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28 October 2022

Project Report
Computer organization
cache simulator project

INTRODUCTION

The cache simulator is used to simulate substitutions using replacement policies (LRU) and write back with write allocate policy.

INPUT

We had to take three variables from the user:

1-capacity in kilobytes

2-blocksize in Bytes

3-associativity

HOW DID WE PROGRAM THE SIMULATOR

Before starting to program the Cache Simulator,

we had to understand how it works,

and this is what we learned in Computer Organization.

HOW it works

After the user enter value, we convert the value to power so we use this equation

$\log(\text{cache\_capacity})/\log(2)$

$\log(\text{blocksize})/\log(2)$

$\log(\text{associativity})/\log(2)$

after that we must verify user input

cache_capacity >= 1 AND cache_capacity <= 64

cache_blocksize >= 4 AND cache_blocksize <= 512

cache_associativity >=1 AND cache_associativity <= 512

The replacement Policy we use is Least recently used (LRU)

Replace that block in the set that has been in the cache longest with

no reference to it

We test the cases from cen214.trace file

The cache capacity is fixed 8 kilobytes

Block size 16 , 128 and 512

Assoc 1 , 2 , 3 and 4

RESULT

Our simulator runs through 100% of the trace file and generates results in seconds. There are no performance issues there was a slight delay when we used 512 blocksize we are not sure exactly what caused the delay but with other tests it was very fast

For each test, there was a fixed cache size of 8 KB

was tested on four associativity 1,2,3 and 4

And blocksize 16 , 128 and 512.

We noticed that no matter how the associativity changes, there will be a very small change in the miss rate
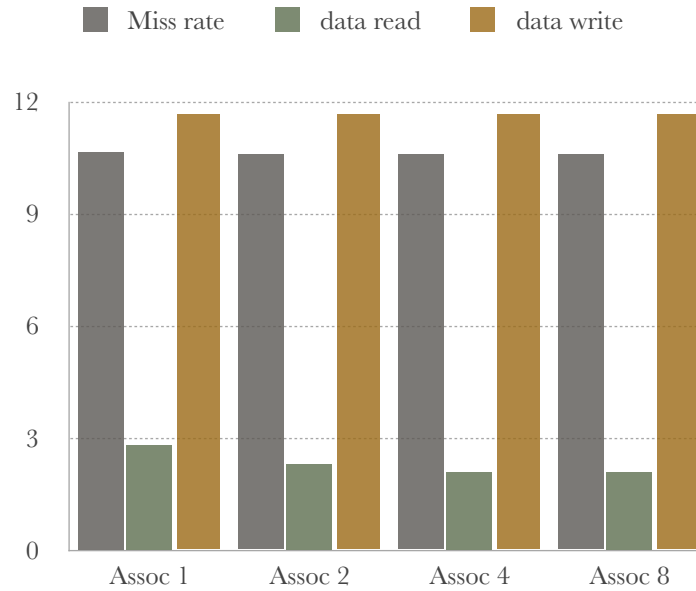
TESTCASE

blocksize is 16bytes, cache capacity is 8Kbytes assoc is 1 ,2 ,3 and 4

	Assoc 1	Assoc 2	Assoc4	Assoc8
Miss Rate	83.121%	83.121%	83.074%	83.074%
Data Reads	4.02381%	3.71292%	3.69515%	3.69515%
Data Writes	93.1554%	93.1442%	93.1442%	93.1442%

TESTCASE

blocksize is 128bytes, cache capacity is 8Kbytes assoc is 1 ,2 ,3 and 4

	Assoc 1	Assoc 2	Assoc4	Assoc8
Miss Rate	10.694	10.607	10.589	10.584
Data Reads	2.81578	2.31835	2.1407	2.07852
Data Writes	11.6934	11.6585	11.6608	11.663

TESTCASE

blocksize is 512bytes, cache capacity is 8Kilobytes assoc is 1 ,2 ,3 and 4
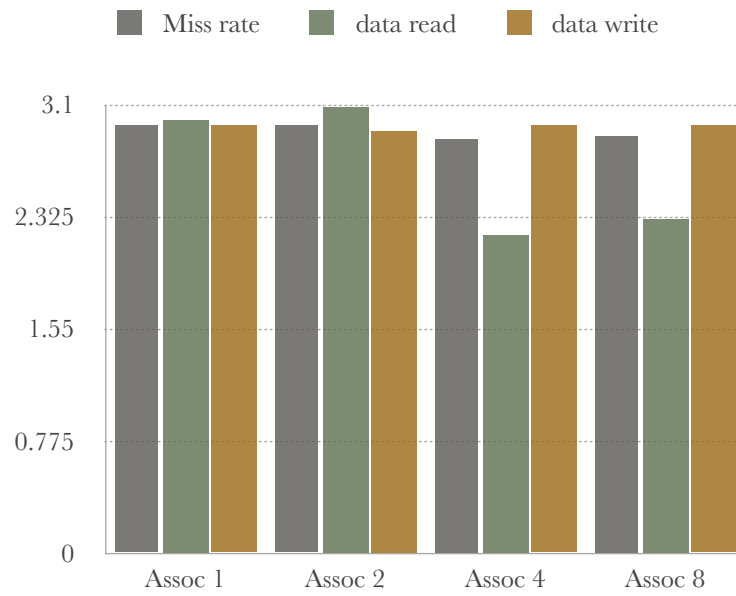
	Assoc 1	Assoc 2	Assoc4	Assoc8
Miss Rate	2.965%	2.953%	2.869	2.88%
Data Reads	2.99343%	3.08225%	2.21176	2.31835%
Data Writes	2.965%	2.9366%	2.95238	2.95125%