# DATA STRUCTURE

- FUNDAMENTALS OF DATA STRUCTURE PART 2

EMAN T.MAHDI
COLLEGE OF C.S. &I.T.

# OVER VIEW

- Arrays
- two dimension array
- Calculating The Address Of two dimension Array Elements

# TWO-DIMENSIONAL ARRAY

A TWO-DIMENSIONAL ARRAY CONSISTS OF BOTH ROWS AND COLUMNS OF ELEMENTS.

GENERAL 2D ARRAY DECLARATION STATEMENT:

**DATA-TYPE** ARRAY-NAME **[NUMBER-OF-ROWS][NUMBER-OF-COLUMNS]**;

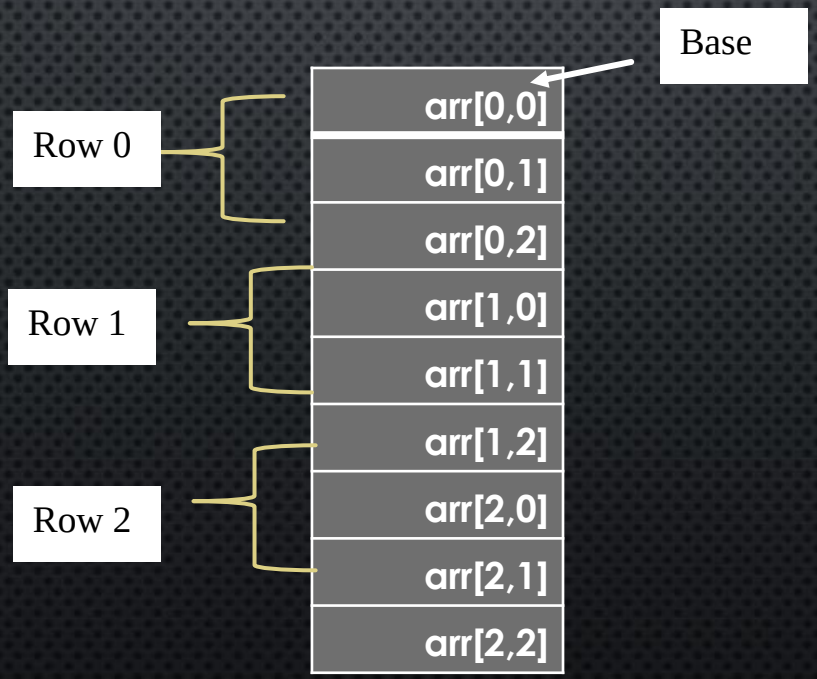
THE NUMBER-OF-ROWS AND NUMBER-OF-COLUMNS MUST BE SPECIFIED BEFORE DECLARING THE ARRAY.

```
int rows = 3;
int cols = 5;
float arr2D[rows][cols];
```

# TWO-DIMENSIONAL ARRAY

| arr2D[0,0] | arr2D[0,1] | arr2D[0,2] | arr2D[0,3] | arr2D[0,4] |
|---|---|---|---|---|
| arr2D[1,0] | arr2D[1,1] | arr2D[1,2] | arr2D[1,3] | arr2D[1,4] |
| arr2D[2,0] | arr2D[2,1] | arr2D[2,2] | arr2D[2,3] | arr2D[2,4] |

Dimensional reference to the linear representation. One method of representing a two-dimensional array in memory is the raw-major representation. Under this representation the first row of the array occupies the first set of memory locations reserved for the array, the second row occupies in next set, and so forth. Let us suppose that a two-dimensional integer array is stored in row-major sequence as in the figure below:



# Two-Dimensional Array

Two ways to represent 2D Array

- Row Wise Method :( Row by Row)

-Column Wise Method :( Column by Column)

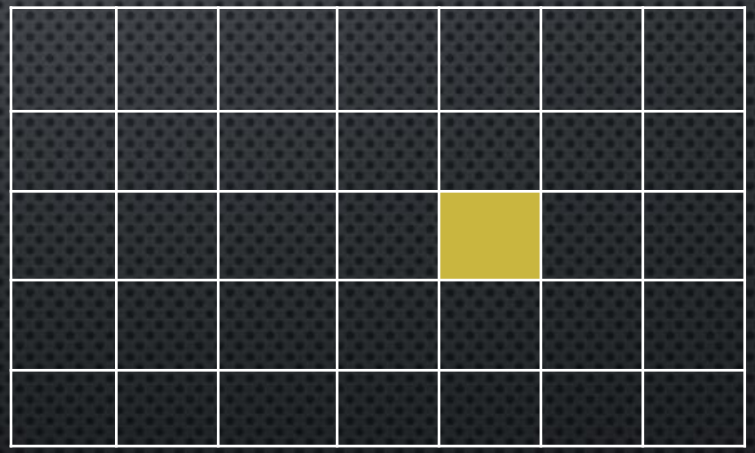
Let int A [M][N] we need two index I and J to arrive elements in the array

Where M= number of rows and N= number of columns

0 <= I < M, 0 <= J < N

N: number of columns

M: number Of rows



A [3][5]

# ROW -WISE METHOD

Location (aa [I][J]) = base address + [(N* I + j)*size

Base address: is the starting address

N: is the number of columns

EX.: LET A[6][8]; WHAT IS THE ADDRESS OF THE ELEMENT A[4][6]? IF THE BASE ADDRESS (BA=300), SUPPOSE THAT EACH ELEMENT OF THE ARRAY REQUIRES A SINGLE UNIT OF STORAGE

LOCATION (A [4][6])=BA+(4*8+6)*1

=300+38*1

=300+38

=338

EX.: LET INT A[6][8]; WHAT IS THE ADDRESS OF THE ELEMENT A[4][6]? IF THE BASE ADDRESS (BA=300).

LOCATION (A [4][6])=BA+(4*8+6)*2

=300+38*2

=300+76

=376

# Column -wise method

Location (A[I][J]) =Base Address + [(M *J +I)*size]

M: is the number of Rows

EX.: LET A [6][8]; WHAT IS THE ADDRESS OF THE ELEMENT A[4][6]? IF THE BASE ADDRESS (BA=300), SUPPOSE THAT EACH ELEMENT OF THE ARRAY REQUIRES A SINGLE UNIT OF STORAGE.

LOCATION (A [4][6])=BA+(6*6+4)*1

=300+40*1

=300+40

=340

# REFERENCES


- : Introduction to Algorithms, 3rd Edition by *Thomas H. Cormen ,Charles E. Leiserson, Ronald L. Rivest, Clifford Stein*
- Introduction to Algorithms, 3rd Edition by *Thomas H. Cormen ,Charles E. Leiserson, Ronald L. Rivest, Clifford Stein*
- Elements of Programming Interviews in Java: The Insiders' Guide, by *Adnan Aziz, Tsung-Hsien Lee, Amit Prakash*
- https://github.com/careermonk/DataStructuresAndAlgorithmsMadeEasy