04JCJLZ - COMPUTER SCIENCES - 2015/2016

Laboratory 8

Objectives

- Write programs that read and manipulate characters and strings

Technical content

- Using the printf format option *%s*
- Using the functions contained in *string.h* and *ctype.h*
- Using functions for string formatting
- Using matrixes

Preferably to be solved in the laboratory

Exercise 1. Write a program that:

a. Define an array of *char* and acquire a string from user to store in it
b. Parse this string answering the following questions
   i. How long is the string?
   ii. How many characters are alphabetic or numeric?

Insight: Acquire a second string to determine if it is contained in the first (for example: “support” includes “port”)

Exercise 2. Write a C program that can:

a. Acquire a string of up to N characters (with N defined as constant)
b. Manipulate the contents as follows:
   i. Transforming all lowercase letters to uppercase
   ii. Replacing all non-alphanumeric characters with the character ‘_’
   iii. Replacing the numerical characters with the character ‘*’
c. Scanning through the string manipulated to count how many words are present in it, considering one or more occurrences of the character ‘_’ as a separator between words.

Insight: Does the order in which the manipulations are performed affect the result? Check the answer by writing two versions of the program that manipulate the string in different ways.

Exercise 3. Write a program that acquires 2 strings corresponding to 2 times, each one expressed in the format *hh:mm*. The program must:

a. Check strings, indicating the cases in which the format is not respected (for example: 10,30 is not valid)
b. Determine whether the time in the first string precedes the time in the second string. In the positive case, do the following:
   i. Translate the 2 times into integer values corresponding to the distance in minutes from 00:00
   ii. Calculate the difference between the 2 values, convert the result (which will be a positive number) into a string as follows “<calculated interval>_minutes”, and print it to the screen.

To be solved at home

Exercise 4. Write a program that captures using the *gets* function a string of maximum 5 words separated by spaces, for a total of up to 60 characters. The program must:

a. Determine how many words are actually contained in the string
b. Calculate the average length of the words
c. Produce a statistic on the length of the words.

For example:

If the input string is "`this string contains five words`", the program will print on the screen:

```
The string contains 5 words
The average word length is 5.4 characters
The string contains
     2 words of 4 characters
     1 word of 5 characters
     1 word of 6 characters
     1 word of 8 characters
```

Instead, if the input string is "`this string is short`", then it will print on the screen:

```
The string contains 4 words
The average word length is 4.25 characters
The string contains
     1 word of 2 characters
     1 word of 4 characters
     1 word of 5 characters
     1 word of 6 characters
```

Exercise 5. Write a program that acquires 3 strings, each containing the name of a product and its price separated by a space. Once this information is stored into appropriate variables, the program receives an additional string containing the name of a product, and an integer value corresponding to a quantity.

The program must:

a. Determine whether the latest product introduced correspond to one of the products previously stored
b. In the negative case, request to insert another product name and quantity
c. In the positive case, calculate and print the total price by multiplying the quantity by the price of the product entered by the user.

Exercise 6. [1]Write a C program that captures sequences of characters from the keyboard, terminated by a new line. The program must continue to acquire sequences until it receives an EOF (*Ctrl-Z*). The program must then print the sequences as follows:

a. Replacing each sequence "ch" with the character 'k'
b. Replacing the double with a single character repetition

For example: rischio → riskio
cammello → camelo

Exercise 7. Write a C program that can:

a. Read a square matrix (5 rows by 5 columns) from the keyboard, loading the values by rows, or by column, at will
b. Find the contiguous sequences of 0s in the rows of the matrix, having a length greater or equal to 3, if any
c. Print the row index of such sequences.

For example: If the matrix is the following:

```
0 0 0 4 5
1 2 0 4 5
1 0 0 4 0
1 2 3 4 5
1 0 0 0 0
```

The sequence of values "0 0 0" is found in the first and in the last row, then the program should print:

```
The sequence is found in the row 0
The sequence is found in the row 5
```

Note that the third row does not contain the indicated sequence, due to the fact that the three 0s are not contiguous.

OPTIONAL

Perform the same search also in the matrix columns. In the previous example, a further message should be print:

```
The sequence is found in the column 2
```

OPTIONAL

Generalize the exercise in order to handle sequences of variable length and variable value. It details, the two parameters are acquired from the keyboard, and specify the length and the value of the sequence to find.

For example: using

Length of the sequence = 3
Value in the sequence = 0

the output should be the same of the previous exercise.

Instead, using:

Length of the sequence = 4
Value in the sequence = 1

The program should search sequences of values "1 1 1 1" in the matrix.

[1] This exercise will be solved using a multimedia format, and its solution will be provided in the course site during the following weeks.