**CS224**

**Section No.: 3**

**Spring 2021**

**Lab No.: 6**

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**PART II**

**FOR 100 INPUTS**

1. **Direct Mapped Caches**

* Row-major averaging, for 100 inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Block Size (words)** | | | | |
| **1** | **2** | **8** | **16** | **32** |
| **Cache Memory (bytes)** | **128** | Miss rate: %97  # of misses: 20179 | Miss rate: %49  # of misses:  10090 | Miss rate: %12  # of misses:  2524 | Miss rate: %6  # of misses:  1263 | Miss rate: %3  # of misses:  633 |
| **256** | Miss rate:  %97  # of misses:  20179 | Miss rate: %49  # of misses:  10090 | Miss rate: %12  # of misses:  2524 | Miss rate: %6  # of misses:  1263 | Miss rate: %3  # of misses:  633 |
| **512** | Miss rate: %97  # of misses:  20179 | Miss rate: %49  # of misses:  10090 | Miss rate: %12  # of misses:  2524 | Miss rate: %6  # of misses:  1263 | Miss rate: %3  # of misses:  633 |
| **1024** | Miss rate: %97  # of misses:  20179 | Miss rate: %49  # of misses:  10090 | Miss rate: %12  # of misses:  2524 | Miss rate: %6  # of misses:  1263 | Miss rate: %3  # of misses:  633 |
| **2048** | Miss rate: %97  # of misses:  20179 | Miss rate: %49  # of misses:  10090 | Miss rate: %12  # of misses:  2524 | Miss rate: %6  # of misses:  1263 | Miss rate: %3  # of misses:  633 |

* Column-major averaging, for 100 inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Block Size (words)** | | | | |
| **1** | **2** | **8** | **16** | **32** |
| **Cache Memory (bytes)** | **128** | Miss rate: %97  # of misses: 20180 | Miss rate: %73  # of misses:  15090 | Miss rate: %54  # of misses:  11274 | Miss rate: %51  # of misses:  10639 | Miss rate: %50  # of misses:  10321 |
| **256** | Miss rate: %97  # of misses: 20180 | Miss rate: %73  # of misses:  15090 | Miss rate: %54  # of misses:  11274 | Miss rate: %51  # of misses:  10639 | Miss rate: %50  # of misses:  10321 |
| **512** | Miss rate: %97  # of misses: 20180 | Miss rate: %73  # of misses:  15090 | Miss rate: %54  # of misses:  11274 | Miss rate: %51  # of misses:  10639 | Miss rate: %50  # of misses:  10321 |
| **1024** | Miss rate: %97  # of misses: 20180 | Miss rate: %66  # of misses:  13690 | Miss rate: %54  # of misses:  11274 | Miss rate: %51  # of misses:  10639 | Miss rate: %50  # of misses:  10321 |
| **2048** | Miss rate: %97  # of misses: 20180 | Miss rate: %49  # of misses:  10080 | Miss rate: %44  # of misses:  9174 | Miss rate: %51  # of misses:  10639 | Miss rate: %50  # of misses:  10321 |

* **Graphs:**

1. **Fully Associative Caches**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Direct Mapped Caches** | **Fully Associative Caches (with LRU policy)** | **Fully Associative Caches (with Random policy)** |
| **Good Hit Rate**  **Cache Memory: 512 bytes**  **Block Size: 32 words** | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 |
| **Medium Hit Rate**  **Cache Memory: 512 bytes**  **Block Size: 2 words** | Miss rate: %73  # of misses: 15090 | Miss rate: %73  # of misses: 15090 | Miss rate: %67  # of misses: 13810 |
| **Poor Hit Rate**  **Cache Memory: 512 bytes**  **Block Size: 1 word** | Miss rate: %97  # of misses: 20180 | Miss rate: %97  # of misses: 20180 | Miss rate: %97  # of misses: 20179 |

1. **N-way Set Associative Caches**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **N = 2** | **N = 4** | **N = 8** | **N = 16** |
| **Cache Memory: 512 bytes**  **Block Size: 2 words** | Miss rate: %73  # of misses: 15090 | Miss rate: %73  # of misses: 15090 | Miss rate: %73  # of misses: 15090 | Miss rate: %73  # of misses: 15090 |
| **Cache Memory: 512 bytes**  **Block Size: 32 words** | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 | - | - |
| **Cache Memory: 2048 bytes**  **Block Size: 32 words** | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 | Miss rate: %50  # of misses: 10321 |
| **Cache Memory: 512 bytes**  **Block Size: 1 word** | Miss rate: %97  # of misses: 20180 | Miss rate: %97  # of misses: 20180 | Miss rate: %97  # of misses: 20180 | Miss rate: %97  # of misses: 20180 |

**FOR 50 INPUTS**

1. **Direct Mapped Caches**

* Row-major averaging, for 50 inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Block Size (words)** | | | | |
| **1** | **2** | **8** | **16** | **32** |
| **Cache Memory (bytes)** | **128** | Miss rate: %91  # of misses: 5179 | Miss rate: %45  # of misses:  2590 | Miss rate: %11  # of misses:  650 | Miss rate: %6  # of misses:  327 | Miss rate: %3  # of misses:  165 |
| **256** | Miss rate: %91  # of misses: 5179 | Miss rate: %45  # of misses:  2590 | Miss rate: %11  # of misses:  650 | Miss rate: %6  # of misses:  327 | Miss rate: %3  # of misses:  165 |
| **512** | Miss rate: %91  # of misses: 5179 | Miss rate: %45  # of misses:  2590 | Miss rate: %11  # of misses:  650 | Miss rate: %6  # of misses:  327 | Miss rate: %3  # of misses:  165 |
| **1024** | Miss rate: %91  # of misses: 5179 | Miss rate: %45  # of misses:  2590 | Miss rate: %11  # of misses:  650 | Miss rate: %6  # of misses:  327 | Miss rate: %3  # of misses:  165 |
| **2048** | Miss rate: %91  # of misses: 5179 | Miss rate: %45  # of misses:  2590 | Miss rate: %11  # of misses:  650 | Miss rate: %6  # of misses:  327 | Miss rate: %3  # of misses:  165 |

* Column-major averaging, for 50 inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | **Block Size (words)** | | | | |
| **1** | **2** | **8** | **16** | **32** |
| **Cache Memory (bytes)** | **128** | Miss rate: %91  # of misses: 5180 | Miss rate: %67  # of misses:  3840 | Miss rate: %50  # of misses:  2837 | Miss rate: %47  # of misses:  2671 | Miss rate: %45  # of misses:  2587 |
| **256** | Miss rate: %91  # of misses: 5180 | Miss rate: %61  # of misses:  3490 | Miss rate: %50  # of misses:  2837 | Miss rate: %47  # of misses:  2671 | Miss rate: %45  # of misses:  2587 |
| **512** | Miss rate: %91  # of misses: 5178 | Miss rate: %45  # of misses:  2589 | Miss rate: %50  # of misses:  2837 | Miss rate: %47  # of misses:  2671 | Miss rate: %45  # of misses:  2587 |
| **1024** | Miss rate: %90  # of misses: 5162 | Miss rate: %45  # of misses:  2581 | Miss rate: %33  # of misses:  1861 | Miss rate: %47  # of misses:  2671 | Miss rate: %45  # of misses:  2587 |
| **2048** | Miss rate: %90  # of misses: 5162 | Miss rate: %44  # of misses:  2537 | Miss rate: %23  # of misses:  1342 | Miss rate: %31  # of misses:  1784 | Miss rate: %45  # of misses:  2587 |

* **Graphs:**

1. **Fully Associative Caches**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Direct Mapped Caches** | **Fully Associative Caches (with LRU policy)** | **Fully Associative Caches (with Random policy)** |
| **Good Hit Rate**  **Cache Memory: 256 bytes**  **Block Size: 32 word** | Miss rate: %45  # of misses: 2587 | Miss rate: %45  # of misses: 2587 | Miss rate: %45  # of misses: 2587 |
| **Medium Hit Rate**  **Cache Memory: 256 bytes**  **Block Size: 2 words** | Miss rate: %61  # of misses: 3490 | Miss rate: %67  # of misses: 3840 | Miss rate: %61  # of misses: 3509 |
| **Poor Hit Rate**  **Cache Memory: 256 bytes**  **Block Size: 1 word** | Miss rate: %91  # of misses: 5180 | Miss rate: %91  # of misses: 5180 | Miss rate: %91  # of misses: 5180 |

1. **N-way Set Associative Caches**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **N = 2** | **N = 4** | **N = 8** | **N = 16** |
| **Cache Memory: 256 bytes**  **Block Size: 32 words** | Miss rate: %45  # of misses: 2587 | - | - | - |
| **Cache Memory: 1024 bytes**  **Block Size: 16 words** | Miss rate: %47  # of misses: 2671 | Miss rate: %47  # of misses: 2671 | Miss rate: %47  # of misses: 2671 | Miss rate: %47  # of misses: 2671 |
| **Cache Memory: 256 bytes**  **Block Size: 2 words** | Miss rate: %67  # of misses: 3840 | Miss rate: %67  # of misses: 3840 | Miss rate: %67  # of misses: 3840 | Miss rate: %67  # of misses: 3840 |
| **Cache Memory: 256 bytes**  **Block Size: 1 word** | Miss rate: %91  # of misses: 5180 | Miss rate: %91  # of misses: 5180 | Miss rate: %91  # of misses: 5180 | Miss rate: %91  # of misses: 5180 |