

Peter G. Mavronicolas
Old Dominion University
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Instructor: Jay Morris

Problem 2: Virtual Memory management problem

Introduction

The Virtual memory management problem proved to be both challenging and rewarding when constructing the source code and outputting the data. Files were created for FIFO (fifo.cpp), Least Recently Used (lru.cpp), Most Recently Used (mru.cpp), Optimal (optimal.cpp) and the main thread (main.cpp). Calculations were made in the code to determine fault rate percentage as well as fault rate as calculated from miss ratio. Data was retrieved from data.txt and, after calculating each respective function, data was outputted into outfile.txt.

Summary of Findings

The following results are derived from the following:

Page Size: 512

of Frames: 4,8,12

Page Size	# of Frames	Algorithm	Page Fault %
512	4	FIFO	0.416016
512	4	LRU	0.386719
512	4	MRU	0.287109
512	4	Optimal	0.335938
512	8	FIFO	0.146484
512	8	LRU	0.136719
512	8	MRU	0.0957031
512	8	Optimal	0.111328
512	12	FIFO	0.363281
512	12	LRU	0.351562
512	12	MRU	0.294922
512	12	Optimal	0.292969

Page Size: 1024

of Frames: 4,8,12

Page Size	# of Frames	Algorithm	Page Fault %
1024	4	FIFO	0.210938

1024	4	LRU	0.198242
1024	4	MRU	0.176758
1024	4	Optimal	0.196289
1024	8	FIFO	0.485352
1024	8	LRU	0.473633
1024	8	MRU	0.393555
1024	8	Optimal	0.418945
1024	12	FIFO	0.194366
1024	12	LRU	0.19043
1024	12	MRU	0.177734
1024	12	Optimal	0.18457

Page Size: 2048

of Frames: 4,8,12

Page Size	# of Frames	Algorithm	Page Fault %
2048	4	FIFO	0.614258
2048	4	LRU	0.598633
2048	4	MRU	0.412598
2048	4	Optimal	0.525879
2048	8	FIFO	0.583496
2048	8	LRU	0.574219
2048	8	MRU	0.411133
2048	8	Optimal	0.478027
2048	12	FIFO	0.569336
2048	12	LRU	0.557129
2048	12	MRU	0.411621
2048	12	Optimal	0.457031

Conclusion

With a page size of 512 words and the number of frames inputted as 4,8, and 12, a page fault percentage of 0.0957031 measured the lowest using the MRU algorithm set at 8 frames (highlighted in green). The highest page fault percentage of 0.416016 set at 4 frames was calculated with the First-In First-Out (FIFO) algorithm (highlighted in red).

With a page size of 1024 words and the number of frames inputted as 4,8, and 12, a page fault percentage of 0.176758 measured the lowest using the Most Recently Used (MRU) algorithm set at 4 frames (highlighted in green). The highest page fault percentage of 0.485352 set at 8 frames was calculated with the First-In First-Out (FIFO) algorithm (highlighted in red).

Finally, with a page size of 2048 words and the number of frames inputted as 4, 8, and 12, a page fault percentage of 0.411133 measured the lowest using the Most Recently Used (MRU) algorithm set at 8 frames (highlighted in green). The highest page fault percentage of 0.614258 set at 4 frames was calculated with the First-In First-Out (FIFO) algorithm (highlighted in red).

Overall, using the FIFO algorithm results in the highest page fault rate regardless of page size and the MRU Algorithm performs better at all page sizes of 512, 1024, and 2048 words set at 8 frames. It should be noted that glitches occurred when compiling the code for frame sizes of 2048 using frames of 4 and 8. After a second attempt repeating the same information (2048, 4 and 2048, 8) the data seemed to have cached from the prior run and compiled. Highlighted in yellow with 1024 words and 8 frames, it should also be noted that the fault rate percentage appeared much higher than 4 or 12 frames which is most likely the result of resetting the programs cache prior to compiling.

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