

LAB03 REPORT: BRANCH PREDICTION

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There are 7 benchmark tasks that I used to get CORE CYCLES. TO compare between different CPUs, I could use geometric means.

$$SpeedUp\ of\ Y\ over\ X = \sqrt[7]{\prod_{i=0}^6 \frac{CORE\ CYCLE\ on\ X}{CORE\ CYCLE\ on\ Y}}$$

As we used same clock frequency for all the CPUs, we could see CORE CYCLE as TIME. I set X as CPU version of LAB02, which doesn't use branch target buffer and branch predictor.

	BASELINE	GSHARE	PERCEPTRON
SpeedUp	1.084	1.197	1.2637

LAB03 BASELINE-CPU, GSHARE-CPU, PERCEPTRON-CPU is 1.084x, 1.197x, 1.2637x faster than LAB02 CPU.

It is not that much faster than I expected. I could explain it by Amdahl's Law. To acquire higher speedups, I should use SuperScalar processor and Out of Order execution. I hope I could try it later.

#CORE CYCLE	LAB02	BASELINE	GSHARE	PERCEPTRON
bst_array	10060	9763	8266	7933
fibo	871	871	856	832
matmul	22431	19365	15789	15291
prime_fact	18883	15832	13885	13249
quicksort	34502	32525	29765	29366
spmv	42430	42169	41944	35896
spconv	249824	215573	198206	187064

BASELINE	bst_array	fibo	matmul	prime_fact	quicksort	spmv	spconv
# of branch instructions	1942	200	3272	4207	5488	8302	36569
# of correct predictions	730	137	1417	2699	2835	4061	20647
branch prediction accuracy	0.375	0.685	0.433	0.641	0.516	0.489	0.564

GSHARE	bst_array	fibo	matmul	prime_fact	quicksort	spmv	spconv
# of branch instructions	1942	200	3272	4207	5488	8302	36569
# of correct predictions	1229	142	2609	3348	3755	4136	26436
branch prediction accuracy	0.632	0.71	0.797	0.795	0.684	0.498	0.722

PERCEPTRON	bst_array	fibo	matmul	prime_fact	quicksort	spmv	spconv
# of branch instructions	1942	200	3272	4207	5488	8302	36569
# of correct predictions	1340	150	2775	3560	3888	6152	30150
branch prediction accuracy	0.690	0.75	0.848	0.846	0.708	0.741	0.824

