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For Process A, which is Read Row (by Row Major) there is 20480 page faults. Every time Process A reads in a row into the Page Table is causes a page fault. So after reading in the first 8 rows and causes 8 page faults, then by the LRU algorithm the first row page entry is replaced by the ninth row page entry and this causes a page fault. For every row it reads every column before going to the next row. Therefore after accessing 20480 rows there were 20480 page faults.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Row Major | | | | | | | |
|  |  |  |  |  |  |  | Page Table |
|  |  |  |  |  |  |  | Data |
|  | 0 |  | | | 4096 |  | Code |
|  | Row 1 | | | | |  | Row 1 |
|  | Row 2 | | | | |  | Row 2 |
|  | Row 3 | | | | |  | Row 3 |
|  | Row 4 | | | | |  | Row 4 |
|  | Row 5 | | | | |  | Row 5 |
|  | Row 6 | | | | |  | Row 6 |
|  | Row 7 | | | | |  | Row 7 |
|  | Row 8 | | | | |  | Row 8 |
|  | Row 9 | | | | |  |  |
|  | … | | | | |  |  |
|  | … | | | | |  |  |
|  | Row 20480 | | | | |  |  |
|  | 20480 |  |  |  |  |  |  |

FIGURE 1. Row Major

For Process B, which is Read Column (by Column Major) there is 20480 x 4096 = 83,886,080 page faults. In order for Process B to Read from the matrix in Column Major order, it must load an entire page for each row inside the column, causing a page fault, this is because C stores memory in Row major order. For every column read there are 20480 page faults drastically lowering the performance of the program.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Column Major | | | | | | | |
|  |  |  |  |  |  |  | Page Table |
|  | 0 |  | | | 4096 |  | Data |
|  | Column 1 | Column 2 | Column 3 | … | Column 4096 |  | Code |
|  |  | **Row 1** |  | | |  | Row 1 |
|  | **Row 2** |  | Row 2 |
|  | **Row 3** |  | Row 3 |
|  | **Row 4** |  | Row 4 |
|  |  | **Row 5** |  |  |  |  | Row 5 |
|  |  | **Row 6** |  | | |  | Row 6 |
|  | **Row 7** |  | Row 7 |
|  | **Row 8** |  | Row 8 |
|  | **Row 9** |  |  |
|  | **…** |  |  |
|  | **…** |  |  |
|  | **Row 20480** |  |  |
|  | 20480 |  |  |  |  |  |  |

FIGURE 2. Column Major

For process A and proccess B there was a total of 83,886,080 + 20480 =?? page faults. Even though there where 10 frames, this made no difference to the performance of the processes because the frames were never re utilized before they were evicted.