TWO DIMENSIONAL ARRAYS

If the array has two subscripts then it is called two dimensional array or matrix. Two dimensional arrays are used in situation where a table of values needs to be stored. A 2D array is an array of 1-D arrays and can be visualized as a plane that has rows and columns.

Declaration

Two dimensional arrays must be declared before they are used so that the compiler can allocate space for them in memory.

Syntax for declaration

datatype array_name [row size] [col size];

- The data type specifies the array elements data type.
- rowsize indicates the size of row
- colsize indicates the size of column

Example

```
int matrix[5] [5];
char name[10] [20];  //  10 rows 20 columns
```

The above array declaration represents the array name is height, we can store a maximum of 10 elements and the array elements are floating point data type.

a

a[3][5]

[0][0]	[0][1]	[0][2]	[0][3]	[0][4]
[1][0]	[1][1]	[1][2]	[1][3]	[1][4]
[2][0]	[2][1]	[2][2]	[2][3]	[2][4]

Memory layout representation

Initialization

The array elements can be initialized when they are declared otherwise they will take garbage values.

Compile time initialization

Arrays can be initialized at compile time.

Syntax

datatype array_name [row size] [col size];= {value 0, value 1, . . . , value n-1};

The initialized values are specified within curly braces separated by commas.

Example:

int matrix[3][5] = { {2, 6, 7,8,9} , {10, -50, 3,5,6},{2,4,6,8,20} };

2	6	7	8	9
10	-50	3	5	6
2	4	6	8	20

Fig. 2.4: Memory Representation of 2D Array

Runtime initialization

Arrays can be initialized at run time.

Example:

```
int a[2][2];
scanf("%d%d",&a[0][0],&a[0][1],&a[1][0],&a[1][1]);
```

Program: Find the addition of two matrix

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[25][25],b[25][25], c[25][25], i, j m, n;
    clrscr();
    printf("\n Enter the rows and columns of two matrices… ");
    scanf("%d %d ", &m, &n)
    printf("\n Enter the elements of A matrix…");
    for(i=0;i<m;i++)
        for(j=0;j<n;j++)
            scanf("%d",&a[i][j]);
    printf("\n Enter the elements of B matrix…");
    for(i=0;i<m;i++)
        for(j=0;j<n;j++)
```

```
                scanf("%d", &b[i][j]);
        for(i=0;i<m;i++)
                for(j=0;j<n;j++)
                        c[i][j]=a[i][j] + b[i][j];
        printf("\n The addition of two matrices");
        for(i=0;i<m;i++)
        {
                printf("\n");
                for(j=0;j<n;j++)
                {
                        printf("\t %d",c[i][j]);
                }
        }
        getch();
}
```

Output:

Enter the rows and columns of two matrices…. 3 3

Enter the elements of A matrix

1	2	3
4	5	6
7	8	9

Enter the elements of B matrix

1	2	3
4	5	6
7	8	9

The addition of two matrixes

2	4	6
8	10	12
14	16	18