CS6290

High Performance Computer Architecture

Project 3: Design Experiment Results

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Experiments

The values of input parameters to our code, the total cache size, the block size, and the associativity for each cache, were varied using a script. The constraints placed on these parameter values were such that the total storage (cache data and mete data storage) for each cache simulator does not exceed 4096 bytes (4KB). This has been described in the experiment methodology section that follows.

Methodology Used

The following constraints were used for cache simulator with three given traces 'astar.trc, 'mcf.trc', and 'pearlbench.trc':

- **Total Storage**: The constraints on total storage for this simulator were as follows:
    - All inputs (total cache size, block size, and associativity) should be of the form 2^x
    - The cache size should be greater than the block size
    - The minimum block size should be 1B
    - The associativity should be less than or equal to the number of lines in a cache (= cachesize/blocksize)
    - Total storage = (Number of lines) * [((66 – Number of offset bits – Number of index bits)/8) + Block size]
      The Total storage was constrained at a maximum of 4KB
    - With a check on all the valid cases (satisfying the conditions described above), the results were exported to a log file and the configuration for minimum AMAT was identified. The results for three given traces are mentioned under the Design Results section.

This methodology is complete because the algorithm it uses includes the following three important constraints:

- Maximum limit on the Total storage (4KB)
- To achieve a maximum limit on the Total storage, the maximum values for sweeping cache and block size were fixed by trial and error as 1B to 4KB, and the conditions mentioned above were imposed.

Design Results

The minimum values of AMAT for three caches for the three given traces are show below. Of these configurations, the cache configuration with the minimum AMAT has been highlighted.

Trace: **astar**			
Total Size of Cache (Bytes)	**Block Size (Bytes)**	**Associativity**	**AMAT**
2048	64	4	8.703154

Trace: **mcf**			
Total Size of Cache (Bytes)	**Block Size (Bytes)**	**Associativity**	**AMAT**
2048	8	8	5.072693

Trace: **pearlbench**			
Total Size of Cache (Bytes)	**Block Size (Bytes)**	**Associativity**	**AMAT**
2048	32	4	9.428505