knowing how the underlying hardware works, and how the software is executed on that hardware, will make you a better programmer.

Assignments and Structure

There are four main sections of the project, corresponding to processor components you will design and simulate. The section topics, and their corresponding components, are:

1. **Logic**: Arithmetic/Logic Unit
2. **Memory**: Register File
3. **Programming**: Your Program
4. **Datapath**: Complete Microprocessor

For each section, there are three things to complete:

1. An asynchronous module covering the content.
2. A synchronous session to begin designing the component within the context of individual and/or group activities.
3. A design report showing you have completed the component, and verified its functionality.

You are expected to complete the content-based asynchronous module **before** the corresponding synchronous session. Content will NOT be covered during the synchronous session; they are NOT lectures. The report showing your final implementation of each component will be due one week after the corresponding synchronous session.

Timeline (subject to change)

Fri Feb 17: Deadline to sign up
Synchronous Location: Fayerweather 313 1:30pm-3:00pm

Date	Asynchronous Module Due	Synchronous Session	Report Due
Fri Feb 17	Logic	Logic	
Fri Feb 24			ALU
Fri Mar 3	Memory	Memory	
Fri Mar 10			Register File
Fri Mar 24	Programming	Programming	
Fri Mar 31			Program
Fri Apr 7	Datapath	Datapath	
Fri Apr 21			Final

Course Policies
Please consult the policy sheet for other important information.