Arrays

SESSION 7

Objectives

- Explain array elements and indices
- Define an array
- Explain array handling in C
- Explain how an array is initialized
- Explain string / character arrays
- Explain two dimensional arrays
- Explain initialization of two dimensional arrays

Array Elements & Indices

- Each member of an array is identified by unique index or subscript assigned to it
- The dimension of an array is determined by the number of indices needed to uniquely identify each element
- An index is a positive integer enclosed in [ ] placed immediately after the array name
- An index holds integer values starting with zero
- An array with 11 elements will look like -

Player[0], Player[1], Player[2],…. Player[10]

Defining an Array

An array has some particular characteristics :

Storage Class

Data Types of the elements in the Array

Array Name

Array Size

An array is defined in the same way as a variable is defined.

Storage_Class   data_types   array_name[size]

Example: int Player[11];

Norms with Arrays

- All elements of an array are of the same type
- Each element of an array can be used wherever a variable is allowed or required
- Each element of an array can be referenced using a variable or an integer expression
- Arrays can have their data types like int, char, float or double

Array Handling in C – 1/2

- An array is treated differently from a variable in C
- Two arrays, even if they are of the same type and size cannot be tested for equality
- It is not possible to assign one array directly to another
- Values cannot be assigned to an array on the whole, instead values are assigned to the elements of the array

Array Handling in C – 2/2

```
int a[10];
int i, total, high;
for(i=0; i<10; i++) {
   printf("\n Enter value: %d: ", i+1);
   scanf("%d",&a[i]);
}
/* Displays highest of the entered values */
high = a[0];
for(i=1; i<10; i++) {
   if(a[i] > high) high = a[i];
}
printf("\nHighest value entered was %d", high);

/* prints average of values entered */
for(i=0,total=0; i<10; i++)
   total = total + a[i];
printf("\nThe average of the elements is %d",total/i);
```

Array Initialization

- Each element of an Automatic array needs to be initialized separately

```
char a[26];
int i, j;
for(i=65,j=0; i<91; i++,j++) {
  a[j] = i;
  printf("The character now assigned is %c \n", a[j]);
}
```

- In case of extern and static arrays, the elements are automatically initialized to zero

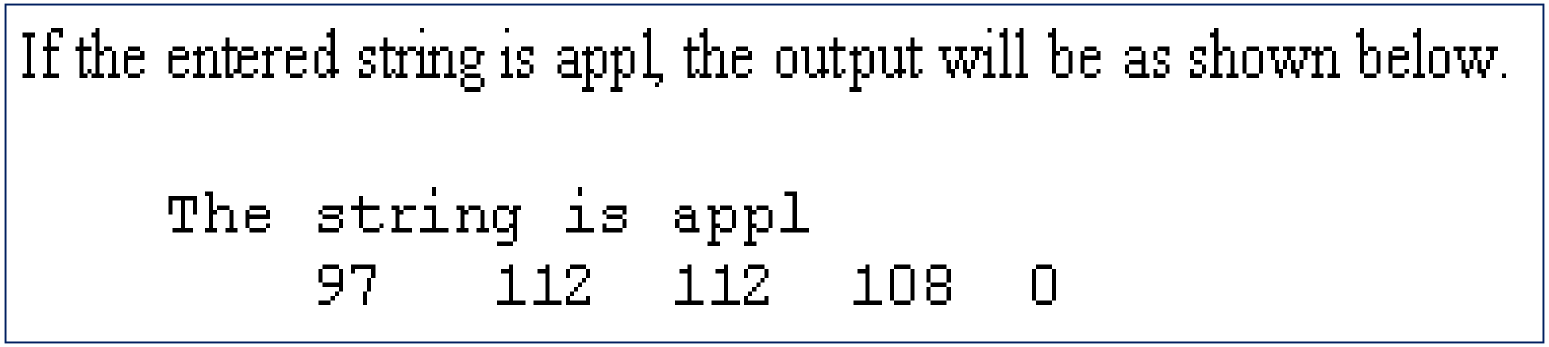
Strings /Character Arrays – 1/2

- A string can be defined as a character type array, which is terminated by a **null** character
- Each character in a string occupies one byte and the last character of a string is “\0” (Backslash zero)
- Example

```
char s[5];
int i;
printf("\n Enter string : ");
scanf("%s",s);
printf("\n The string is %s \n\n", s);
for (i=0; i<5; i++)
    printf("\t %d", s[i]);
```

Strings /Character Arrays – 2/2

Output -



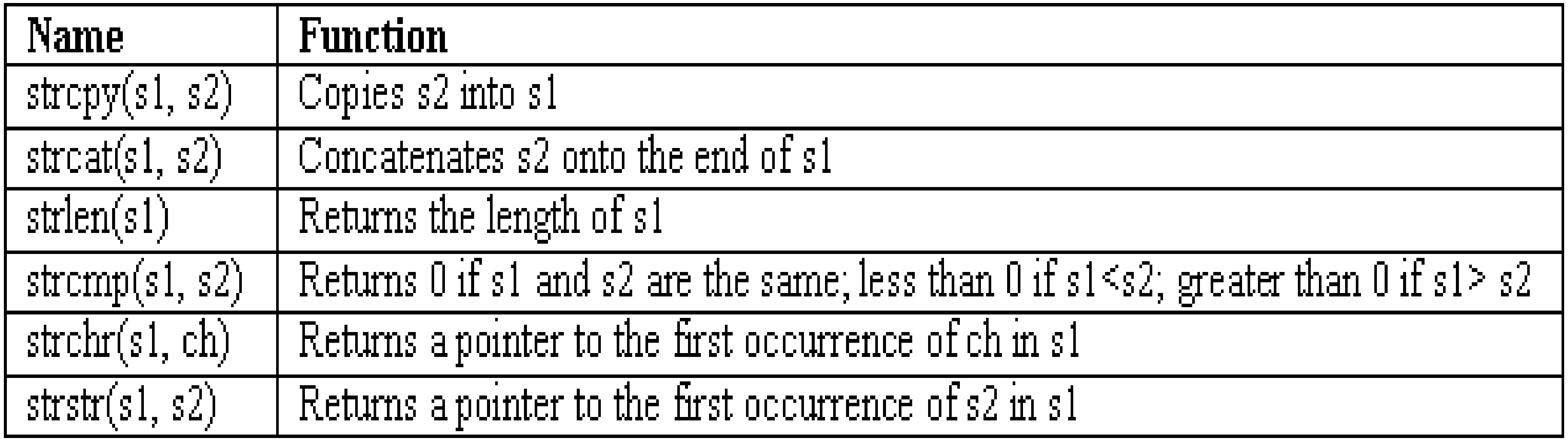
If the entered string is appl, the output will be as shown below.

```
     The string is appl
          97    112   112   108   0
```

The input for the above is of 4 characters and the 5th character is the null character

String Functions

Wide range of string functions, which are found in the standard header file <string.h>



Name	Function
strcpy(s1, s2)	Copies s2 into s1
strcat(s1, s2)	Concatenates s2 onto the end of s1
strlen(s1)	Returns the length of s1
strcmp(s1, s2)	Returns 0 if s1 and s2 are the same; less than 0 if s1<s2; greater than 0 if s1> s2
strchr(s1, ch)	Returns a pointer to the first occurrence of ch in s1
strstr(s1, s2)	Returns a pointer to the first occurrence of s2 in s1

Two-Dimensional Arrays

- The simplest and the most commonly used multi-dimensional array is the two-dimensional array
- A two-dimensional array can be thought of as an array of two single dimensional arrays
- A two-dimensional array looks like a railway time-table consisting of rows and columns
- A two–dimensional array is declared as -

```
int temp[4][3];
```

Initialization of Multidimensional Arrays -1/2

```
int ary[3][4] = {1,2,3,4,5,6,7,8,9,10,11,12};
```

The result of the above assignment will be as follows :

ary [0] [0] = 1	ary [0] [1] = 2	ary [0] [2] = 3	ary [0] [3] = 4
ary[1] [0] = 5	ary [1][1] = 6	ary [1] [2] = 7	ary [1][3] = 8
ary[2] [0] = 9	ary [2][1] = 10	ary [2] [2] = 11	ary [2][3] = 12

Initialization of Multidimensional Arrays -2/2

```
int ary[3][4]= { {1,2,3}, {4,5,6}, {7,8,3} };
```

The result of the assignment will be as follows :

```
ary[0][0] =1      ary[0][1]=2      ary[0][2]=3      ary[0][3]=0
ary[1][0]=4       ary[1][1]=5      ary[1][2]=6      ary[1][3]=0
ary[2][0]=7       ary[2][1]=8      ary[2][2]=3      ary[2][3]=0
```

A two - dimensional string array is declared in the following manner : **char str_ary[25][80];**

Two-Dimensional Array – 1/2

Example

```
#include <stdio.h>
#include <string.h>
void main ()   {
   int i, n = 0;
   int item;
   char x[10][12];
   char temp[12];

   printf("Enter each string on a separate line\n\n");
   printf("Type 'END' when over \n\n");

   /* read in the list of strings */
   do   {
      printf("String %d : ", n+1);
      scanf("%s", x[n]);
   } while (strcmp(x[n++], "END"));
```

contd...

Two-Dimensional Array – 2/2

Example

```
   /*reorder the list of strings */
   n = n - 1;
  for(item=0; item<n-1; ++item)   {
       /* find lowest of remaining strings */
   for(i=item+1; i<n; ++i)     {
           if(strcmp (x[item], x[i]) > 0) {
       /*interchange two strings */
        strcpy (temp, x[item]);
        strcpy (x[item], x[i]);
        strcpy (x[i], temp);
        }
   }
   }
   /* Display the arranged list of strings */
   printf("Recorded list of strings : \n");
   for(i = 0; i < n ; ++i)   {
   printf("\nString %d is %s", i+1, x[i]);
   }
```