SLIIT

Discover Your Future

# IT1010 – Introduction to Programming

## Lecture 7 - Arrays

SLIIT
FACULTY OF COMPUTING

# Objectives

- At the end of the Lecture students should be able to
  - To define an array, initialize an array and refer to individual elements of an array.
  - To pass array to functions.
  - To define and manipulate multidimensional arrays.
  - To use string functions to handle character arrays.

# Introduction

- Array is a data structure which store the data items of the same data type.
- Array store all the data items in continuous memory locations.

| | |
|---|---|
| c[0] | -45 |
| c[1] | 6 |
| c[2] | 0 |
| c[3] | 72 |
| c[4] | 1543 |
| c[5] | -89 |
| c[6] | 0 |
| c[7] | 62 |

# Defining Arrays

- To define an array, we need to specify the type of data elements , name and the number of elements (size).

```
int c[8]
```

- The above definition reserves 8 elements for integer  array c.
- Array name, like other variables can contain only letters, digits and underscore and cannot begin with a digit.

# Using Arrays

- To refer to a particular location or element in the array, we need to specify array's name followed by the position number (index, subscript) of the particular element in square brackets.
- First element in the array is the zeroth element. Last element is size – 1.

c[0], c[1], c[2],c[3].....c[7]

# Using Arrays

- Print the first element in the array.

```
printf("%d", c[0]);
```

- Print the sum of first three elements in the array.

```
printf("%d", c[0] + c[1] + c[2]);
```

- Add 2 to the fifth element

```
c[4] += 2;
```

# Defining and initializing an array

```
//initializing the elements of an array to zeros
 # include <stdio.h>
int  main(void)
{
        int n[ 5 ]; // n is an array of 5 integers
        int i; // counter

        //initialize elements of array  n to 0
        for( i  = 0; i  < 5; ++i)
                n[ i ] = 0;

        printf("%s%13s\n",  "Element",  " Value");

        //output contents of array n in a tabular format
        for( i  = 0; i < 5; ++i)
                printf("%7d %13d\n", i , n[ i ]);
        return 0;
}
```

# Initializing array using an initializer list

```
/*initializing the elements of an array using an initializer list */
 # include <stdio.h>
int  main(void)
{
    int n[5] = {5, 12, 34, 56, 23};
    int i;
    printf("%s%13s\n",  "Element",  " Value");
    //output contents of array n in a tabular format
    for( i  = 0; i < 5; ++i)
                                printf("%7d %13d\n", i , n[ i ]);
      return 0;
}
```

# Initializing array using an initializer list

```
/*initializing the elements of an array to zero
# include <stdio.h>
int  main(void)
{
    int n[5] = { 0 };
    int  i;

    printf("%s%13s\n",  "Element",  " Value");

    //output contents of array n in a tabular format
    for( i  = 0; i < 5; ++i)
                        printf("%7d %13d\n", i , n[ i ]);
}
```

# Specifying an array's size with a symbolic constant

```
 # include <stdio.h>
# define SIZE 10
int  main(void)
{
        int a[ SIZE ];
        int  j; // counter

        for( j = 0; j   < SIZE; ++j)
                a[  j  ] = 2 + 2 * j;

        printf("%s%13s\n",  "Element",  " Value");

        for( j  = 0; j < SIZE; ++j)
                printf("%7d %13d\n", j , a[ j ]);
}
```

# Summing the Elements of an Array

```
# include <stdio.h>
# define SIZE 12
int  main(void)
{
        int a[ SIZE ] ;
        int i, j;
        int total = 0; // sum of array

        for( i = 0; i   < SIZE; ++i)
        {
                printf("\n a[%d] = ",i);
                scanf("%d", &a[ i ]);
        }
        for( j = 0; j   < SIZE; ++j)
                total += a[ j ];
        printf("Total of array elements is %d \n", total);
}
```

# Exercise 1

- Write a C program to the following.
  - Define an integer array *counts* with 10 elements.
  - Initialize all elements to zeros.
  - Read and store 10 numbers each of which is between 10 to 100.
  - Find the maximum number  from the stored numbers.

# Storing *strings* in character arrays

- A string can be stored in a character array as follows:

```
char  string1 [ ] = “first”;
```

```
char  string1 [ ] = {‘f’, ‘i’, ‘r’, ’s’, ’t’, ‘\0’};
```

```
scanf( “%19s”, string1);
```

- Function scanf will read characters until space, tab, newline or end-of-file indicator is encountered.

# Display character strings

- A character array representing a string can be printed as follows:

```
printf("string1 is : %s\n", string1);
```

```
for ( i= 0; i < SIZE && string1 [ i ] != '\0'; ++i){
        printf("%c", string1[ i ]);
}
```

# Function strcpy

- strcpy copy the entire string in array x into y

```
# include <stdio.h>
# include <string.h>
# define SIZE1 25
int main ( void )
{
      char x[ ]= “Happy Birthday to You”;
      char y[ SIZE1];

      strcpy( y , x );
      printf(“The string in array y is : %s\n”, y);
      return 0;
}
```

Output:  The string in array y is : Happy Birthday to You

# Function strlen

- strlen takes a string as an argument and return the number of characters in the string.

```
# include < stdio.h>
# include <string.h>
int main ( void )
{
      char string1[ ]= “I love C programming”;
      printf(“The length of string1 is %d”, strlen(string1));
return 0;
}
```

Output:  The length of string1 is 20

# Passing Arrays to Functions

- To pass an array argument to a function, specify the array's name without any brackets.

```
# include < stdio.h>
# define SIZE 5
void modifyArray(int b[ ], int size);

int main ( void )
{
      int a[ SIZE]  = { 0, 1, 2, 3, 4};
      modifyArray(a, SIZE);
      return 0;
}
```

```
void modifyArray( int b [  ], int size)
{
            int  j;
            // multiply each array element by 2
            for( j  = 0; j < size; ++j)
                        b[j] *= 2;
}
```

# Passing Arrays to Functions

```
# include <stdio.h>
# define SIZE 5
void modifyArray( int b[ ], int size);
int  main(void)
{
    int a[ SIZE ] = {0, 1, 2, 3, 4};
    int  i; // counter
    //output original array
    for( i = 0; i   < SIZE; ++i)
                printf("%3d", a[ i ]);
    puts(" ");
    modifyArray( a , SIZE);
    // output modified array
    for( i  = 0; i < SIZE; ++i)
                printf("%3d ", a[i ]);
}
```

Output

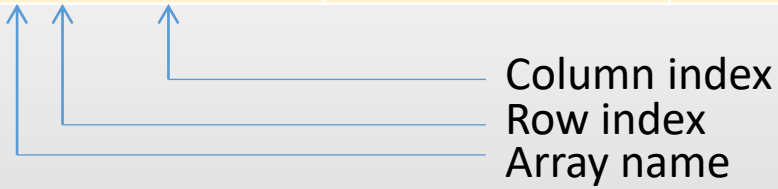
Original Array  : 0 1 2 3 4
Modified Array : 0 2 4 6 8

# Multidimensional Arrays

- C language have arrays with multiple subscripts.
- These arrays are referred as multidimensional arrays.
- Multidimensional arrays are used to represent table of values consisting of information arranged in rows and columns.
- An array with two subscripts is called **double-subscripted or Two-Dimensional** array.

# Two-Dimensional Array

| | Column 0 | Column 1 | Column 2 | Column 3 |
|---|---|---|---|---|
| Row 0 | a [ 0 ] [ 0 ] | a [ 0 ] [ 1 ] | a [ 0 ] [ 2 ] | a [ 0 ] [ 3 ] |
| Row 1 | a [ 1 ] [ 0 ] | a [ 1 ] [ 1 ] | a [ 1 ] [ 2 ] | a [ 1 ] [ 3 ] |
| Row 2 | a [ 2 ] [ 0 ] | a [ 2 ] [ 1 ] | a [ 2 ] [ 2 ] | a [ 2 ] [ 3 ] |



# Define and initialize 2D array

```
//initializing multidimensional arrays
 # include <stdio.h>
int  main(void)
{
    int array1[ 2 ][ 3 ] = { { 1, 2, 3},{4,5, 6}};
    int array2[ 2 ][ 3 ] = {  1, 2, 3, 4, 5};
    int array3[ 2 ][ 3 ] = {{1, 2}, {4}};
    int i, j;
    for( i  = 0; i  < =1; ++i){
                        for( j  = 0; j <= 2; ++j)
                            printf("%d\n", array1[i][j]);
            printf("\n");
     }
```

```
for( i  = 0; i  < =1; ++i){
            for( j  = 0; j <= 2; ++j)
                printf("%d\n", array2[i][j]);
            printf("\n");
        }
            for( i  = 0; i  < =1; ++i){
              for( j  = 0; j <= 2; ++j)
                printf("%d\n", array3[i][j]);
            printf("\n");
        }
return 0;
}
```

# Define and initialize 2D array

Values in array1 by row are:

1 2 3

4 5 6

Values in array2 by row are:

1 2 3

4 5 0

Values in array3 by row are:

1 2 0

4 0 0

# Summing the Elements of a 2D Array

```
# include <stdio.h>
# define SIZE 12
int  main(void)
{
     int row, column;
     int a[2][3];
     int total = 0;
    for( row  = 0; row  < =1; ++row){
                for( column  = 0; column <= 2; ++ column)
                {
                                printf("\na[ %d][%d ] = ", row, column);
                                scanf("%d",  &a[ row ][column ]);
                }
    }
                for( row  = 0; row  < =1; ++row)
                                for( column  = 0; column <= 2; ++ column)
                                                total += a [row] [column];
    }
    printf("The total of the elements of the array : %d", total);
  return 0;
}
```

# Summary

- Handling 1D arrays
- String manipulation
- Passing arrays to functions
- Handling 2D arrays