

CS 423 – Spring 2012

Homework #3

Due April 17th, 2012

Due Tuesday, April 17, 2012 by 5:00PM an email to Ismail Akturk. Remember to read and comply with the Homework Policy posted on the course Website.

Obtaining and installing SimpleScalar:

You can see the details of SimpleScalar in [Homework 2](#).

Branch Prediction:

The goal of this homework is to implement and test different branch predictors.

Part A

There are multiple branch predictors implemented in SimpleScalar:

BPredComb,	/* combined predictor (McFarling) */
BPred2Level,	/* 2-level correlating pred w/2-bit counters */
BPred2bit,	/* 2-bit saturating cntr pred (dir mapped) */
BPredTaken,	/* static predict taken */
BPredNotTaken,	/* static predict not taken */

Your first goal is to run these prediction schemes with sim-outorder's default configuration. For gcc, anagram, compress, and go, run for 100M instructions each. Compare the results to the baseline and write your own analysis with graphs in your report. When you compare performance, use CPI and branch predictor hit rates.

How to run sim-outorder with 100 million instructions:

```
-max:inst 100000000 -redir:sim sim output file
```

Part B

You will implement a new branch predictor where you will use a 3-bit branch prediction scheme. A 3-bit branch prediction scheme consists of eight states, and is a logical extension of a 2-bit branch predictor. When a branch is taken, the predictor switches to the next more strongly taken state (unless it is already saturated); when it is not taken, it switches to the next more weakly taken state.

You are going to modify the bpred.h and bpred.c to support the 3-bit prediction scheme. (It is probably easiest to just modify an existing predictor rather than adding a new one). Initialize all counters to very weakly taken. Compare this new predictor with the previous results and analyze its effectiveness. You also need to document your changes to bpred.c and bpred.h.

What to Submit: Submit a zip file through email to iakturk@cs (with a subject line **CS423 HW3 YourName**). Zip file should be named as **HW3_YourName.zip**. In the zip file you will provide a report explaining both parts A and B and your modified source code (only the files you modified) and outputs generated.