

E. Branch Predictor

BRANCH PREDICTION FOR CONTROL HAZARD

We have implemented the branch predictor, we will use a table of 2^{14} 2-bit saturating counters indexed by the 14 least significant bits (LSBs) of the branch instruction's address. We will also use a 2-bit Branch History Register (BHR) that keeps track of the outcomes of the previous two branches. We have implemented the three classes **SaturatingBranchPredictor**, **BHRBranchPredictor** and **SaturatingBHRBranchPredictor**.

STRATEGY

We will vary the starting state of each saturating counter and BHR by initializing them to each possible combination of 00, 01, 10, and 11. We will use three prediction strategies: (1) using only the saturating counters, (2) using only the BHRs, and (3) combining the saturating counters and BHRs. All predictions are stored in corresponding output file.

For each strategy, we will run the branchtrace file and output a file indicating whether each branch was predicted as taken or not taken. We will then calculate the prediction accuracy as the number of correct predictions divided by the total number of predictions.

ACCURACY TABLE

The table below summarizes the results for each strategy and starting state combination:

Strategy	Starting State	Prediction Accuracy
Saturating Counters only	00	0.79015
Saturating Counters only	01	0.83942
Saturating Counters only	10	0.87956
Saturating Counters only	11	0.86679
BHR only	00	0.71533
BHR only	01	0.72263
BHR only	10	0.72628
BHR only	11	0.72810
Saturating Counters and BHR combined	00	0.78285
Saturating Counters and BHR combined	01	0.83029
Saturating Counters and BHR combined	10	0.87591
Saturating Counters and BHR combined	11	0.86496
	(size = 2^{16})	