1 Multi-dimensional arrays in MIPS

1.1 Implementing multi-dimensional arrays

Ways of implementing multi-dimensional arrays

- Row major → Most widely used.
- Column major → Not widely used.

1.1.1 Row-major way

Consider this 2D array:

int array[3][4];

This is how the array looks like:

$$\begin{bmatrix} array[0][0] & array[0][1] & array[0][2] & array[0][3] \\ array[1][0] & array[1][1] & array[1][2] & array[1][3] \\ array[2][0] & array[2][1] & array[2][2] & array[2][3] \end{bmatrix}$$

This is how the array will look like in row-major form:

0	array[0][0]
1	array[0][1]
2	array[0][2]
3	array[0][3]
4	array[1][0]
5	array[1][1]
6	array[1][2]
7	array[1][3]
8	array[2][0]
9	array[2][1]
10	array[2][2]
11	array[2][3]

Table 1: Row-Major representation of matrix array

To access the values in the array, we will use the following formula:

$$addr = baseAddr + (rowIndex * colSize + colIndex) * dataSize$$

1.1.2 Column-major way

To access the values in the array, we will use the following formula:

$$addr = baseAddr + (colIndex * rowSize + rowIndex) * dataSize$$

The array in column-representation:

0	array[0][0]
1	array[1][0]
2	array[2][0]
3	array[0][1]
4	array[1][1]
5	array[2][1]
6	array[0][2]
7	array[1][2]
8	array[2][2]
9	array[0][3]
10	array[1][3]
11	array[2][3]

Table 2: Column-Major representation of matrix array