Advanced Computer Architecture

Programming Assignment 4

Due on Monday, Aban 10^{th}, 1395

Overview

In this assignment, you will extend the cache simulator that you developed in PA1 to assess the effective of a proposed replacement policy using traces of CloudSuite, PARSEC, and SPEC workloads. You are free to choose the programming language of your choice among C/C++, Java, Perl, PHP, or Python. You are advised to start early.

Programming Exercise

Nimrod Megiddo and Dharmendra S. Modha proposed an adaptive replacement policy and claim that it outperforms LRU by dynamically responding to changing access patterns and continually balancing between workload recency and frequency features. Implement the proposed replacement policy and evaluate the claim of Nimrod and Dharmendra on a 2 MB, 16-way associative last-level cache with a 64B block size.

Note: Please refer to Outperforming LRU with an Adaptive Replacement Cache Algorithm for more information on the proposed replacement policy.

Milestone 1

For every workload, measure the hit ratio of the last-level cache with the suggested replacement policy.

Milestone 2 (OPTIONAL but HIGHLY recommended)

Propose a replacement policy that is better than what you already implemented. Implement the proposed idea in your cache simulator and measure its effectiveness (what matters the most is *innovation*!).

Deliverable

Hand in the code and a short report (PDF) that describes what you observed in this experiment. Compare the effectiveness of this PA's replacement policy against the replacement policies of PA 1, 2, and 3. Sort the replacement policies based on their effectiveness. Which replacement policy does offer the lowest miss ratio? Which replacement policy does offer the highest miss ratio? What did you learn from the programming assignments? If you have done Milestone 3, please

clearly explain the proposed idea, justify why you believe it works, and report the simulation numbers to back up your claim.

Please put your code and report in separate folders named *code* and *report*, respectively, place both folders in another folder named *pa4_firstname_lastname*, zip the upper folder and email it to plotfi@ipm.ir with subject "Programming Assignment 4". Moreover, please upload the zip file to CW.