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Operating systems

Virtual Memory

Overview

The work seeks to implement a simple but fully functional demand paged virtual memory model with several page replacement policies:

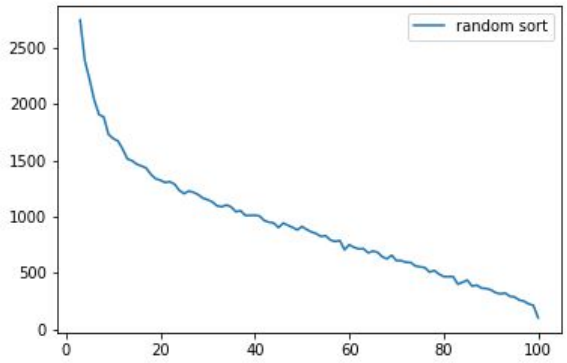
1) Random
2) FIFO
3) Second Chance

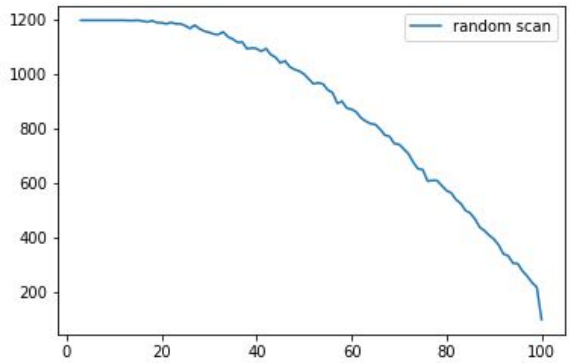
Test Environment

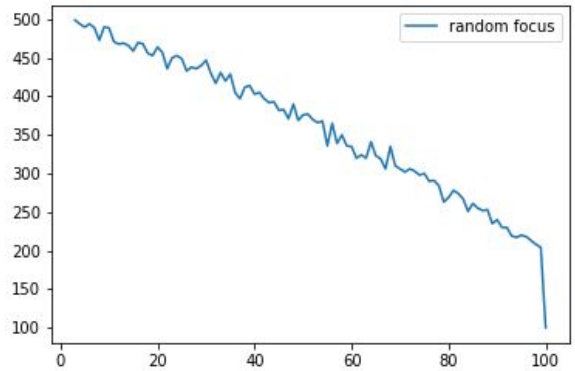
OS: Ubuntu 16.04 LTS
Intel(R) Core(TM) i5-7200U CPU @ 2.50GHz
GeForce 940MX

Results

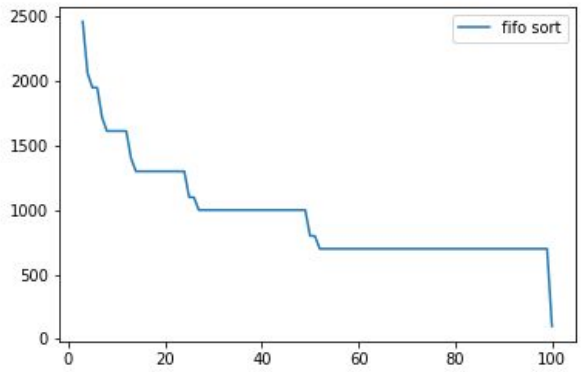
Random

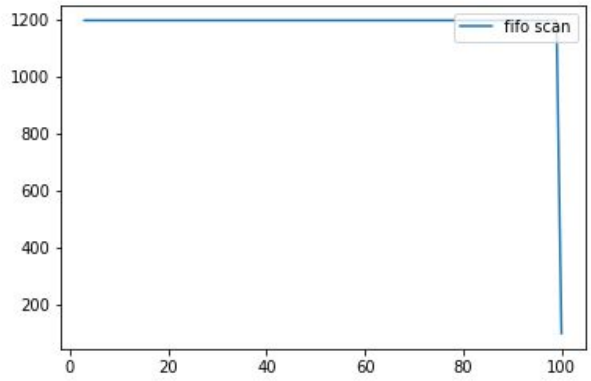


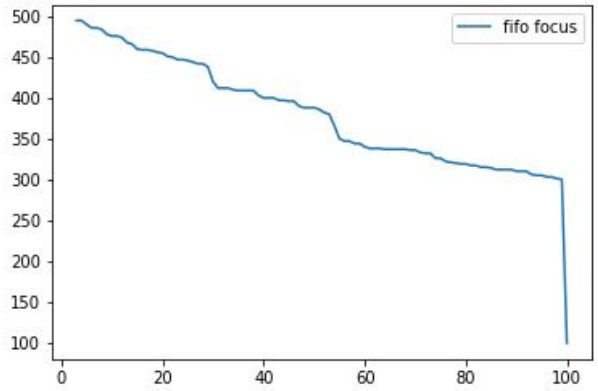




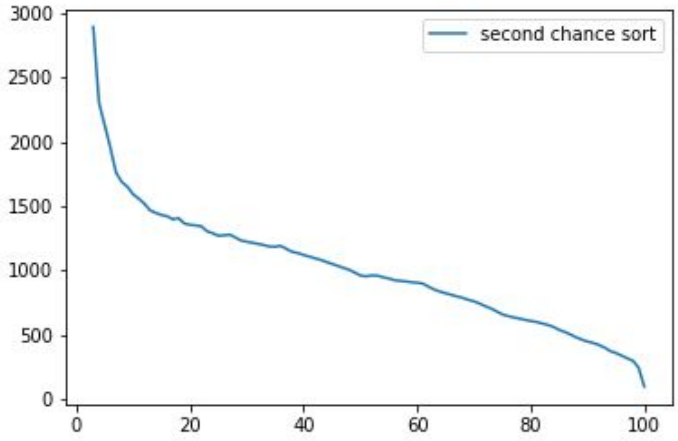
FIFO

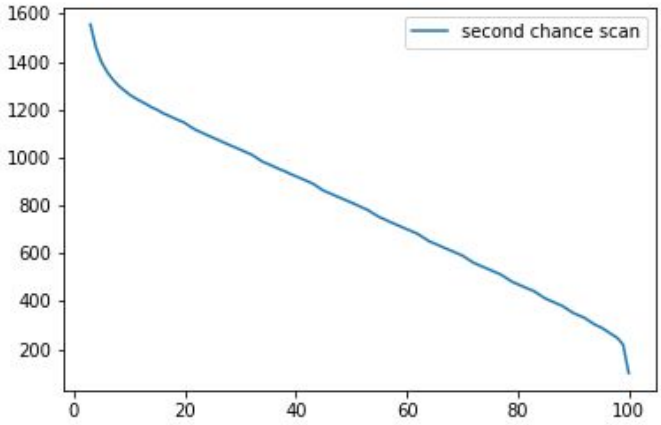

fifo sort
2500
2000
1500
1000
500
0
0
20
40
60
80
100

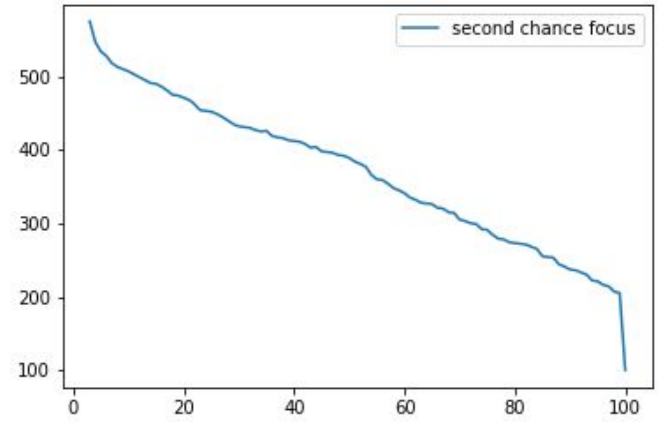

fifo scan
1200
1000
800
600
400
200
0
20
40
60
80
100


fifo focus
500
450
400
350
300
250
200
150
100
0
20
40
60
80
100

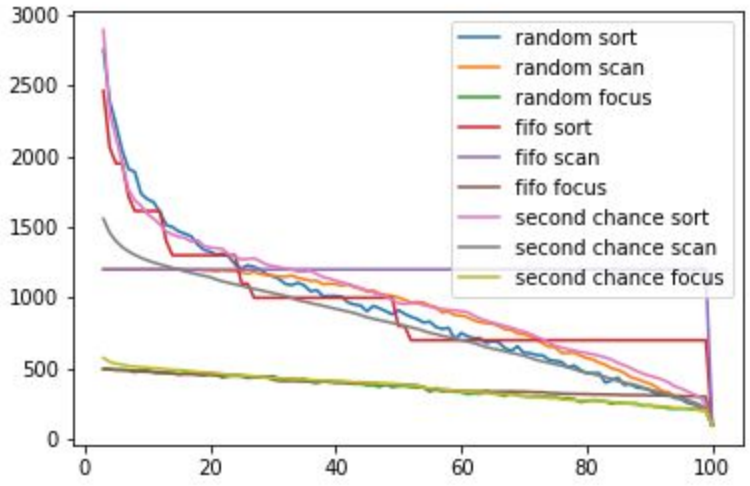
Second Chance







All in one



Analysis

FIFO is best to for sorting
Random is best for scan

Sort program works best with a FIFO algorithm. Sort uses quicksort to sort a number of random integers. The quicksort algorithm loops through addresses in the same area (locality of reference) more often than the scan program does. For FIFO and Second Chance , this allows pages to be referenced many times before they are removed from the end of their queues.

For scan, FIFO and Second chance tend to evict pages before they are referenced again and perform very poorly while random increases the chances that a page will still be in memory the next time it is referenced.

The focus program looked up addresses in memory at random. So naturally we would think that random will perform the best, and it does fairly consistently.