Laboratory #3

Christian Fernando Ortiz Pulido

October 2018

1 Minimum number of inversions

The instance of an array A of size n that you want to order in increasing order that has the minimum number inversions, in other words equal to 0, is the array of the form A =(1, 2, 3, ..., n-2, n-1, n)

2 Maximum number of inversions

The instance of an array A of size n that you want to order in increasing order that has the minimum number inversions, in other words equal to n*(n-1)/2, is the array of the form A =(n, n-1, n-2, ..., 3, 2, 1)

3 Complexity (worst case number of comparisons) of the brute force counting on A

In the brute force algorithm, the worst-case complexity, when the array is of form A =(n, n-1, n-2, ..., 3, 2, 1), is O(n^2)

4 Complexity (worst case number of comparisons) of the divide an conquer (mergesort) counting on A

In the brute force algorithm, the worst-case complexity, when the array is of form A =(n, n-1, n-2, ..., 3, 2, 1), is O(n*log(n))

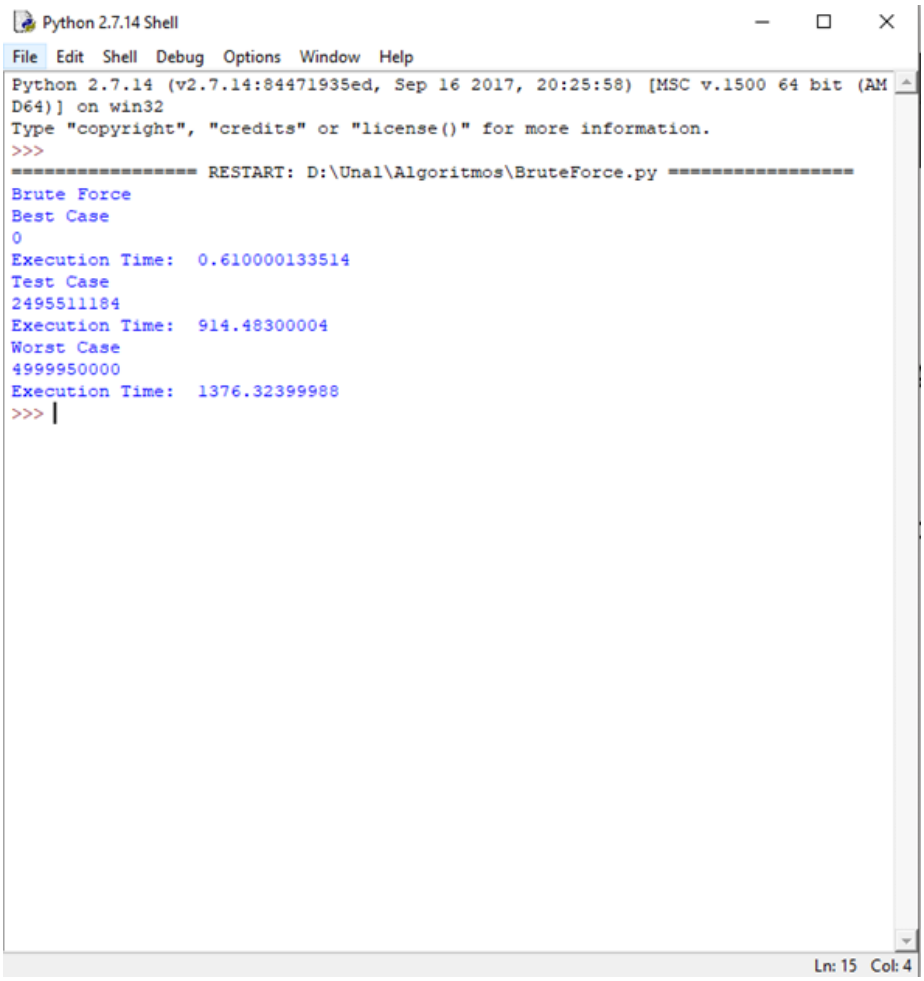
5 Run in your local machine the brute force and divide and conquer algorithms in Python 2.7 and calculate the time for the first 10^5 numbers of size instance from Hackearth input and output and for the 10^5 sorted increasing and decreasing numbers.

In the images you can see the number of swaps and the execution time in seconds. The respective codes are attached in txt format

Merge Sort


Python 2.7.14 Shell
File Edit Shell Debug Options Window Help
Python 2.7.14 (v2.7.14:84471935ed, Sep 16 2017, 20:25:58) [MSC v.1500 64 bit (AM
D64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: D:\Unal\Algoritmos\MergeSort.py ==========
Merge Sort Increasing
Best Case
0
Execution Time: 0.740000009537
Test Case
2495511184
Execution Time: 2.94900012016
Worst Case
4999950000
Execution Time: 0.869999885559
>>>
Ln: 15 Col: 4

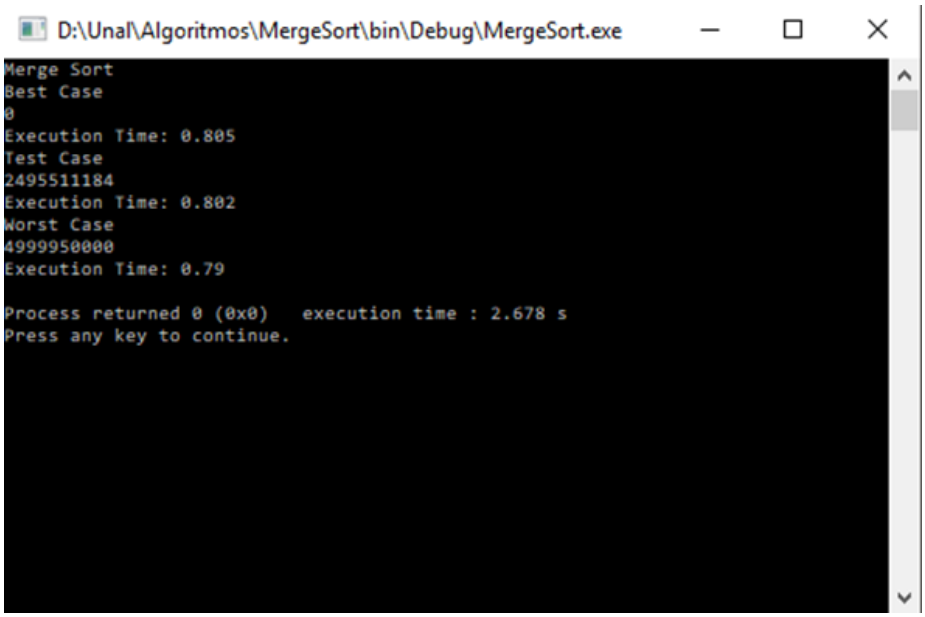
Brute Force



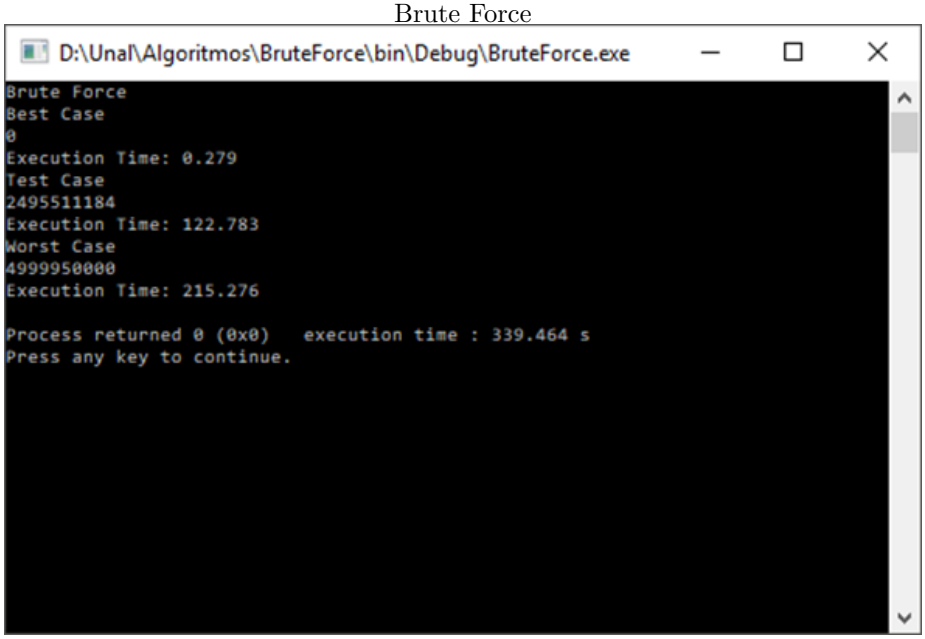
6 Run in your local machine the brute force and divide and conquer algorithms in C or C++ and calculate the time for the first 10^5 numbers of size instance from Hackearth input and output and for the 10^5 sorted increasing and decreasing numbers.

In the images you can see the number of swaps and the execution time in seconds. The respective codes are attached in txt format

Merge Sort


D:\Unal\Algoritmos\MergeSort\bin\Debug\MergeSort.exe
Merge Sort
Best Case
0
Execution Time: 0.805
Test Case
2495511184
Execution Time: 0.802
Worst Case
4999950000
Execution Time: 0.79
Process returned 0 (0x0)   execution time : 2.678 s
Press any key to continue.

Brute Force


D:\Unal\Algoritmos\BruteForce\bin\Debug\BruteForce.exe
Brute Force
Best Case
0
Execution Time: 0.279
Test Case
2495511184
Execution Time: 122.783
Worst Case
4999950000
Execution Time: 215.276
Process returned 0 (0x0)   execution time : 339.464 s
Press any key to continue.