

CSCE 611
Lab 4
Three-Stage Pipelined CPU Design
Due Date: 11/15, 11:59pm

Design Requirements

Your goal for this lab is to extend your processor design to implement the MIPS instruction set, as detailed on the course website:

http://www.cse.sc.edu/~jbakos/611/mips/isa_detail.shtml

Your design will be graded according to how well it executes "**SimpleTest**", which is a program that includes all the required instructions. SimpleTest can be downloaded from the course website:

<http://www.cse.sc.edu/~jbakos/611/simpletest/simpletest.s>

SimpleTest is divided into three sections. The first section is comprised of a series of arithmetic, logical, shift, and comparison instructions.

In the second section, your processor must successfully navigate through a complex set of branch and jump instructions that include several infinite loops in which your processor may become stuck if conditional branches are not resolved correctly.

The third section tests loads and stores, and includes a series of stores of each register in order to expose the contents of the register file to the memory interface. This will allow for the verification of the instructions of the first section.

Students Receiving Graduate Credit

Students taking this course for graduate credit must implement six additional instructions, beyond the base instruction set detailed in the MIPS instruction set detail:

1. <code>mult rs, rt</code>	R-type, func=011000	{Hi,Lo} = R[rs]*R[rt]
2. <code>div rs, rt</code>	R-type, func=011010	Lo=R[rs]/R[rt]; Hi=R[rs]%R[rt]
3. <code>mfhi rd</code>	R-type, func=010000	R[rd] = Hi
4. <code>mflo rd</code>	R-type, func=010010	R[rd] = Lo
5. <code>mthi rs</code>	R-type, func=010001	Hi = R[rs]
6. <code>mtlo rs</code>	R-type, func=010011	Lo = R[rs]

Project Submission

Each group must archive their design library(ies) and submit them through **Dropbox**. To archive your files, open a terminal, switch to your **HDS** directory, and enter the following command:

```
tar cvf <lastname1_lastname2>.tar * (for two-person groups), or  
tar cvf <lastname>.tar * (for one-person groups) or
```

We will run SimpleTest against your design in order to grade it.