

Computer Programming



Escola Tècnica
Superior d'Enginyeria
Informàtica

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|------------------|--|--------------------------|------------|
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| Type | <input checked="" type="checkbox"/> Individual | Stéphane Díaz-Alejo León | |
| | <input type="checkbox"/> In group | | |

Sections of deliverable

Doubts and questions (there should be three at least)

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Solution to the posed problem with explanation and comments. If the task was to summarize of a topic, it is mandatory an explanation with a schema. You can use more sheets of paper if it is not enough with the two pages of this one.

FACTORIAL:

The input size of the problem would be the integer n :

$$n \equiv n$$

The best critical instruction is the condition of the trivial case as it is going to be executed as many times as any other:

$$n > 1$$

The algorithm does not execute a different number of elementary operations depending on input data for the same size of the input.

So, $T(n)$ would be:

$$T(n) = 1 + T(n-1) = 2 + T(n-2) = \dots = n - 1 + T(1) = n + T(0) = n + 1$$
$$T(n) \in \Theta(n)$$

FIBONACCI:

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So, $T(n)$ would be:

$$T(n) = 1 + T(n-1) + T(n-2) = * = \left(\frac{1+\sqrt{5}}{2}\right)^n$$

$$T(n) \in \Theta(2^n)$$

$$* a) < 1 + 2 T(n-1)$$

$$b) > 1 + 2 T(n-2)$$

$$a) 1 + 2 + 2 T(n-2) = 2^0 + 2^1 + 2^2 + 2^3 T(n-3) = \dots = \sum_{i=0}^n 2^i = 2^{n+1} - 1$$

$$b) 1 + 2 + 2^2 T(n-2 * 2) = 2^0 + 2^1 + 2^2 + 2^3 T(n-2 * 3) = \dots = \sum_{i=0}^{n/2} 2^i = 2^{n/2+1} - 1$$

$$T(n) \simeq \Phi^n; \Phi \in]\sqrt{2}, 2[$$

$$\Phi^n = \Phi^{n-1} + \Phi^{n-2}$$

$$\Phi^2 = \Phi^1 + 1 \rightarrow x^2 - x - 1 = 0$$

$$x = \frac{1+\sqrt{5}}{2}$$