Advanced Operating Systems - Homework 1

Page Replacement Algorithms and Evaluation

Motivation:

In class, you have learned some page replacement algorithms. Homework 1 asks you to implement these algorithms, propose your own one, and evaluate their performance

Specification:

1. Range of reference string: 1~1,200
2. The number of memory references: At least 120,000 times
3. The number of frames in the main memory: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
4. Three test reference strings:
   (1) Random: Arbitrarily pick one number for each reference.
   (2) Locality: Simulate procedure calls. The reference string length of each procedure call accounts for 1/200-1/100 of the overall reference string length. Note that the length shall be random.
   (3) Your reference string (not same to the above two settings). You must explain why you choose such a reference string in the report.
5. You can use reference and dirty bits.

Requirements:

1. You need to implement three algorithms for comparison:
   (1) FIFO algorithm
   (2) Optimal algorithm
   (3) Enhanced second-chance algorithm
2. Moreover, you must design your own algorithm (not in the textbook). Your algorithm shall 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 and the number of pages written back to the disk. Recall that each time when you invoke the OS to do something, an interrupt is always necessary.
3. For each algorithm and reference string, you must present at least three figures in your report:
   (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.
   In addition, your report should give some discussions about the behaviors of these

algorithms.

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

Due Day:

2024/10/24

Grading Policy:

Programming: 65% (including 5% for comments)

Report: 35% (in a PDF file)

[Note] If you do NOT demonstrate your program to TAs, you will get zero point in this homework even though you submit your code and report.