

## CPSC 614: Computer Architecture

### Homework 2 (Work in groups of 2)

Release Date: **06/14/2004**

Due Date: **06/18/2004 (before class)**

#### Programming Assignment

##### *Objective*

Familiarization with SimpleScalar and branch prediction mechanisms.

##### *Programming Environment*

Use the department Linux machine. ([linux.cs.tamu.edu](http://linux.cs.tamu.edu))

##### *Description*

Get the SimpleScalar version 3.0 from <http://www.simplescalar.com> and build the SimpleScalar/PISA executables.

You may also find the executables in [~praveenb/bin](#).

Write the following two programs in C:

1. A 100 by 100 matrix multiplication program (matrix.c). DO NOT initialize two matrices. Declare two integer matrices (two dimensional array) and use the matrix having the garbage value to each element of the matrix. **DO NOT try to initialize a matrix using any random function.** The program should have no input or output.
2. A sort program (sort.c), that sorts an array of 10000 numbers in ascending order. As before, do not initialize the matrix in anyway and should not have any inputs or output.

Next use SimpleScalar's version of gcc to compile them for the PISA instruction set. A copy of this version of gcc, `sslittle-na-sstrix-gcc` is located at [~praveenb/bin](#). You can verify the program with `sim-safe`.

Measure the branch prediction accuracy (target address hit rate) and IPC for the following branch configuration with `sim-outorder` (Use default values for other parameters)

- a) predict taken
- b) predict not-taken
- c) perfect predictor
- d) bimodal with 512, 1024, 2048(default) and 4096 entries

Compare and evaluate the results you get from above 4 configurations.

##### *Turnin Instruction*

Please make a tar file from your outputs and reports, and send it through email to [praveenb@cs.tamu.edu](mailto:praveenb@cs.tamu.edu) .

- List of files to turn in
  - matrix multiplication program
    - matrix.c (No comments)
  - sort program
    - sort.c

14 branch prediction simulation outputs (Use the option -redir:sim)

(file names should be:)

sim1.out+\* : predict-taken

sim2.out+\* : predict-not-taken

sim3.out+\* : perfect predictor

sim4.out+\* : bimodal with 512 entries

sim5.out+\* : bimodal with 1024 entries

sim6.out+\* : bimodal with 2048 entries

sim7.out+\* : bimodal with 4096 entries

short report in plain text or pdf only

report+\*. [txt|pdf]

where \* = matrix and sort

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## Textbook Assignments

### 3.1, 3.6, 3.10

In 3.6, Assume the following:

- R1 contains the address of X and R2 contains the address of Y. (Ignore "R1=0" in problem statement)
- 2 CDB and 2 inst. Commits
- Change all "DADDUI" to "DADDIU".
- "DSGTUI" to "DADDIU" and "#800" to "#-792".
- "BEQZ" to "BNEQZ".
- "Figure 3.63" to "Figure 3.62".