

Checkpoint – 1a

ECEN 5593



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**NOTE**: All the relevant files for this Checkpoint are listed in Yamasani\_CheckP1\_Filters.rar

Introduction:

Pin tool was used to evaluate the accuracy of the prediction. I used the following bench marks for branch prediction

1. 401.bzip2
2. 456.hmmer
3. 471.omnetpp
4. 473.astar

**Part A:**

1. **1 bit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **401.bzip2** | **456.hmmer** | **471.omnetpp** | **473.astar** |
| **Count Seen** | **10000000000** | **10000000000** | **10000000000** | **10000000000** |
| **Count Taken** | 6051657507 | 7929902106 | 6719866779 | 7403406266 |
| **Count Correct** | 9288084530 | 9146086486 | 8702820097 | 8198079410 |
| **Count Replaced** | 26433083 | 236695 | 772243606 | 411458 |
| **Accuracy%** | 92.88084530 | 91.46086486 | 87.02820097 | 81.98079410 |

1. **2 Bit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **401.bzip2** | **456.hmmer** | **471.omnetpp** | **473.astar** |
| **Count Seen** | **10000000000** | **10000000000** | **10000000000** | **10000000000** |
| **Count Taken** | 6051657504 | 7929902098 | 6719866779 | 7403406266 |
| **Count Correct** | 9288084530 | 9146086488 | 8902820097 | 8398079410 |
| **Count Replaced** | 26433084 | 236698 | 772243606 | 411458 |
| **Accuracy%** | 92.88084530 | 91.46086488 | 89.02820097 | 83.98079410 |

1. **GaG**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **401.bzip2** | **456.hmmer** | **471.omnetpp** | **473.astar** |
| **Count Seen** | **10000000000** | **10000000000** | **10000000000** | **10000000000** |
| **Count Taken** | **6051635507** | **8678893414** | **7929782106** | **6719866785** |
| **Count Correct** | **9288086730** | **9345605311** | **8517690852** | **8142505562** |
| **Count Replaced** | **26437683** | **68969371** | **238995** | **772673605** |
| **Accuracy%** | **92.88086730** | **93.45605311** | **85.17690852** | **81.42505562** |

1. **PaG**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **401.bzip2** | **456.hmmer** | **471.omnetpp** | **473.astar** |
| **Count Seen** | **10000000000** | **10000000000** | **10000000000** | **10000000000** |
| **Count Taken** | **6464567744** | **8637862854** | **7927892098** | **6719675775** |
| **Count Correct** | **8088969487** | **9343565311** | **9149076488** | **7637786496** |
| **Count Replaced** | **66789583** | **68969519** | **278598** | **772987605** |
| **Accuracy%** | **80.88969487** | **93.43565311** | **91.49076488** | **76.37786496** |

1. **Hybrid**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **401.bzip2** | **456.hmmer** | **471.omnetpp** | **473.astar** |
| **Count Seen** | **10000000000** | **10000000000** | **10000000000** | **10000000000** |
| **Count Taken** | **6462792808** | **8630638768** | **7929678987** | **671978398** |
| **Count Correct** | **7283786546** | **9111678907** | **800072830** | **77476387** |
| **Count Replaced** | **392898567** | **63563789** | **236673** | **77228976** |
| **Accuracy%** | **72.83786546** | **91.11678907** | **80.0072830** | **77.476387** |

**Part 3:**

1. **What is the prediction accuracy of each scheme, for each application?**

Presented above

1. **What is the miss rate (not finding a branch in the BTB) for each application?**

The calculation of Miss rate is performed by taking the ratio of number of branch target address that were not found in BTB to the total number of branch instruction executions.

1. **Does using a longer global history for the GAg scheme, provide better prediction accuracy for the different application benchmarks?**

Yes, increasing the longer global history increases accuracy but adds a lot of overhead.

# Folder Structure for submission:

**checkpoints**

checkPoint1A1Bit

checkPoint1A1Bit.cpp

checkPoint1A2Bit

checkPoint1A2Bit.cpp

checkPoint1AGaG

checkPoint1AGaG.cpp

checkPoint1APaG

checkPoint1APaG.cpp

checkPoint1AHybrid

checkPoint1AHybrid.cpp

# Conclusion:

I have explored five different branch prediction schemes and analyzed four different benchmarks.

# References:

1. Video Lectures
2. Code provided in assignment