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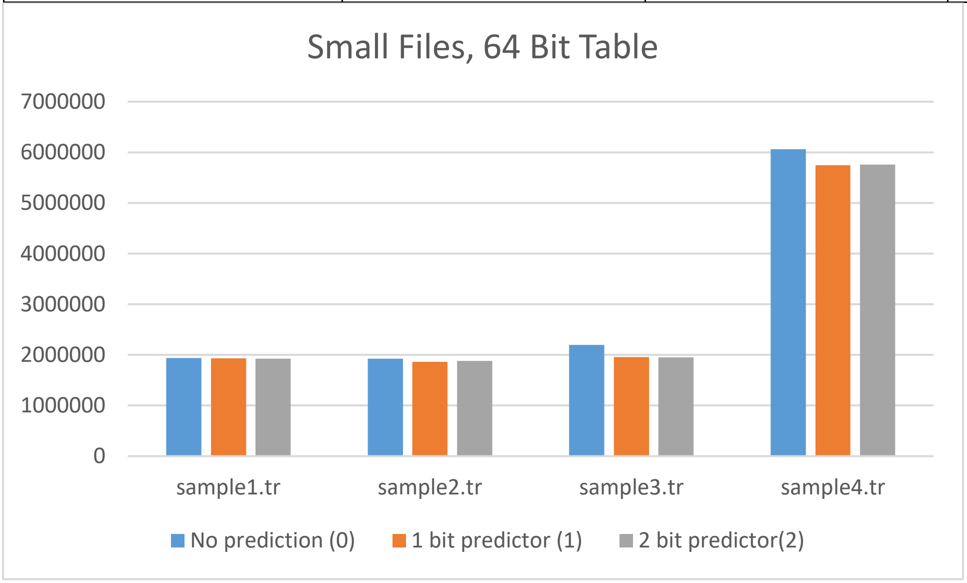
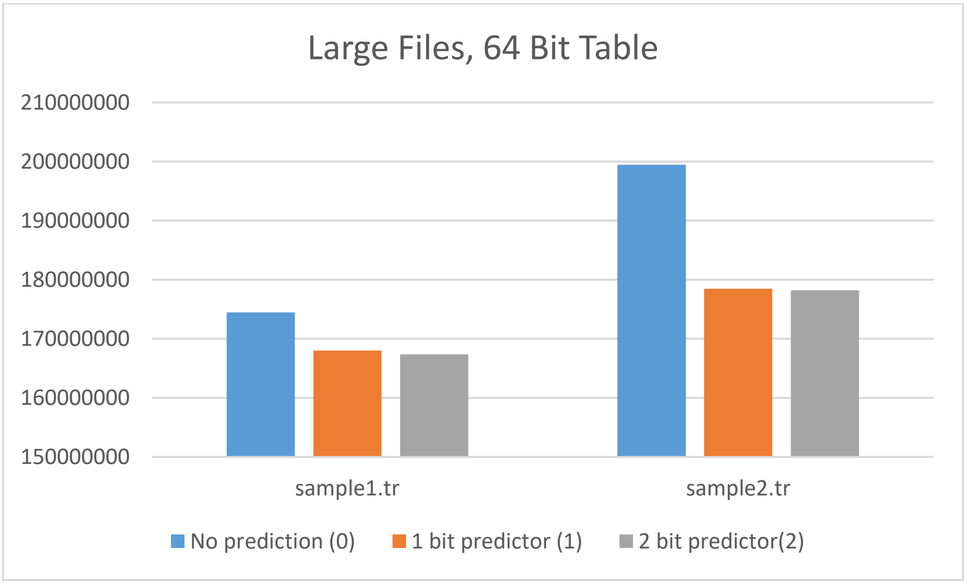
CS1541

Project 1

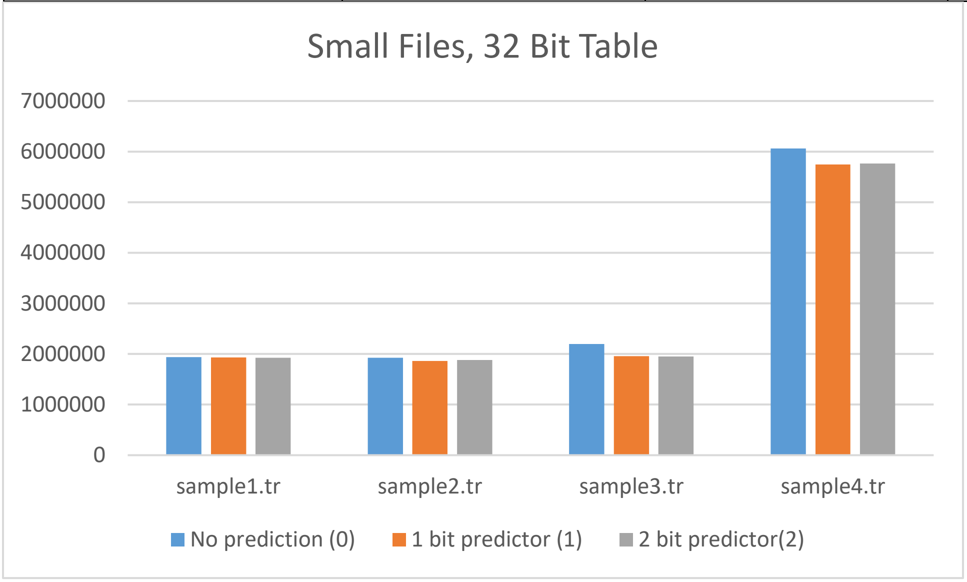
2/19/18

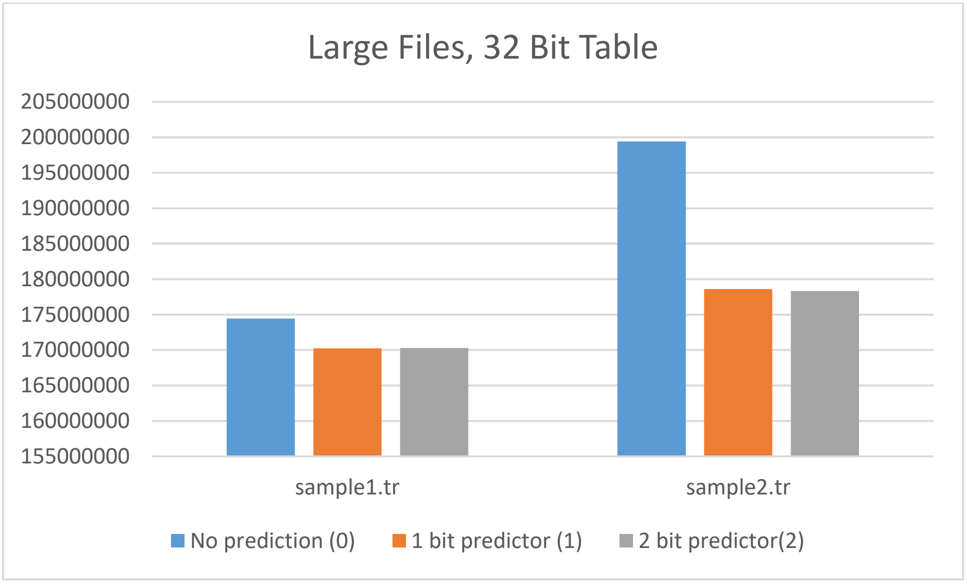
#Cycles for 64 Entry Table			
File name	No prediction (0)	1 bit predictor (1)	2 bit predictor(2)
sample1.tr	1939824	1929230	1925984
sample2.tr	1927240	1858945	1880021
sample3.tr	2196389	1954864	1951767
sample4.tr	6063444	5743032	5757765
sample_large1.tr	174440671	168002361	167358315
sample_large2.tr	199433328	178459105	178211675



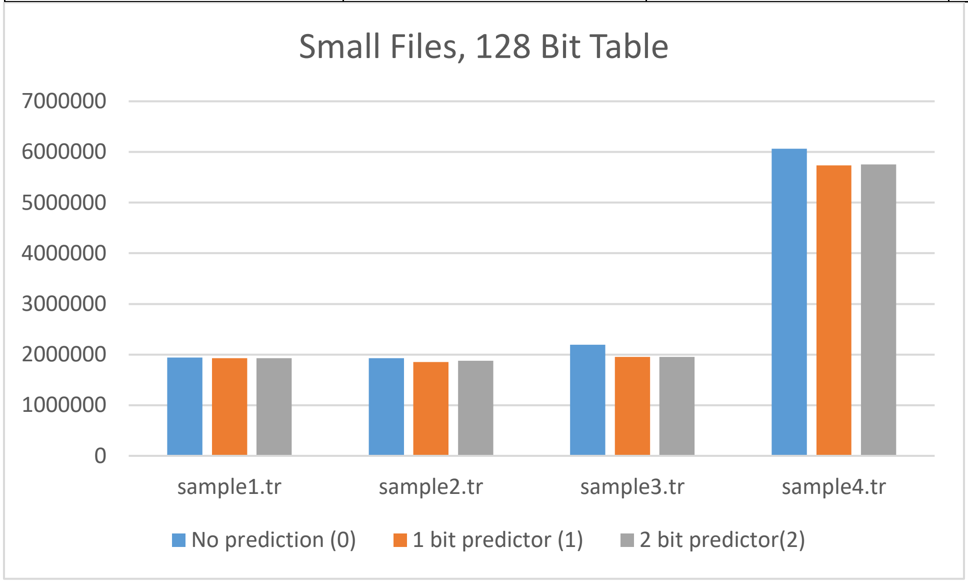


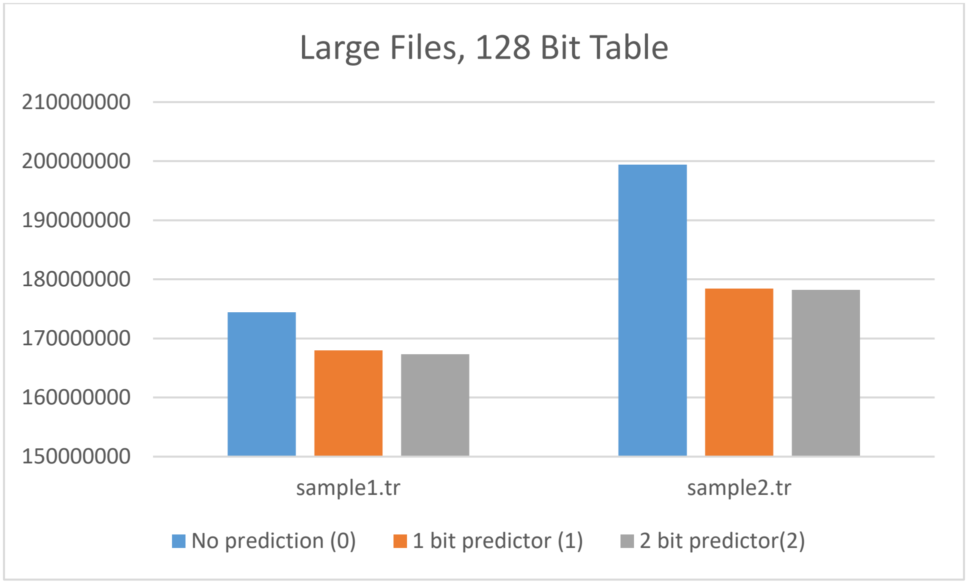
#Cycles for 32 Entry Table			
File name	No prediction (0)	1 bit predictor (1)	2 bit predictor(2)
sample1.tr	x	x	x
sample2.tr	1927240	1861703	1882407
sample3.tr	2196389	1956634	1953459
sample4.tr	6063444	5747560	5761843
sample_large1.tr	174440671	170224777	170303826
sample_large2.tr	199433328	178599432	178346342





#Cycles for 128 Entry Table			
File name	No prediction (0)	1 bit predictor (1)	2 bit predictor(2)
sample1.tr	x	x	x
sample2.tr	1927240	1853004	1875217
sample3.tr	2196389	1954847	1951776
sample4.tr	6063444	5737074	5752970
sample_large1.tr	174440671	167987373	167337101
sample_large2.tr	199433328	178457238	178207039





x= no change from the first table

Notes on Testing

Tests were performed on Thoth.cs.pitt.edu.

We interpreted instruction “squashing” as the insertion of “NOP” instructions into the pipeline.

Results of Prediction Methods

The tests performed yielded results that were mostly to be expected, with a few interesting variations therein.

When varying between prediction methods, we found that branch prediction, across the board, performed better than no prediction at all. This leads us to the conclusion that the predictions were accurate enough to reduce the number of cycles needed to execute the program, so any branches that were not taken (thus resulting in unnecessary steps from the prediction) were outweighed by the number of branches that *were* taken, and predicted correctly. This is true for the sample files provided.

Comparing the 1-bit and 2-bit prediction methods was not as straightforward. Some samples performed better on the 2-bit prediction method. Others performed better with a 1-bit prediction method. This might be the case due to the 2-bit predictor’s characteristic of requiring 2 mispredictions before changing what it should be predicted as. For these files, it may have made the program more inefficient to run overall since it may have been squashing 6 instructions for 2 wrong predictions as opposed to just 3 for the 1 bit predictor.

Results of Table Size

The tests showed with almost uniform consistency that increasing the size of the hash table improved cycle time with prediction. This leads us to conclude that, as a general rule, increasing the table size allows for more accurate prediction due to a fewer number of misses. There were two main exceptions to this rule: sample1.tr showed no change as a result of table size, indicating that there are likely very few branches in this file. The other exception is sample3.tr, which saw a very small increase in the number of cycles from a 64 bit table to a 128 bit table in the 2-bit predictor only. It is difficult to say for certain why this is occurring; there is only a nine-cycle difference, so for most intents and purposes these files run at essentially the same speed. It is possible that there is a random collision or table miss in the 128 bit table that does not occur in the other table sizes. Regardless, increasing table size does seem to improve performance as a general rule.