APA laboratory_01

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LaTeX

Subject: Algorithm analyzing

Purpose:

- Analiza empirică a algoritmilor.
- Analiza teoretică a algoritmilor.
- Determinarea complexităţii temporale şi asimptotice a algoritmilor

Conditions:

1. Efectuaţi analiza empirică a algoritmilor propuşi.
2. Determinaţi relaţia ce determină complexitatea temporală pentru aceşti algoritmi.
3. Determinaţi complexitatea asimptotică a algoritmilor.
4. Faceţi o concluzie asupra lucrării efectuate.

1 Recursive method

Algorithm 1: Recursive method

```
1 function fib1(n)
2     if n < 2 then
3         return n
4     else
5         return fib1(n - 1) + fib1(n - 2)
6
```

$$\text{T(n) - ?}$$

For line 2 and 3: O(1)
For line 5: T(n - 1) + T(n - 2)
So:
T(n) = 2, n < 2
T(n) = T(n - 1) + T(n - 2) + 3 ≈ T(n - 1) + T(n - 2), n ≥ 2

$$t_n - t_{n-1} - t_{n-2} = 0$$
$$x^2 - x - 1 = 0$$

$$\begin{bmatrix} x_1 = \frac{1-\sqrt{5}}{2} \\ x_2 = \frac{1+\sqrt{5}}{2} \end{bmatrix}$$

$$t_n = C_1(\tfrac{1-\sqrt{5}}{2})^n + C_2(\tfrac{1+\sqrt{5}}{2})^n$$

The fraction: $\frac{1+\sqrt{5}}{2}$ is also known as the *Golden Ratio* denoted as φ.
The most significant part of t_n is φ.

$$T(n) = O(\varphi^n)$$

2 Iterative method

3 Optimized iterative method