**Problem 1:** Solve Fall 2008 Final Exam Problem 3.

**Problem 2:** Continue to consider the systems and code from Problem 3.
(a) What is the warmup time of the local predictor on branch B2?
(b) What is the warmup time of the global predictor on branch B2?

**Problem 3:** Continuing still with Problem 3, suppose the number of iterations of the B1 loop could be 1, 2, or 3, the probability of each number of iterations is \(\frac{1}{3}\) and the number of iterations is independent of everything. The patterns of B1 for an iteration of BIGLOOP can thus be N or T N or T T N.

(a) What is the accuracy of the bimodal predictor on B1. An exact solution is preferred but an approximate solution is acceptable. *Hint: Model the effect of the change of one BIGLOOP iteration on the counter using a Markov chain, something you may have learned about in other courses.*
(b) How will B1’s behavior impact the accuracy of the local predictor on branch B2? Show an example of execution that would result in a B2 misprediction and compute the probability of that particular execution.
(c) Optional: Find the exact prediction accuracy of B2 on the local predictor with B1’s new behavior. This may be very difficult so don’t spend too much time on it.