CA FINAL PROJECT

TOPIC: Miss rate of a set-associative LRU cache

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Introduction:

In this project we have implemented the n way set associative cache using LRU cache which basically take the main memory size, cache size, block size, associativity and the numbers which we want to enter from the user as input.

The output is the no of misses, hits and also the miss rate and hit rate and also the total numbers which user has given input to keep them in sets in an output file.

The code also gives output about Total Blocks, Total no. of Sets, Physical Address Bits and offset Address Bits.

- Hit rate = (no.of hits)/(no.of hits + no.of miss)
- Miss rate = (no.of misses)/(no.of hits + no.of miss)
- total blocks = cashe size/bloc size
- Total sets = total blocks/associativity
- Physical bit = log2(main memory size)
- Offset bit = log2(totalblock)
- Index bit = log2(totalset)
- Tag bit = physical bit - offsetbit - indexbit

Hit Rate:

The hit rate is the number of cache hits divided by the total number of memory requests over a given time interval. The value is expressed as a

percentage:

$$\frac{\text{Number of cache hits}}{(\text{Number of cache hits} + \text{Number of cache misses})} = \text{Cache hit ratio}$$

Miss Rate:

The *miss rate* is similar in form: the total cache misses divided by the total number of memory requests expressed as a percentage over a time interval. Note that the miss rate also equals 100 minus the hit rate.
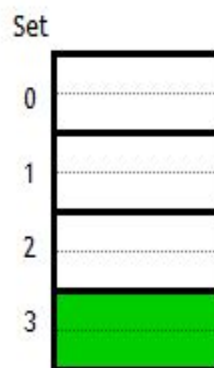
$$\text{Miss Ratio:} \quad MR = \frac{misses}{hits + misses} = 1 - HR$$
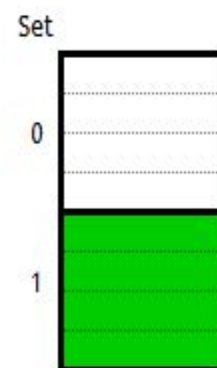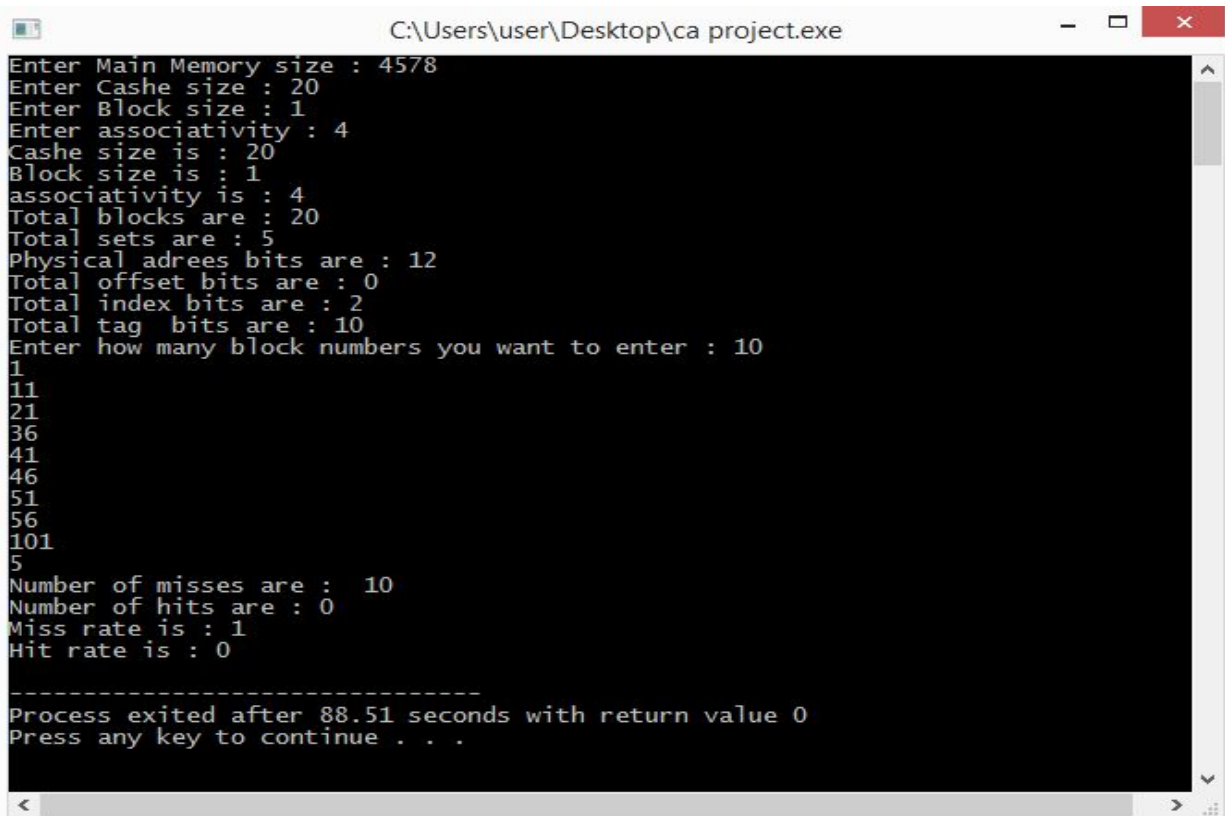
Miss Rate of a set Associative LRU cache:

As the whole working is based on no of sets and LRU algorithm the formulas used for calculating the sets no, most recently used number, total blocks, physical bits, and tag and index bits

The working of code basically is that after calculating the no of sets using total blocks and associativity. The User gives all inputs in number. When a number is given input it first check that in which set It will be replaced after checking that in which set it will be replaced it is passed to The LRU ..LRU basically stands for the Least Recently Used the LRU first checks that if there is hit in the specific set, If found then it will increment one to the index array. If there is a miss then first it checks that if there is any vacant place in the set then it put it in the nearest place in the set.

If all places all are filled then It removes the least recently used number in only that set and replaces it with the given number.

We have achieved the Miss Rate and Hit Rate.

Calculations:

```
                    C:\Users\user\Desktop\ca project.exe        -  □  ×
Enter Main Memory size : 4578
Enter Cashe size : 20
Enter Block size : 1
Enter associativity : 4
Cashe size is : 20
Block size is : 1
associativity is : 4
Total blocks are : 20
Total sets are : 5
Physical adrees bits are : 12
Total offset bits are : 0
Total index bits are : 2
Total tag  bits are : 10
Enter how many block numbers you want to enter : 10
1
11
21
36
41
46
51
56
101
5
Number of misses are :   10
Number of hits are : 0
Miss rate is : 1
Hit rate is : 0

---------------------------------
Process exited after 88.51 seconds with return value 0
Press any key to continue . . .
```

```
set number0 :
set number1 : 1
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 1 11
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 1 11 21
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 1 11 21 36
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 41 11 21 36
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 41 46 21 36
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 41 46 51 36
set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 41 46 51 56
```

set number2 :
set number3 :
set number4 :
set number0 :
set number1 : 101 46 51 56
set number2 :
set number3 :
set number4 :
set number0 : 5
set number1 : 101 46 51 56
set number2 :
set number3 :
set number4 :

Conclusion:

So, it's an overall code which basically checks the total hits and misses and calculates the miss rate and hit Rate. The Set Associative and LRU are the main techniques to calculate these both values in n way set associativity.