Advanced Operating Systems - Homework 1

Page Replacement Algorithms and Evaluation

Motivation:

You have learned a number of page replacement algorithms in class. Homework 1 asks you to implement some of them, propose your idea, and evaluate the system performance.

Specification:

1. Reference string: 1~1,200
2. Number of memory references: At least 300,000 times
3. Number of frames in the physical memory: 30, 60, 90, 120, 150
4. Three test reference strings:
   (1) Random: Arbitrarily pick [1, 20] continuous numbers for each reference.
   (2) Locality: Simulate procedure calls. Each procedure may refer a subset of 1/300~1/120 string (the length of string can be random).
   (3) Your own reference string. However, you should discuss why you choose such a reference string in the report.
5. You can use both reference and dirty bits.

Requirements:

1. You need to implement THREE algorithms for comparison:
   (1) FIFO algorithm
   (2) Optimal algorithm
   (3) Additional-reference-bits algorithm
2. In addition, you should develop your own algorithm (not in the textbook). Your algorithm is expected to at least win the FIFO one (in terms of the page-fault rate or cost), where the cost is defined by the number of interrupts required and the number of pages needed to be written back to the disk. Recall that every time when you invoke the OS to do something, interrupts are always necessary.
3. In your report, you should give the following three figures for each replacement algorithm and each reference string:
   (1) Relationship between page faults and the number of frames.
   (2) Relationship between the number of interrupts and the number of frames.
   (3) Relationship between the number of disk writes (in pages) and the number of frames.
   Moreover, your report should present discussions on the behaviors of these algorithms.
4. You need to demonstrate your program to TA and submit your report in class.

Due Day:
2021/11/11

Grading Policy:
Programming 65% (including 5% for comments)
Report 35%