ES 215 Project - Champsim: Branch Predictors

Task 1 : Clone and install ChampSim

ChampSim is an architectural simulator that has been designed for studying specific subsystems within a CPU, specifically, branch predictors, prefetchers and on-chip caches.

ChampSim is a trace driven simulator. This implies that inputs to the simulator are traces of instruction executions of various programs that have been collected from previous runs of the benchmark. As a result, one of the inputs that will be supplied to the simulator will be an instruction trace file. ChampSim team has made a number of such instruction traces available.

Your first task is to clone and install ChampSim. The GitHub repository of the tool, along with the instructions to compile and run the software is located here. In a Linux environment, follow these instructions to make run the sample single core simulations using the provided `run_champsim.sh` script for the `400.perlbench-41B.champsimtrace.xz` trace file. Once that is done, follow the instructions to run the sample 4-core simulation, compiling for the 4 core configuration, using the `run_4core.sh` script.

Task 2 : Performance Comparison of Branch Predictors

A few branch predictors are coded up and are supplied with the simulator. These include gshare, perceptron and hashed perceptron predictors. Run a single code configuration with default simulation parameters for the following single core trace files, and report the branch prediction rates. For each benchmark trace, do different benchmark traces have different prediction rates? Does the branch prediction rate have a correlation with performance? Can you co-relate the difference in the prediction rates to the design of the predictors?

Traces :
For this task, download the following trace files from here.
649.fotonik3d_s-1B.champsimtrace.xz
654.roms_s-1021B.champsimtrace.xz
603.bwaves_s-5359B.champsimtrace.xz
454.calculix-104B.champsimtrace.xz

Results :
Create a presentation/document and upload a screenshot of the completed runs of each one of the simulations in Task 1. Report the performance comparison for Task 2 in a table.

Query Resolution

Feel free to mail your queries to Pranjali Jain(pranjali.jain@iitgn.ac.in).