TP-5: Algorithms and Computational Thinking

Thursday, 17th October 2017

Implementing sorting algorithms

Objective : In this exercise, you will get a basic understanding of using lists and performing various operation on the lists. You will also implement a sorting algorithm to sort the items in the list.

Exercise 1

Alice wants to write a program to find the minimum number in a list. She writes the following piece of code.

```
x=[5,6,5,9,3,8,1,2] #Declares a list containing some elements
z=len(x)-1 #len(x) returns the length of a list
i=0
for i in range(z) :# Loop until the last element of a list
    if x[i]<x[i+1] : #If the current item is smaller then the next item
        y=x[i]
    else :
        y=x[i+1]
print(y)
```

Execute the above code and check the result. You will notice that the code is able to find the minimum number in the list. However, B wants to test the code and changes the list elements to x=[2,3,5,9,1,0,2,3], and the above program fails to find the minimum number. Your tasks are the following : **(You are free to choose any language of your choise)**

1. What is the bug in the above program ?. Change the above program such that it is able to find the minimum number in the list entered by B maintaining a linear complexity O(n).

2. Add functionality in the above program to find the maximum and also the average number of the list. In this case what is the complexity involved ? How can the complexity be reduced ?

Exercise 2

The books in the library of the "Ecole des Sciences Criminelles" are not in alphabetic order, and it is impossible to search through them.

Write a software that depending on the user input :

1. Asks the user for a new book
2. Orders the books in the list representing the library collection and prints the ordered list

Make sure to ask the user again for input after completing one task (use a while loop for example). Use the insertion algorithm learnt in class.

Use the following list as a starting point :

library = ["Traces de Souliers", "Algebre Lineaire", "Traces d'armes a feu", "Preuve par l'ADN", "Incendies et Explosions d'Atmosphere"]

Sample Output :
What should i do ? [add/sort] :
■ add
Enter book name :
■ Precis de droit penal
What should i do ? [add/sort] :
■ sort
["Algebre Lineaire", "Incendies et Explosions d'Atmosphere", "Precis de droit penal", "Preuve par l'ADN", "Traces d'armes a feu", "Traces de Souliers"]