LSU EE 7700-1 **Homework 2** **Due: 24 February 2006**

Find and follow the instructions on `http://www.ece.lsu.edu/tca/proc.html` *for getting started with Homework 2. The instructions show how to set up the class account and get the simulator running.*

Discuss the Homework in this Forum:
`http://www.ece.lsu.edu/phpBB2/viewtopic.php?t=196`.

Problem 1: Modify the noisy branch analyzer (hw2.c) so that it marks appropriate branches as noisy. (This can be done by modifying a single `if` condition.) That is, make whatever changes are necessary so that it makes good choices for noisy branches.

Problem 2: Collect noisy branch data over a variety of benchmarks and provide a one or two paragraph characterization of the noisy branches. The characterization should not just be a listing of statistics and it should not be vague statements: "Lots of noisy branches were found." Instead, the characterization should be interesting and informative. Try playing to the reader's expectations by pointing how the data is just what one would expect or how it's intriguingly different than one might expect.

Feel free to add any insightful observations you might have about the noisy branches.

Problem 3: The ultimate goal is to use profile runs to identify noisy branches (and other information) then use that information to initialize a branch predictor. For that to work branches identified as noisy must be noisy for a wide range of benchmark inputs.

Run experiments to determine just how robust a noisy designation is. That is, how many branches are noisy for a wide variety of inputs.

Write a one or two paragraph description of your results. The goal is to show whether noisy branch information collected during profile runs would be useful. Describe what was ran, show a summary of the data, and come to a conclusion.

(It is easiest to change inputs for the TeX benchmark, see the procedures Web page, `http://www.ece.lsu.edu/tca/proc.html`.)

Problem 4: In phase two (non-iterative) the simulator shows the improvement in prediction accuracy (and number of correct predictions) for 20 different branch predictors, one per branch shown, each branch predictor omits one branch's outcomes (the one listed) from the GHR.

Modify the simulator to add these improvements together for all noisy branches and call the sum the *best-case improvement*. Compare the best-case improvement to the improvement shown in phase three, where only a single branch predictor is used and that predictor omits the outcomes of *all* noisy branches from the GHR.

Discuss the results and provide possible explanations for the differences.

Problem 5: Try to improve the performance of the phase-three predictor. (Of course, it must be based on noisy branches.) That might be done by changing the method of finding noisy branches, choosing a subset of noisy branches, or changing the way the GHR is updated.