COP6611.001S006 Operating Systems – Project 2

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Purpose: Analyze the performance of LRU and VMS page replacement algorithms on SPEC benchmarks

Implementation and assumptions:

We modeled two page replacement algorithms for our memory simulator, the Least Recently Used (LRU) and the VMS segmented FIFO algorithm of VAX architecture. The simulator takes in a memory trace, number of frames, the page replacement algorithm to be used, a debug flag. The following analysis is based on the gcc.trace.

Analysis:

Write Operation:

Fig. 1 represents the comparison of LRU and VMS algorithm performance in terms of number of write operation. The number of write operation decreases as the number of frames increases for both

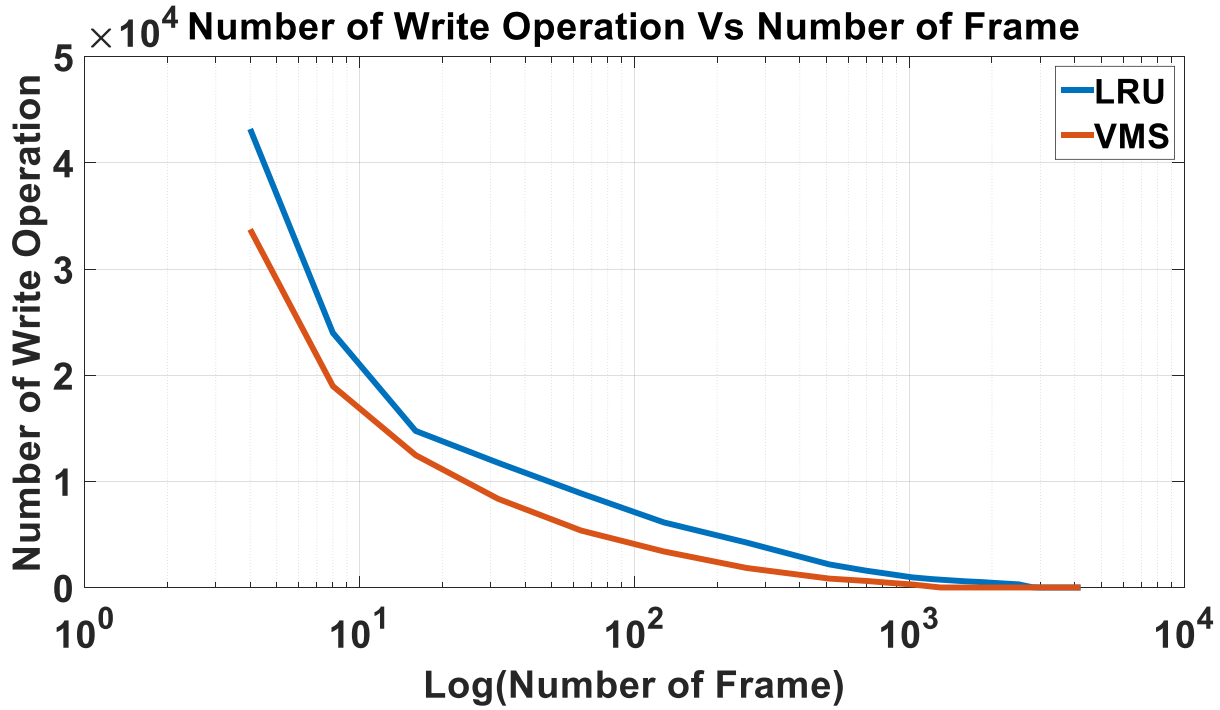

Fig.1: Comparison of LRU and VMS algorithm in terms of number of write operation

algorithms. However, the VMS curve is stiffer than LRU. The number of write operation becomes 0 at 1301 and 2849 number of frames for VMS and LRU respectively. It is evident from the figure that VMS require fewer write operation to disk.

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Read Operation:

Fig. 2 represents the comparison of LRU and VMS algorithm performance in terms of number of read operation. The number of read operation decreases as the number of frames increases for both algorithm. However, the VMS curve for read operation is stiffer than LRU (same as write operation). The number of read operation reaches a minimum value of 2852 for both algorithm. LRU requires 2786 frames for

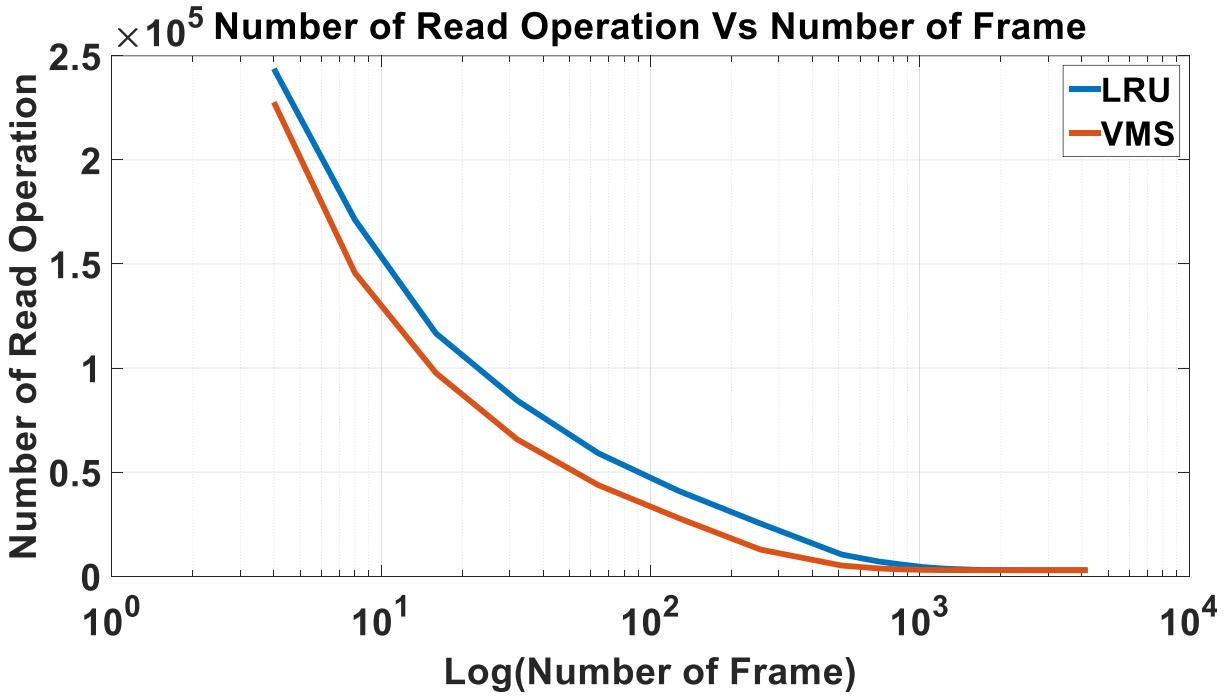

Fig.2: Comparison of LRU and VMS algorithm in terms of number of read operation

reaching this minimum value. For, VMS it is 2789.

VMS algorithm works best. Although, VMS reaches minimum read operation at slightly larger number than LRU, below 2700 frames VMS performance is better. Even if we consider the write operation, VMS requires fewer write for a specific number of frames than LRU.

Although most of the time VMS works best, but for above 2000 frames the value of number read operation fluctuates from 2868 to 2853 and finally at 2789 frames the read operation becomes 2852. So, in this window, the performance of VMS very slightly fluctuates. If we ignore this insignificant variation, VMS almost all the time performs better.

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Data for other traces

LRU			Vms		
bzip.trace					
N	Read	Write	N	Read	Write
4	92770	35650	4	64321	15419
8	30691	11092	8	4456	1427
16	3344	1069	16	2539	816
32	2133	702	32	1420	458
64	1264	420	64	837	216
128	771	224	128	470	43
256	397	48	256	323	0
512	317	0	512	317	0
1024	317	0	1024	317	0
sixpack.trace					
N	Read	Write	N	Read	Write
4	282620	71260	4	260367	54259
8	176496	32717	8	151683	26179
16	108632	19342	16	83777	15325
32	67747	13730	32	53257	10014
64	41186	9672	64	24544	6659
128	21090	6526	128	12296	4005
256	11240	4092	256	6356	2554
512	5823	2444	512	4611	1840
1024	4468	1846	1024	4037	1195
2048	3951	1356	2048	3906	287
4096	3890	0	4096	3890	0
swim.trace					
N	Read	Write	N	Read	Write
4	346936	56045	4	338936	51635
8	285375	53614	8	219992	30709
16	171961	46293	16	79491	12409
32	48254	9674	32	30838	6460
64	21656	5687	64	16429	4191
128	13250	3812	128	6352	1912
256	5673	1866	256	4048	1197
512	3632	1159	512	2888	770
1024	2803	789	1024	2600	176
2048	2576	259	2048	2556	0
4096	2543	0	4096	2543	0