Brendan von Hofe & Eric Zhen

CS492 Assignment 2

With demand paging, the best algorithm was least recently used, although it was very similar to the clock algorithm. This is inline with my expectations as both clock and LRU evict pages that are not referenced often, which is a better metric than when the page is loaded into memory. It seems to make sense that larger page sizes lead to less page faults. When programs access a certain memory location often, they will more likely access other locations close to it. With pre-paging, I differentiated between page faults and page swaps. When the extra page was loaded because of pre-paging, I counted it as a page swap but not a page fault. In terms of page faults, pre-paging resulted in much better performance. However there was not a direct trend between page-size and page-faults. The best performance was between 2 and 8 memory locations per page. I would have expected this to be similar to demand paging.

The page replacement algorithms themselves were rather simple to implement. FIFO and LRU were just about the same except that LRU compares last access time instead of load time. Clock was a bit simpler to implement as I didn't have to loop through all of the memory, just wind the clock until an unreferenced page is found.

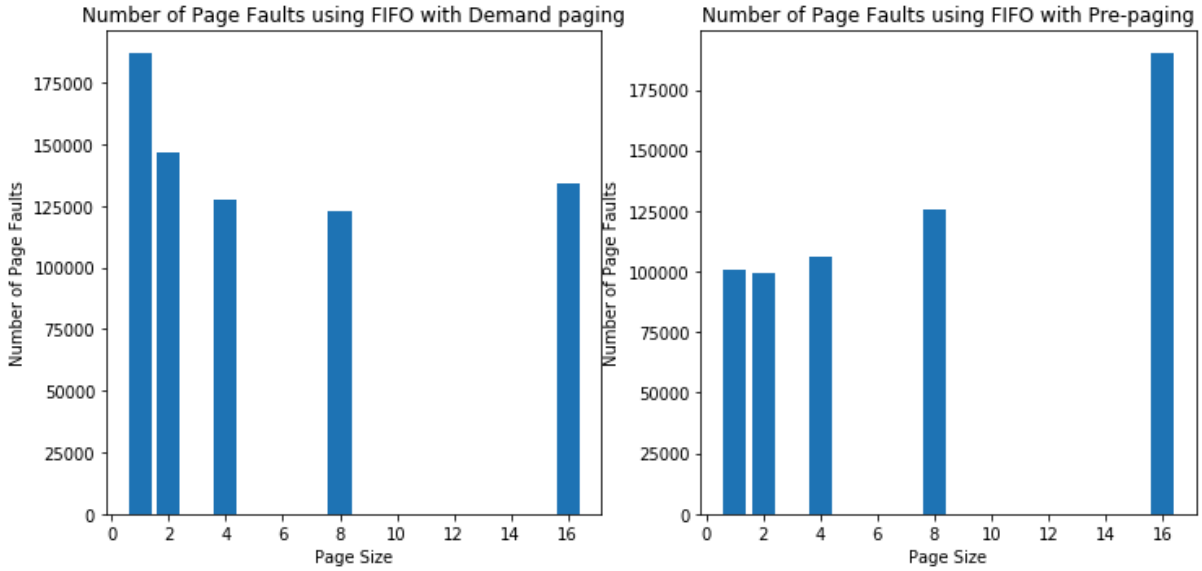
A completely random access memory trace would probably result in more page faults as the locality would not be preserved. Larger page sizes and pre-paging would not help to reduce page faults.

| Alg | Page Size | Prepaging | Page Swaps | Page Faults |
|---|---|---|---|---|
| Clock | 1 | 0 | 185409 | 185409 |
| Clock | 2 | 0 | 138421 | 138421 |
| Clock | 4 | 0 | 114990 | 114990 |
| Clock | 8 | 0 | 103636 | 103636 |
| Clock | 16 | 0 | 103498 | 103498 |
| FIFO | 1 | 0 | 186783 | 186783 |
| FIFO | 2 | 0 | 146731 | 146731 |
| FIFO | 4 | 0 | 127235 | 127235 |
| FIFO | 8 | 0 | 123205 | 123205 |
| FIFO | 16 | 0 | 134351 | 134351 |
| LRU | 1 | 0 | 185230 | 185230 |
| LRU | 2 | 0 | 138364 | 138364 |
| LRU | 4 | 0 | 114959 | 114959 |
| LRU | 8 | 0 | 103516 | 103516 |
| LRU | 16 | 0 | 97977 | 97977 |

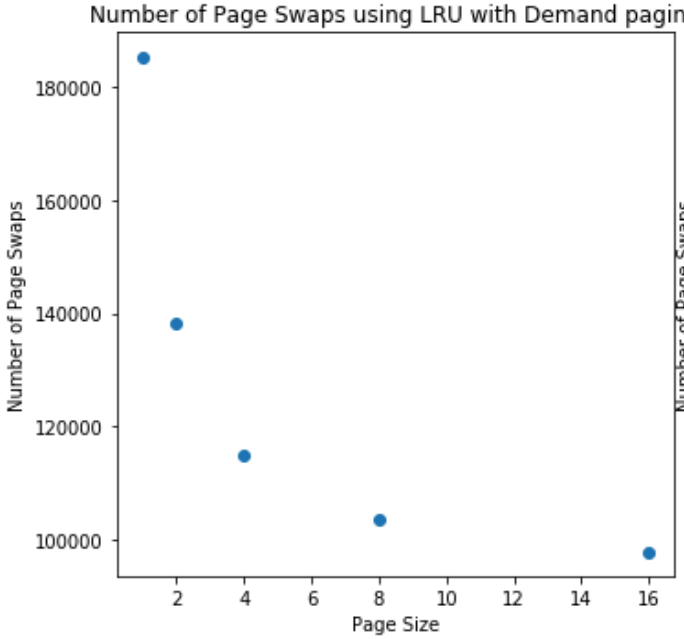
| Alg | Page Size | Prepaging | Page Swaps | Page Faults |
|---|---|---|---|---|
| Clock | 1 | 1 | 199794 | 99918 |
| Clock | 2 | 1 | 188980 | 94635 |
| Clock | 4 | 1 | 186391 | 93447 |
| Clock | 8 | 1 | 186352 | 93671 |
| Clock | 16 | 1 | 258765 | 131128 |
| FIFO | 1 | 1 | 201741 | 100893 |
| FIFO | 2 | 1 | 198391 | 99349 |
| FIFO | 4 | 1 | 212114 | 106338 |
| FIFO | 8 | 1 | 249622 | 125480 |
| FIFO | 16 | 1 | 375222 | 189908 |
| LRU | 1 | 1 | 199838 | 99943 |
| LRU | 2 | 1 | 191138 | 95720 |
| LRU | 4 | 1 | 193074 | 96792 |
| LRU | 8 | 1 | 191483 | 96239 |
| LRU | 16 | 1 | 188875 | 95787 |

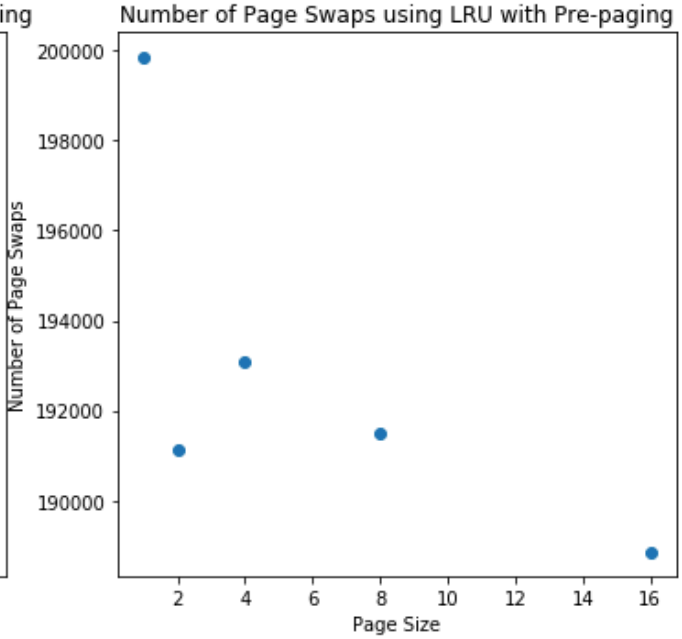

Number of Page Swaps using FIFO with Demand paging
Number of Page Swaps
Page Size
0
25000
50000
75000
100000
125000
150000
175000
0
2
4
6
8
10
12
14
16

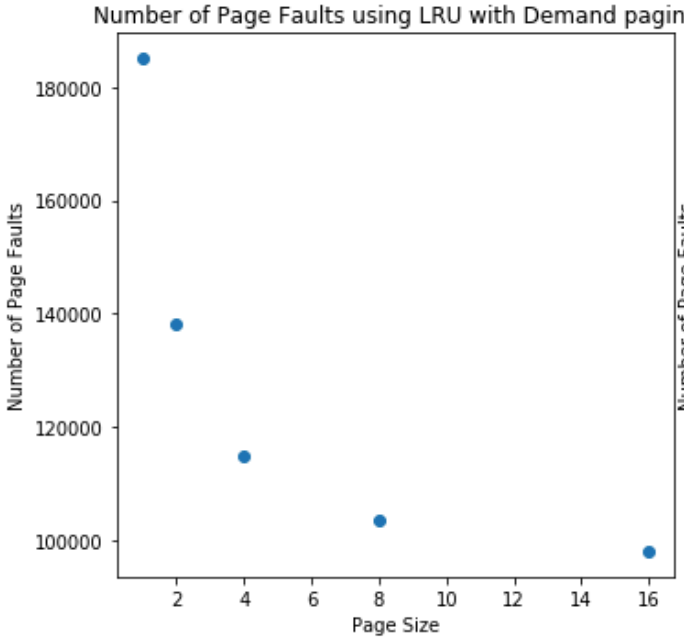

Number of Page Swaps using FIFO with Pre-paging
Number of Page Swaps
Page Size
0
50000
100000
150000
200000
250000
300000
350000
0
2
4
6
8
10
12
14
16

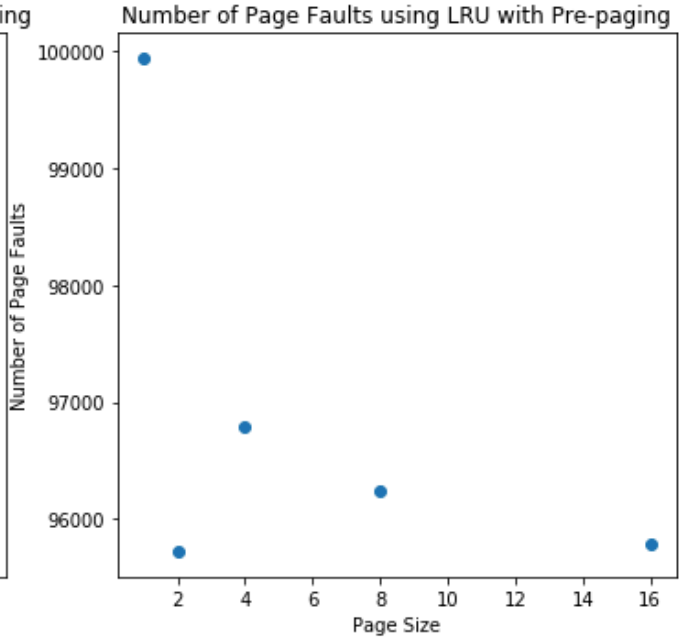

Number of Page Faults using FIFO with Demand paging
Number of Page Faults
Page Size
0
25000
50000
75000
100000
125000
150000
175000
0
2
4
6
8
10
12
14
16

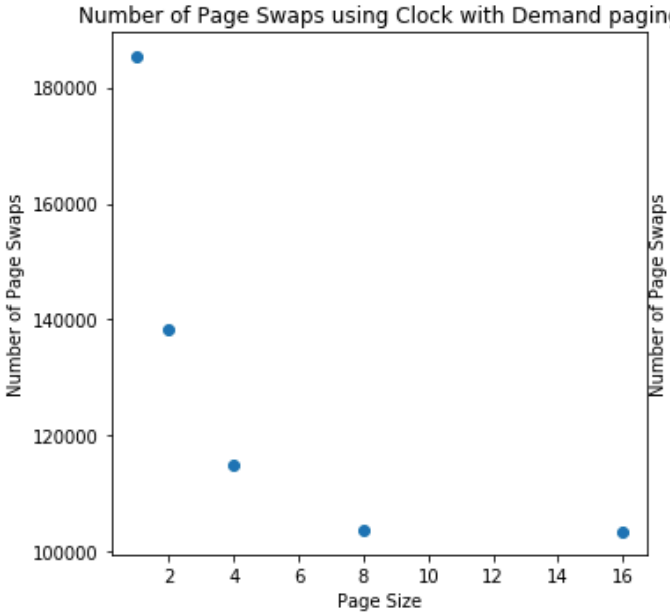

Number of Page Faults using FIFO with Pre-paging
Number of Page Faults
Page Size
0
25000
50000
75000
100000
125000
150000
175000
0
2
4
6
8
10
12
14
16

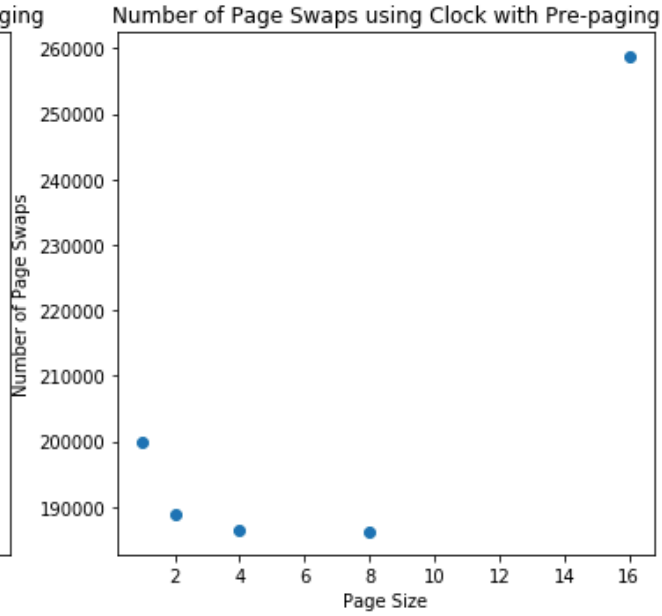

Number of Page Swaps using LRU with Demand paging
Number of Page Swaps
Page Size
180000
160000
140000
120000
100000
2
4
6
8
10
12
14
16

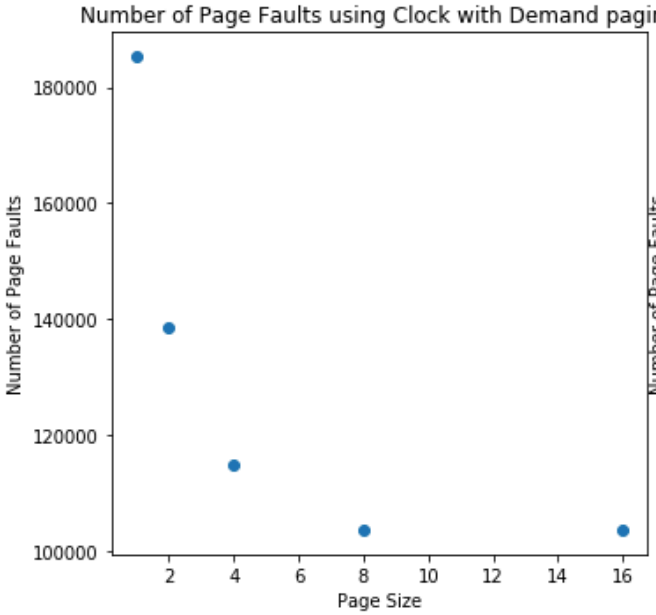

Number of Page Swaps using LRU with Pre-paging
Number of Page Swaps
Page Size
200000
198000
196000
194000
192000
190000
2
4
6
8
10
12
14
16

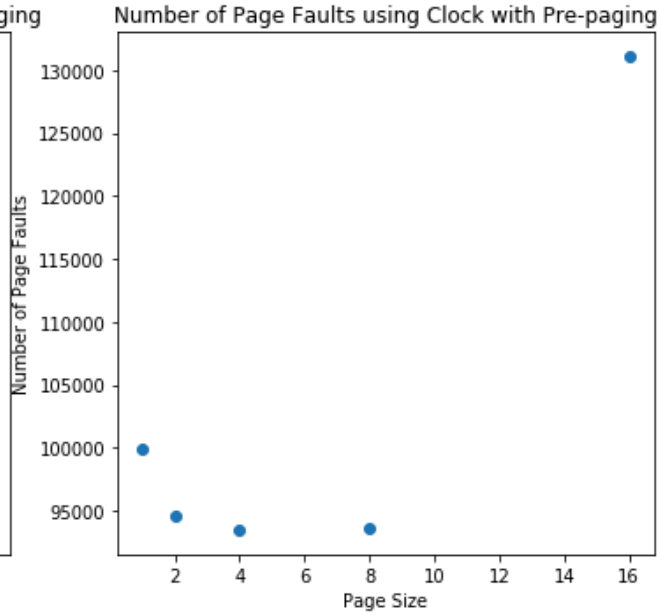

Number of Page Faults using LRU with Demand paging
Number of Page Faults
Page Size
180000
160000
140000
120000
100000
2
4
6
8
10
12
14
16


Number of Page Faults using LRU with Pre-paging
Number of Page Faults
Page Size
100000
99000
98000
97000
96000
2
4
6
8
10
12
14
16


Number of Page Swaps using Clock with Demand paging
Number of Page Swaps
Page Size
180000
160000
140000
120000
100000
2
4
6
8
10
12
14
16


Number of Page Swaps using Clock with Pre-paging
Number of Page Swaps
Page Size
260000
250000
240000
230000
220000
210000
200000
190000
2
4
6
8
10
12
14
16


Number of Page Faults using Clock with Demand paging
Number of Page Faults
Page Size
180000
160000
140000
120000
100000
2
4
6
8
10
12
14
16


Number of Page Faults using Clock with Pre-paging
Number of Page Faults
Page Size
130000
125000
120000
115000
110000
105000
100000
95000
2
4
6
8
10
12
14
16