

Lecture 7

Composed or structured variable. One-dimensional and two-dimensional arrays in C/C++ languages

As we defined before (see lecture 2) a composed or structured variable represents named location in the memory of computer, where more than one value can be stored. There are different kinds of composed variables which are also called data structures. One of these kinds is an **array**.

In programming, an array is a composed variable or a data structure, which represents **named set of values** (also called elements or components) **of the same type**, located in the memory of computer **continuously one after one**. Arrays are very often used in programming for storing and processing data. In mathematics arrays are known as matrices and are used for solving different problems.

Usually in computer programming are used one-dimensional (1-D) and two-dimensional (two-dimensional) arrays (2-D). Dimension of an array depends on the number of integer values called indices (subscripts) used for determining the position of a given element and for accessing to the corresponding element. One subscript is used for indicating elements of 1-D array (vector) and two subscripts are used for elements of 2-D array (matrix). In mathematics 1-D arrays also called vectors represent special kind of matrices (2-D arrays) having only one line (row) or one column.

In C/C++ languages indices (subscripts) are enclosed in square brackets [] represented the indexation operator. In C/C++ languages values of subscripts start by 0.

Ex.: A[0] is the first element of an 1-D array named A;
B[3] is the forth element of an 1-D array named B;
C[2][3] is an element of the third row(line) and of the fourth column of an 2-D array named C;

Array declaration and initialization

The general form of an array declarations in C/C++ languages are following:
for 1-D array is **type name[size(length) of array or number of elements];**
and for 2-D array **type name[number of rows(lines)][number of columns];**

Ex.: int A[20];
float B[50];
char C[10][30];

Arrays can be initialized during declaration in such a way:

int A[5]={3,-5,6,7, 0};
float B[2][3]={ {3.2, 2.5, 0},{-5.3, 9, 47.55 } };
or float B[2][3]={ 3.2, 2.5, 0, -5.3, 9, 47.55 };

Usually initialization of arrays is effectuated in run time by different ways, for example by input elements from keyboard or from existing file or by using special random function(program) for generating elements of an array.

Array processing. Input arrays from keyboard and output arrays on the screen

Lets consider a program for input a given 1-D array from keyboard and output it on the screen:

```

#include<stdio.h>
#include <conio.h>
int main ( )
{
    int A[10];
    int n,i;
    clrscr();
    printf("Enter n: ");
    scanf("%d", &n);
    printf("Enter elements of array:\n");
    for(i=0;i<n;i++)
    {
        scanf("%d", &A[i]);
    }
    puts("Results:");
    printf("You entered array: \n");
    for (i=0;i<n;i++)
    {
        printf(" %d\t ", A[i]);
    }
    printf("\n");
    getch();
    return 0;
}

```

Exercise: Write a program for input 2-D array from keyboard and output it on the screen.

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