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ECEC 412
Prof. Anup Das
Project 2

ECE 412 Project 2

Tournament Predictor: 531.deepsjeng_r_branches

localHistoryTableSize	globalPredictorSize	choicePredictorSize	Results
2048	8192	8192	Number of correct predictions: 186109401 Number of incorrect predictions: 18610565 Predictor Correctness: 90.909264%
4096	8192	8192	Number of correct predictions: 186687194 Number of incorrect predictions: 18032772 Predictor Correctness: 91.191498%
4096	16384	16384	Number of correct predictions: 188341148 Number of incorrect predictions: 16378818 Predictor Correctness: 91.999405%

Tournament Predictor: 541.leela_r_branches

localHistoryTableSize	globalPredictorSize	choicePredictorSize	Results
2048	8192	8192	Number of correct predictions: 181642358 Number of incorrect predictions: 34490415 Predictor Correctness: 84.042023%
4096	8192	8192	Number of correct predictions: 181934854 Number of incorrect predictions: 34197919 Predictor Correctness: 84.177361%
4096	16384	16384	Number of correct predictions: 183491957 Number of incorrect predictions: 32640816 Predictor Correctness: 84.897789%

Tournament Predictor: **548.exchange2_r_branches**

localHistoryTableSize	globalPredictorSize	choicePredictorSize	Results
2048	8192	8192	Number of correct predictions: 336251743 Number of incorrect predictions: 17599457 Predictor Correctness: 95.026314%
4096	8192	8192	Number of correct predictions: 336333680 Number of incorrect predictions: 17517520 Predictor Correctness: 95.049469%
4096	16384	16384	Number of correct predictions: 337201241 Number of incorrect predictions: 16649959 Predictor Correctness: 95.294647%

GSHARE Predictor: **531.deepsjeng_r_branches**

globalPredictorSize	Results
4096	Number of correct predictions: 174604586 Number of incorrect predictions: 30115380 Predictor Correctness: 85.289474%
8192	Number of correct predictions: 179529273 Number of incorrect predictions: 25190693 Predictor Correctness: 87.695053%
16384	Number of correct predictions: 183701357 Number of incorrect predictions: 21018609 Predictor Correctness: 89.733002%

GSHARE Predictor: **541.leela_r_branches**

globalPredictorSize	Results
4096	Number of correct predictions: 167678309 Number of incorrect predictions: 48454464 Predictor Correctness: 77.581154%
8192	Number of correct predictions: 172317632

	Number of incorrect predictions: 43815141 Predictor Correctness: 79.727676%
16384	Number of correct predictions: 176292704 Number of incorrect predictions: 39840069 Predictor Correctness: 81.566856%

GSHARE Predictor: **548.exchange2_r_branches**

globalPredictorSize	Results
4096	Number of correct predictions: 324191040 Number of incorrect predictions: 29660160 Predictor Correctness: 91.617897%
8192	Number of correct predictions: 328448818 Number of incorrect predictions: 25402382 Predictor Correctness: 92.821175%
16384	Number of correct predictions: 331533004 Number of incorrect predictions: 22318196 Predictor Correctness: 93.692764%

Comparison Between Predictors

- **Two-Bit Local vs. gShare**:
    - The gShare predictor generally outperformed the two-bit local predictor, particularly in exchange2_r, where gShare's accuracy reached 93.69% compared to the local predictor's peak of 82.57%.
    - Both predictors demonstrated diminishing returns with substantial table sizes.
- **gShare vs. Tournament**:
    - The tournament predictor showed superior performance, especially on exchange2_r, achieving 95.29% accuracy, indicating its capability to leverage global and local prediction strategies.
    - gShare, while slightly less accurate, remained competitive, mainly when storage space is a limiting factor.

Conclusions

The analysis reveals that branch predictor performance improves significantly with larger table sizes and more sophisticated prediction methods. While effective, the two-bit local predictor falls behind the gShare and tournament predictors regarding accuracy. The tournament predictor's ability to dynamically choose between global and local predictors gives it an edge, particularly

for complex workloads. However, for scenarios where storage and simplicity are constraints, the gShare predictor balances performance and resource usage well.