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 these algorithms, propose your own scheme, and evaluate their system performance.

Specification:

1. Reference string: 1~800
2. Number of memory references: At least 200,000 times
3. Number of frames in the physical memory: 20, 40, 60, 80, 100
4. Three test reference strings:
   (1) Random: Arbitrarily pick [1, 25] continuous numbers for each reference.
   (2) Locality: Simulate function calls. Each function call may refer a subset of 1/25~1/15 string (the length of string can be random).
   (3) Your own reference string. However, you should explain 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) ARB algorithm (8-bit information)
   (3) Enhanced second-chance 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, interrupt is always necessary.
3. For each algorithm and reference string, your report should present the following three figures:
   (1) The relationship between page faults and the number of frames.
   (2) The relationship between the number of interrupts and the number of frames.
   (3) The relationship between the number of disk writes (in pages) and the number of frames.

   Furthermore, your report should give some discussions about the behaviors of these

algorithms.

4. You need to demonstrate your program to TA and submit your report in class.

Due Day:
2020/10/29

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