Advanced Computer Architecture

Programming Assignment 3

Due on Monday, Aban 3rd, 1395

Overview

In this assignment, you will extend the cache simulator that you developed in PA1 to assess the effective of a recently 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

Akanksha Jain and Calvin Lin recently proposed a replacement policy that learns from Belady's algorithm by applying it to past cache accesses to inform future cache replacement decisions. Implement the proposed replacement policy and compare it against the replacement policies of PA 1 and 2 on a 2 MB, 16-way associative last-level cache with a 64B block size.

Note: Please refer to Back to the Future: Leveraging Belady's Algorithm for Improved Cache Replacement 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)

Kaushik Rajan and Govindarajan Ramaswamy proposed Emulating Optimal Replacement with a Shepherd Cache. Implement the proposed replacement policy and compare it against the competing replacement policies on a 2 MB, 16-way associative last-level cache with a 64B block size.

Milestone 3 (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. Please include the hit ratio for every workload in your report. What did you learn from this experiment? 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 *pa3_firstname_lastname*, zip the upper folder and email it to plotfi@ipm.ir with subject "Programming Assignment 3". Moreover, please upload the zip file to CW.