I. Demo Documentation

SimpleScalar was used with a singular program provided in the suite of tests downloaded in the SimpleScalar packages. The following statistics are used as a demonstration of a concept. Additional tests with a greater variety of programs should be completed for a better indication of more accurate numerical values for the given tests.

A. Demo Section A: Accuracy of Different Predictors

Four of the possible prediction methods supported by -bpred in SimpleScalar were run with the test program. Their rates of accuracy prediction are shown in Figure 1:

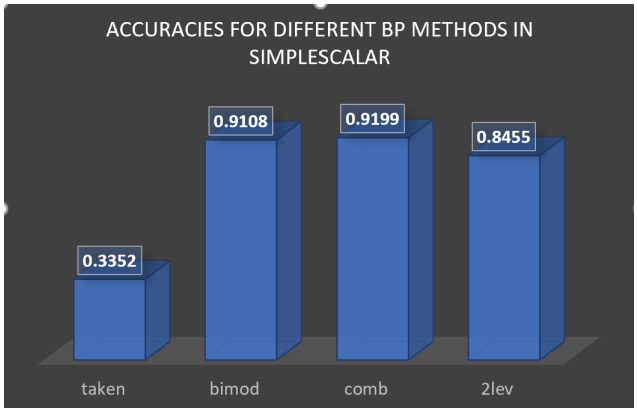

Fig. 1. Different Branch Prediction Method Accuracies SimpleScalar

The *taken* method sees the least accuracy which makes sense as it is the only static method of the four. *2lev* is a dynamic global method which shows comparable but slightly less accuracy than *bimod* which makes sense as well because *bimod* is a local dynamic method. *comb* is a combination of *bimod* and *2lev*.

B. Demo Section B: Impact of Varying History Width

In SimpleScalar, $-bpred : 2lev$ can be used to redefine the variables M, N, W, X which correspond to $l1\_size$, $l2\_size$, $hist\_size$, and XOR, respectively, as defined in Figure 2:

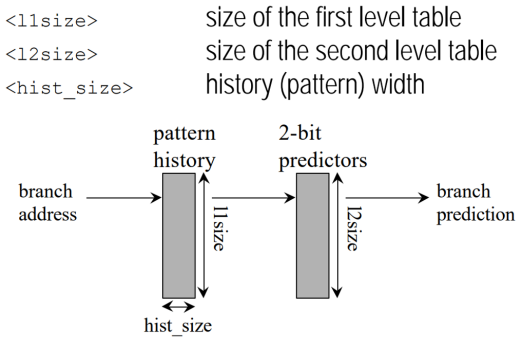

Fig. 2. SimpleScalar Documentation of 2lev [1]

These variables can be edited for the $2lev$ branch prediction method that's available. The default values are: M, N, W, X = 1,1024, 8, 0. These values are redefined using the Global History Register scheme (GAg) as defined in the first row of Figure 3.

predictor	l1_size	hist_size	l2_size	xor
GAg	1	W	2^W	0
GAp	1	W	$>2^W$	0
PAg	N	W	2^W	0
PAp	N	W	2^{N+W}	0
gshare	1	W	2^W	1

Fig. 3. Table 1: SimpleScalar Simulation Data

The values obtained by altering the value of the history width, W, are shown in Table 1:

Type of Predictor	M	N	W	X	Accuracy	Level 1 Cache Miss Rate
2lev	<1>	<2^W>	<W>	<0>		
	1	2	1	0	0.6438	0.0607
	1	4	2	0	0.6507	0.0616
	1	16	4	0	0.6726	0.062
	1	256	8	0	0.7466	0.0625
	1	1024	10	0	0.7849	0.063
	1	32768	15	0	0.8049	0.0629
	1	1048576	20	0	0.8029	0.0624

Fig. 4. Table 1: SimpleScalar Simulation Data

Fig. 5. Accuracy

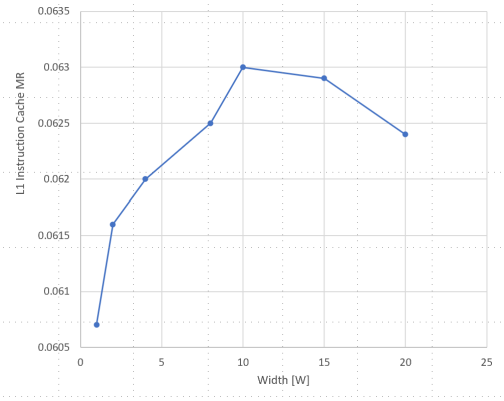

Fig. 6. Misses in Level 1 Cache

The results did see an increase in cache misses as the amount of bits needed to accommodate the predictor increased.

The accuracy also increased with increasing history width and size of the second level table but with diminishing returns.

REFERENCES

[1] Burger, D., Austin, T.M. The SimpleScalar Tool Set, Version 2.0. Retrieved from http://www.simplescalar.com/docs/users$_guide_v2.pdf$