PRFETCHER_REPORT

CS203

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1. Introduction:

In this project, we are supposed to make a hardware prefetcher.

The Data Cache has the following stats:

32KB Size

2-way Set Associative

16 byte line size

write-through

no-write-allocate

1 cycle hit time

10 entry write-buffer

A L2 cache (data only) has the following stats:

256KB Size

8-way set associative

32 byte line size

write-back

write-allocate

20 ycle access time (fully pipelined)

2.Prefetching Instruction:

In this project, I refer the technology called GHB(global history buffer)

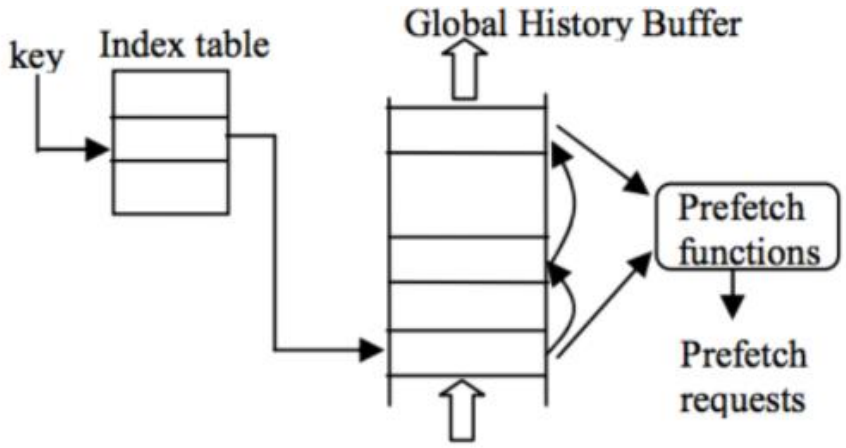


Figure 1: Global history buffer prefetching [7, 8].

I also used the Target-Line prefetching is an instruction prefetching algorithm that attempts to capture more control transfer targets. In this algorithm, a target table is used to maintain a history of the paths taken for conditional branch instructions. The target table consisted of two entries: address tag and target address. This algorithm works just like the Next-Line algorithm until a conditional instruction is encountered. Once a conditional branch instruction is fetched, the path that was taken on the previous execution of the control instruction is prefetched, assuming there is an entry for this instruction in the table. After the instruction is executed, the target table is updated with the address for the executed instruction and the path taken on this execution. This algorithm makes the assumption that the path taken previously for an instruction will likely be the path taken the next time. Using this approach, the hardware will hopefully be able to prefetch on the correct path if an entry is found in the table.

3.Test & Result(AMAT)

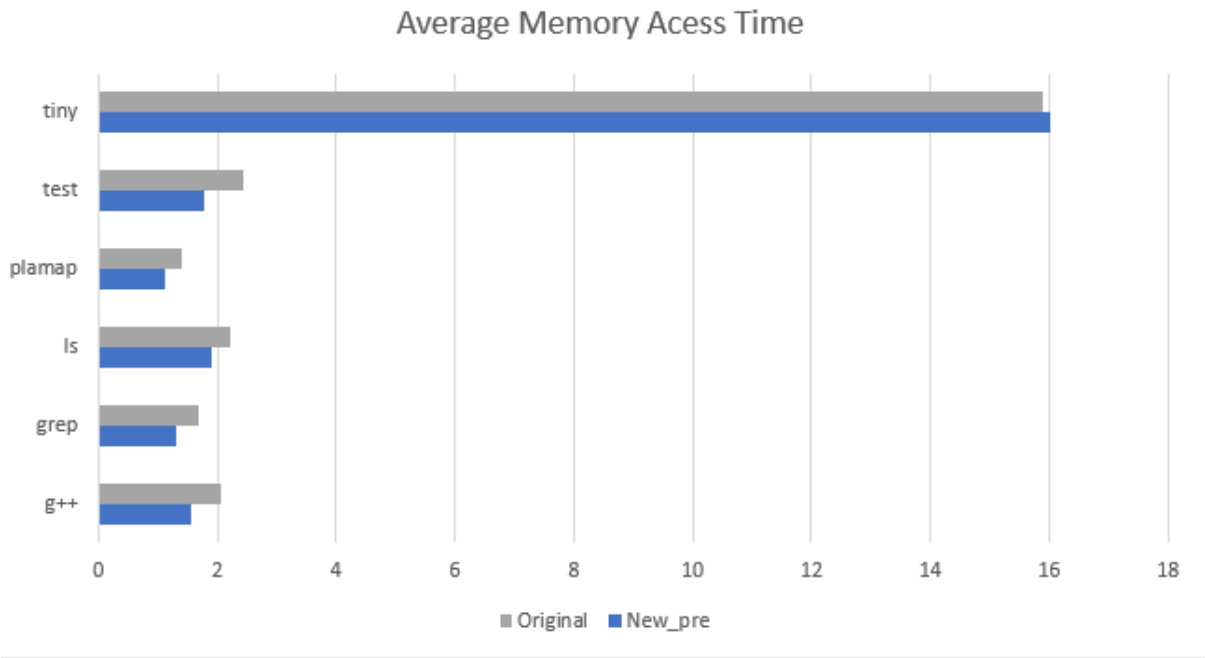
My prefecther:

A	B	C	D	E	F	G	H
g++	grep	ls	plamap	test	tiny		
1.5676	1.32	1.89599	1.13	1.77345	16.026		
0.308292	0.268098	0.168269	0.235696	0.370211	-0.00923	improvement	
				speedup	0.223555	0.270113	
				total AMA	23.71304		

Sample one:

baseline					
b_g++	b_grep	b_ls	b_plamap	b_test	b_tiny
2.050878	1.67389	2.215026	1.396336	2.43	15.878
				total	25.64413

Comparing with sample one :



4.Reference:

Kyle J, Nesbit and James E.Smith, *Data Cache Prefetching Using a Global History Buffer*, https://www.eecg.utoronto.ca/~steffan/carg/readings/ghb.pdf

Martin Dimitrov, Huiyang Zhou, *Combining Local and Global History for High Performance Data, Prefetching,* https://jilp.org/vol13/v13paper1.pdf