CSE 548P: Computer Design & Organization
Assignment 2
Due: Wednesday May 4

The purpose of this assignment is to develop your intuition about the effects on performance of different parts of the CPU hardware that are designed to improve program execution. You will use as the focus point of your investigation a comparison between in-order and out-of-order execution. Assume you are handed a simple, straightforward implementation of a CPU whose out-of-order engine is a variant of the Pentium's reorder buffer (this is the particular implementation in SimpleScalar which combines the reorder buffer and the RAT). The question you are to investigate is how much does this processor's out-or-order capability buy you. Could you design an in-order CPU that could perform just as well, but have a different design in respects other than the choice of the instruction issue mechanism.

This is the out-of-order CPU that should serve as your baseline model:

Multiple issue:	1 instruction
Speed of the front-end relative to the execution core:	1
Integer ALUs:	1
Integer multipliers/dividers:	1
Memory system ports:	1
Floating point ALUs:	1
Floating point multipliers/dividers:	1

How you answer this question is up to you. Whatever tack you decide to take, follow the good experimental methodology you used in the branch prediction assignment. Think about what parts of the in-order processor you plan to change and develop a good hypothesis as to why it might execute faster than the out-of-order version. Also, try to keep other factors constant in your comparisions, so your results don't reflect more than one design change. In other words, don't just run a bizillion arbitrary simulations and pick the best. Think carefully about what parts of the design you want to change and why.

You have several means to change your CPU designs: parameter values, the def files and changing the SimpleScalar code. If you do the latter, it would behoove you to check with Douglas beforehand. He'll ward you off from ideas that will take you until next year to implement.

Depending on your new design, Douglas may assign you a new cycle time relative to that used by the out-of-order processor. Use this new cycle time to report your bottom line performance.

Most credit for the most clever and sucessful design changes.

You are expected to work in teams of 2 people; again try to choose a different person.