



Direct Mapped Cache Simulations

**Digital Fundamentals and Computer
Architecture
Simulation Design**

Name: Rich Toji

Roll No: 52

Course Code: 24MCAT103

Objective

- To simulate Direct Mapped Cache mapping tech
- To analyze cache hits and misses
- To display cache content after each memory access
- To calculate hit ratio



Direct Mapped Cache

- In directmappedcache,eachmemoryblockismapped to exactly one cache line.
- The mapping between memory block and cache line is fixed.
- This technique is simple and fast but may cause more cache misses due to conflicts.

Mapping Formula:

Cache Index = Block Number mod Cache Size

Algorithm – Direct Mapped Cache

1.Start

2.Read Cache Size

3.Read memory block reference sequence

4.Initialize cache with empty values

5.For each memory block:

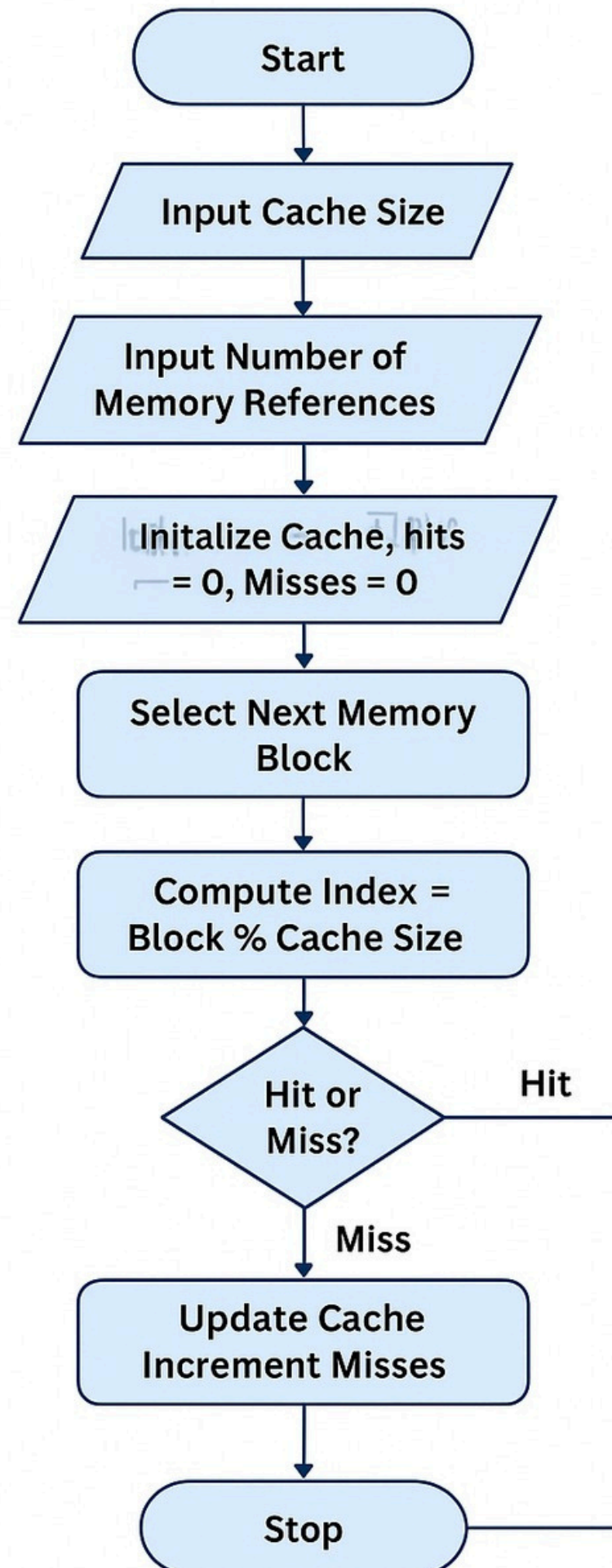
- **Compute index = block % cache size**
- **If block is found → Hit**
- **Else → Miss and replace block**

6.Display cache after each access

7.Calculate hit ratio

8.Stop

Flow Diagram





Sample input

Input Details:

Cache Size:

4

Memory Block Reference Sequence:

1 2 3 1 4 2 1

Cache Access Workflow

Block	Index	Hit/Miss	Cache State
1	1	Miss	[-1, 1, -1, -1]
2	2	Miss	[-1, 1, 2, -1]
3	3	Hit	[4, 1, 2, 3]
1	4	Hit	[4, 1, 2, 3]
4	0	Miss	[4, 1, 2, 3]
1	1	Hit	[4, 1, 2, 3]

Cache Access Workflow (Continued)

Block	Index	Hit/Miss	Cache State
1	1	Hit	[4, 1, 2, 3]
4	0	Miss	[4, 1, 2, 3]
2	2	Hit	[4, 1, 2, 3]
1	1	Miss	[4, 1, 2, 3]

Final Result

- Total Hits = 3
- Total Misses = 4
- Hit Ratio = $3 / 7 = 0.43$

Conclusion

- Direct Mapping is simple and fast
- Each block has a fixed cache location
- Cache performance depends on access pattern
- Simulation helps understand cache behavior