BİL 102 – Computer Programming
HW 07

Last Submission Date: April 14, 2015 – 17:00

For Submission and/or Questions about the HomeWork #2 see Ar. Gör. Betül Türkkol (Room 108-Computer Vision Lab)

Do not use global and/or static variables. Do not change given prototypes of functions.

1. A) You will write a recursive function that finds and returns size of a string.
   int find_size(const char *string)
   B) Using the function above write a new function that finds how many times a given string is used in a given string.
   int char_number(const char *string, const char *wish_to_find)

2. Assume every Friday, you have to climb **n** stairs for C lab on the first floor. You can take your steps as follow: **One stair at a time** or **two stairs at a time**. You will write a complete C program to calculate in how many distinct ways you can climb to the top and to print it on the screen.

   For example: n=4 you can climb in **5** different ways as

   1 stair+1 stair+1stair+1stair
   OR
   1 stair+1 stair+2 stairs
   OR
   1 stair+2 stairs+1 stair
   OR
   2 stairs+1 stair+1 stair
   OR
   2 stairs+2 stairs

   To calculate ways you will use the sum of combinations of choice **"2 stairs"** in total steps. For example C(4,0)+C(3,1)+C(2,2) will be calculated for the case above.

   Your program will include at least two functions as following :
   - **int combination (int n , int k) :** a recursive function to calculate combination **"n choose k"** and returns the result.
   - **int ways (int n) :** write a recursive function to calculate and return total number of ways.

   Hint : Use following properties of combination
   - *C(n, k) = C(n, n-k)*
   - *C(n, 0) = C(n, n) = 1*
   - *C(n, k) = C(n-1, k-1) + C(n-1, k)*

3. You will write a complete C program to find a path on a grid maze with the following rules:

- You must stay in the grid
- You can follow **available**'s and **right_down**'s on your path
- You cannot use **notavailable**'s on your path
- When you are on an **available** position, you can go to either right or down if it is also **available**.
- A **notavailable** position means that coordinate is not available. You can not move to that position.
- When you are on a **right_down** position, you must go to right-down coordinate if it is **available** or it is a dead-end.

Your program should have at least 3 functions.

```
void read_table(FILE *input_file, Grid_t table[][COL_SIZE]);
void print_path(char path[][COL_SIZE], int n);
Bool find_path(Grid_t table[][COL_SIZE], char path[][COL_SIZE],
                    int size, int location_x, int location_y);
```

Some More Information About Program:

Grid Generation: An NxN table will be read from a file called table.txt.
Into an **NxN** array of **enumerated type** called **Grid_t**.

```
enum Grid_t{notavailable,available,right_down};
```

You are expected to write a recursive function to draw a path from first coordinate of the grid to the last coordinate.

```
Bool find_path(Grid table[][COL_SIZE], char path[][COL_SIZE],
                    int size, int location_x, int location_y)
```

Inputs of the function:

Grid table[][] : given NxN Grid array that you are asked to find a way on.

Char path[][] : an NxN char you will draw the path on this char array using "*"'s as shown in the example

int ROW_SIZE : row size of the input array

int location_x : x coordinate of your current location initially 0.

int location_y : y coordinate of your current location initially 0.

The function returns whether a path is found or not.

Example : Assume I am given the My_table below where 0 = notavailable; 1=available; 2=right_down. My path array would be as shown.

My_table

1	0	0	0	0
1	1	1	0	0
1	0	2	0	0
0	0	1	1	0
0	0	2	1	1

My_path

*				
*	*	*		
		*		
			*	
			*	*

General:

1. Obey honor code principles.
2. **Read your homework <u>carefully</u>** and follow the directives about the I/O format (data file names, file formats, etc.) and submission format **<u>strictly</u>**. Violating any of these directives will be penalized.
3. Obey coding convention.
4. Your submission should include the following files **<u>and NOTHING MORE</u>** (no data files, object files, etc):
   HW07_<student_name>_<studentSurname>_<student number>_part1.c
   HW07_<student_name>_<studentSurname>_<student number>_part2.c
   HW07_<student_name>_<studentSurname>_<student number>_part3.c
5. Do not use non-English characters in any part of your homework (in body, **file name**, etc.).
6. Deliver the printout of your work **until the last submission date**.