

Cas – Lab 02



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Exercise

- Write a program in 8086 assembly for multiplying two matrices whose elements are signed numbers expressed with one byte.
- First matrix has N rows and M columns.
- Second matrix has M rows and P columns.
- The result is a matrix with N rows and P columns. The matrix contains sign numbers expressed with one word.
- N , M , P are constants defined with `EQU` .

Matrix multiplication

- let a_{ik} the element at row i and column k in matrix A
- let b_{kj} the element at row k and column j in matrix B
- the product of the matrices A and B is a matrix C whose elements are:

$$c_{ij} = \sum_{k=1}^n a_{ik} b_{kj}$$

Example 1

$$N = 3, M = 4, P = 2$$

$$A = \begin{pmatrix} 4 & -3 & 5 & 1 \\ 3 & -5 & 0 & 11 \\ -5 & 12 & 4 & -5 \end{pmatrix}$$

$$B = \begin{pmatrix} -2 & 3 \\ 5 & -1 \\ 4 & 3 \\ 9 & -7 \end{pmatrix}$$

$$C = \begin{pmatrix} 6 & 23 \\ 68 & -63 \\ 41 & 20 \end{pmatrix}$$

Overflow management

- Overflow must be monitored.
- If the result after the overflow is positive, it must be replaced with the minimum negative number representable in one word (-32768).
- If the result after the overflow is negative, it must be replaced with the maximum positive number representable in one word (32767).

Example 2

$$N = 4, M = 7, P = 5$$

$$A = \begin{pmatrix} 3 & 14 & -15 & 9 & 26 & -53 & 5 \\ 89 & 79 & 3 & 23 & 84 & -6 & 26 \\ 43 & -3 & 83 & 27 & -9 & 50 & 28 \\ -88 & 41 & 97 & -103 & 69 & 39 & -9 \end{pmatrix}$$

Example 2 (cont.)

$$B = \begin{pmatrix} 37 & -101 & 0 & 58 & -20 \\ 9 & 74 & 94 & -4 & 59 \\ -23 & 90 & -78 & 16 & -4 \\ 0 & -62 & 86 & 20 & 89 \\ 9 & 86 & 28 & 0 & -34 \\ 82 & 5 & 34 & -21 & 1 \\ 70 & -67 & 9 & 82 & 14 \end{pmatrix}$$

Example 2 (cont.)

$$C = \begin{pmatrix} -3180 & 461 & 2231 & 1581 & 760 \\ 6019 & 1153 & 11552 & 7612 & 2418 \\ 5634 & -1169 & -2734 & 5620 & 1782 \\ -1929 & \mathbf{32767} & -9393 & -7333 & -7809 \end{pmatrix}$$

- c_{42} should be 33770, but it is replaced with the maximum positive number representable in one word (32767).