

Algorithmics	Student information	Date	Number of session
	UO: 283928	03/14	Session 3
	Surname: Suárez Losada		
	Name: Gonzalo		

Activity 1. Tromino times

Measurements taken on a 16GiB ram PC whose CPU is an intel-i5 10400 @2.9GHz.

size	time (ms)
16	0
32	0
64	0
128	1
256	0
512	3
1024	11
2048	31
4096	90
8192	332
16384	1294

Analysis of the theoretical complexity:

This algorithm implements a Divide and Conquer strategy by division. As such, its complexity depends on three variables:

- a: amount of subproblems (4 in this case).
- b: reducing factor (2 as we are splitting by halves).
- k: complexity of the remaining method ($O(1)$).

Then, as $a > b^k$, complexity will be $O(n^{\log_b(a)}) = O(n^{\log_2(4)}) = O(n^2)$

Checking if the real measurements are close to theoretical values

$$N1 \rightarrow t1$$

$$N2 \rightarrow t2 = ?$$

$$\text{Then, } t2 = t1 * f(n2)/f(n1), \text{ being } f(n) = n^2$$

$$\text{Hence, } f2 = 4 * t1$$

For $n1 = 4096$:

$$T2 = 90 * (2048/1024)^2 = 360, \text{ which is really close to the real value}(336)$$

For $n2 = 332$:

$$T2 = 336 * (2048/1024)^2 = 1344, \text{ which is really close to the real value}(1294)$$

Then, we can conclude that the real complexity is very close to $O(n^2)$