

## Page Replacement Simulation - Final Report

Name: Gauri DAVE

SCU ID : 07700010781

Email : Gdavescu.edu

### Overview

The objective of the memory management simulation is to assess the effectiveness of different page replacement algorithms within the constraints of a computer operating system with limited main memory. The simulation involved analyzing the concurrent execution of multiple processes and generating memory references using a locality of reference algorithm.

Page Replacement Algorithm Used:

1. FIFO
2. LRU
3. LFU
4. MFU
5. Random pick

### Discussion:

- I observed varied results LRU was best and MFU worst other times FIFO was better than random pick and LRU and sometimes LFU was worst.
- Which algorithm is best cannot be said.
- The variation in performance across different outputs or simulations can be attributed to the nature of the workload and the specific characteristics of each simulation. Page replacement algorithms are designed to handle different scenarios and workloads, and their effectiveness can vary based on the access patterns of the application.
- Here we have random processes of different sizes, random service durations so output will vary in every simulation.
- The program may exhibit different behaviors on various operating systems.

### Sample Output 1:

2023-12-07 12:05:23.738282000

End of Simulation statistics for FIFO\_PAGE\_REPLACEMENT : Hits = 8185, Misses = 8216, Average Hit-Miss ratio across all iterations = 0.9962268743914313

2023-12-07 12:05:23.840333000

End of Simulation statistics for RANDOM\_PICK : Hits = 8226, Misses = 8118, Average Hit-Miss ratio across all iterations = 1.0133037694013303

2023-12-07 12:05:23.840680000

End of Simulation statistics for LRU : Hits = 8391, Misses = 8037, Average Hit-Miss ratio across all iterations = 1.044046285927585

2023-12-07 12:05:23.840739000

End of Simulation statistics for LFU : Hits = 7634, Misses = 8492, Average Hit-Miss ratio across all iterations = 0.8989637305699482

2023-12-07 12:05:23.840771000

End of Simulation statistics for MFU : Hits = 8223, Misses = 8143, Average Hit-Miss ratio across all iterations = 1.0098243890458063

## **Sample Output 2:**

### **Analysis**

**Performed entire simulation several times and out of them got below.**

Best Performing Algorithm: LRU (Multiple Trials)

LRU demonstrated the highest average hit/miss ratio among the tested algorithms. It tends to perform well in scenarios where the hit/miss ratio is crucial for efficient cache utilization. By prioritizing the retention of recently used pages, LRU maximizes the likelihood of hitting pages that are currently in demand.

Worst Performing Algorithm: LFU(Multiple Trials)

LFU showed the lowest average hit/miss ratio. It emphasizes the frequency of page usage, may lead to suboptimal cache utilization if it retains pages with high historical frequencies but low current demand.