Assignment 7

Operating Systems Lab

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Abstract

In this assignment we have explored some of the page frame reclaiming algorithms. We have implemented 4 different such algorithms, namely

- Random Algorithm
- Optimal Algorithm
- Least Recently Used (LRU)
- Clock Algorithm

In theory, random algorithm picks a random page to replace. Optimal algorithm picks the page not needed for the longest time in future. LRU Algorithm picks the page that was least recently used in the past. Clock Algorithm approximates LRU by picking a page not used recently in the past instead of picking the page that was least recently used in the past.

Plots

After simulating these algorithms, their hit ratio was plotted against frames in the memory. The plots are shown below.

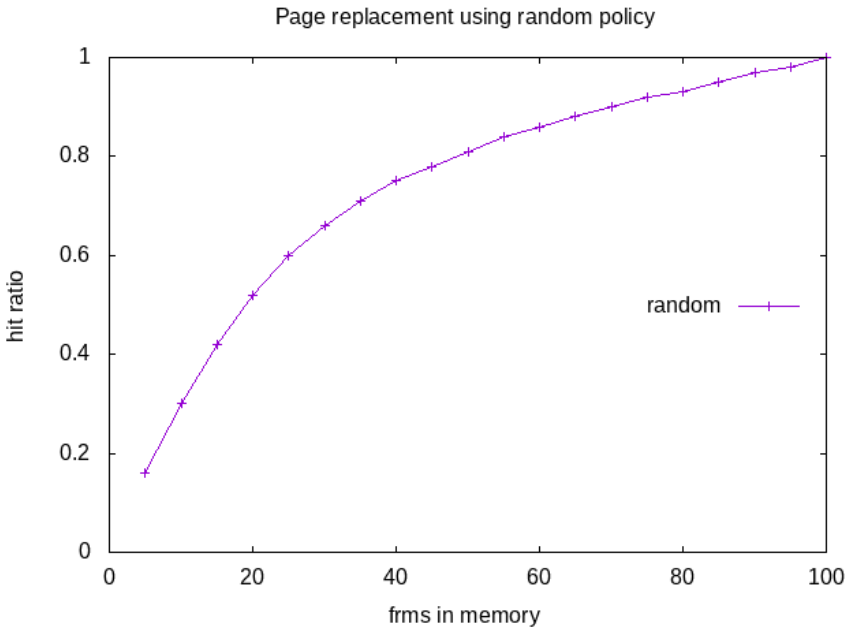

Figure 1: Random Algorithm

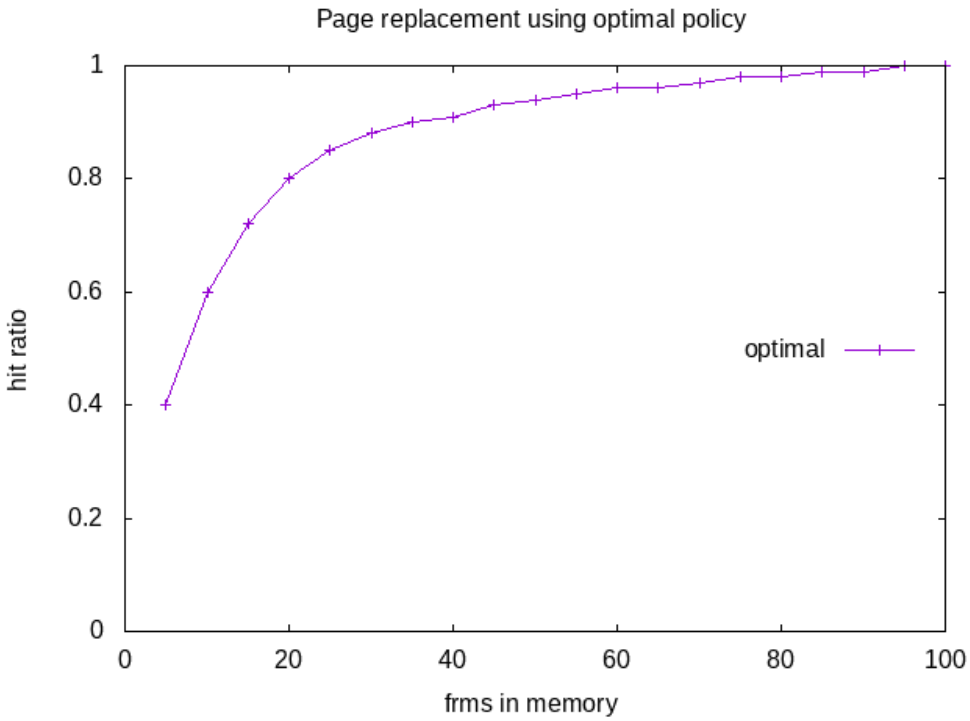

Figure 2: Optimal Algorithm

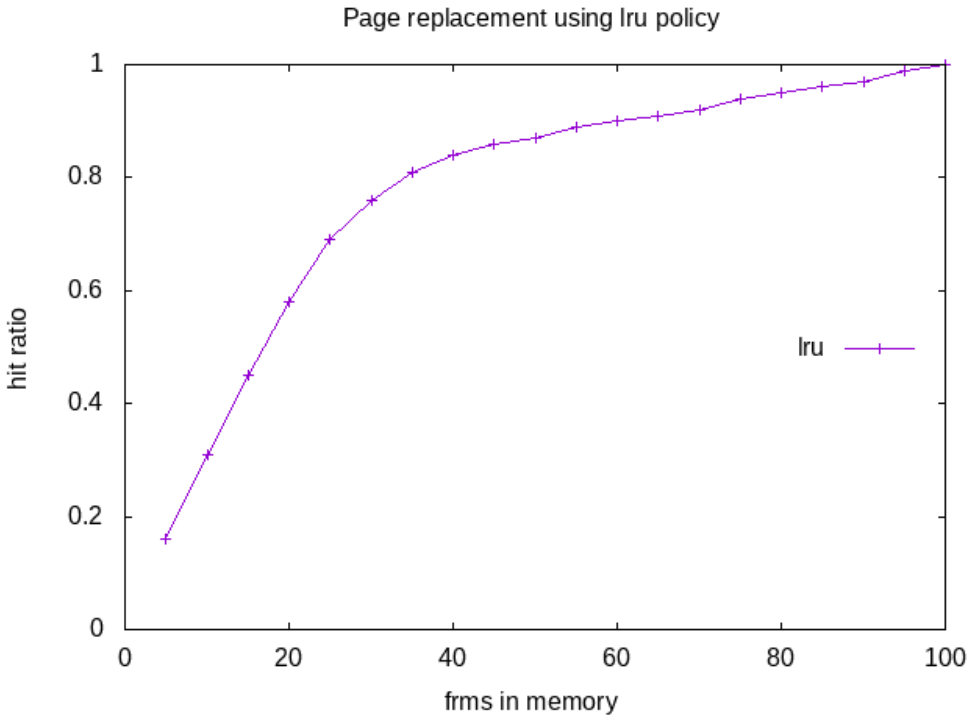

Figure 3: LRU Algorithm

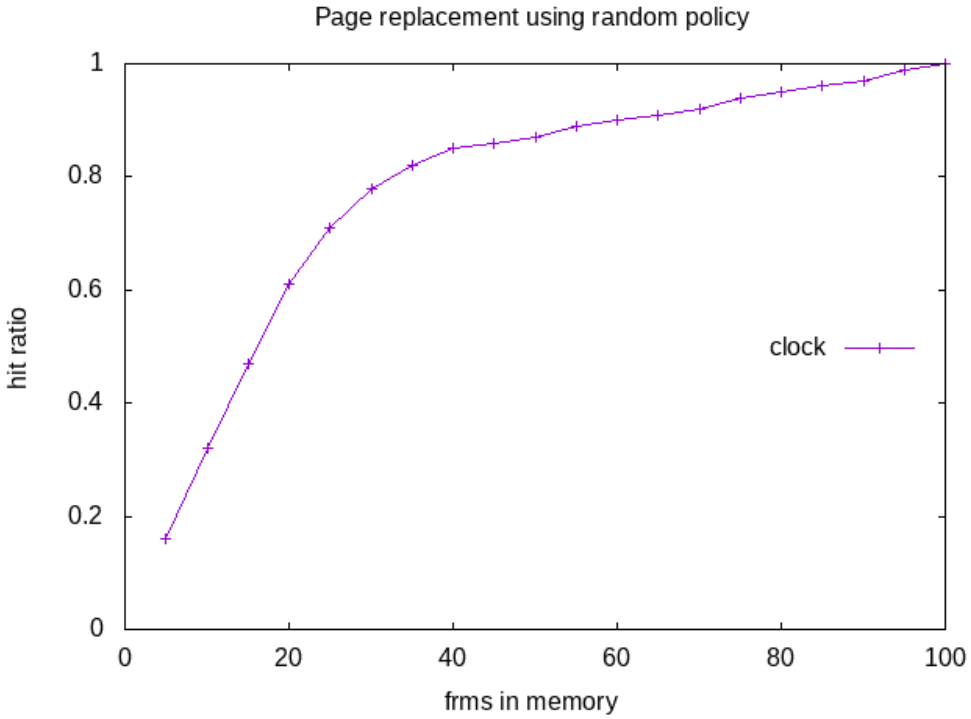

Figure 4: Clock Algorithm

Observations and Inferences

The comparison of different algorithms in one plot is shown below.

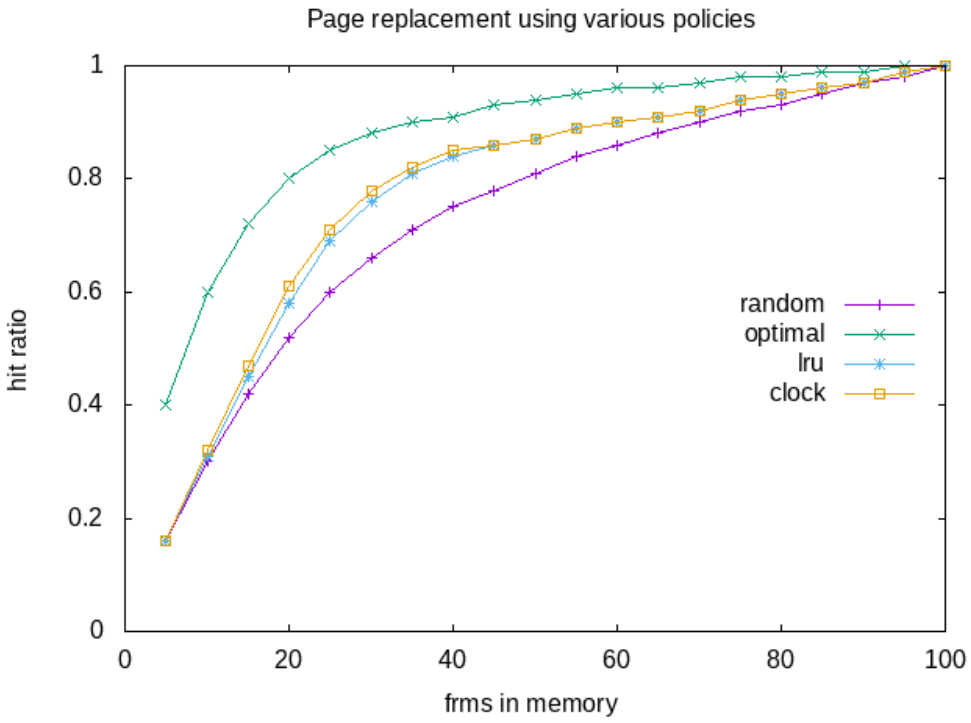

Figure 5: Clock Algorithm

From the above plots, we can practically confirm a lot of points which are believed to be true from theory.

- Firstly, we see that optimal algorithm performs better than any other algorithm.
- The random algorithm on the other hand performs the worst among all.
- The LRU algorithm, though not as good as optimal performs better than random algorithm.
- It is because it tries to predict would be used in near future based on past trend.
- On the other hand, since LRU is hard to implement in hardware, the clock algorithm tries to approximate LRU.
- Therefore, naturally it performs better than random and close to LRU.
- Sometimes, as seen here clock may perform better than LRU. But it is completely based on luck and coincidence. In theory it cannot outperform the LRU algorithm.

- An interesting point to notice is that once the number of frames in memory reaches a high enough number (in this case 100), all algorithms performs ideally with hit rate 1, as we can keep all the pages in frames.