= CURS 9 =

Complexitate: măsuri de <u>complexitatea calculului</u>

Relații între clase.

P vs NP – reduceri

Complexitate: calculului

• Kolmogorov.

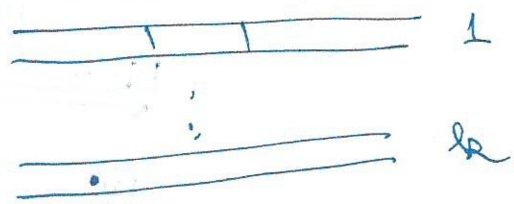
Descriptivă

Măsura timp (TIME)

spațiu (SPACE)

Modelul de MT: 1. MT se oprește

2. Are k benzi infinite la ambele capete



3. Poate staționa

Calcul $\underbrace{C(\underbrace{M}_{MT}, \underbrace{x}_{intrare})}_{} = \underbrace{C_1 C_2 \dots C_n}_{configurații}$.

$time(C(M,x)) = n$

$time_M(\underline{x}) = \max\{ time(C(M,x)) \mid C(M,x)$ calcul al lui $x \}$

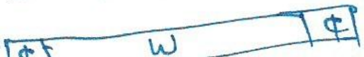
$time_M(\underline{n}) = \max\{ time_M(x) \mid \forall x$ a.î. $|x| = n \}$

$TIME_k(f(n)) = \{ L \mid \exists M$ o MT cu k benzi a.î. $L = L(M)$ și $time_M(n) \le f(n), \forall n \ge n_0 \}$

<u>Obs</u> ~~TIME~~$_k$ $f(n) \ge n+1$.

<u>SPACE</u>: Modelul: 1. MT se oprește

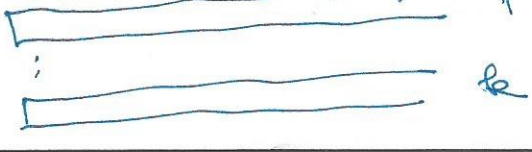
(off-line) 2. Are o bandă de intrare.



w intrare

disponibilă <u>doar</u> pentru citire

3.



citire/scriere

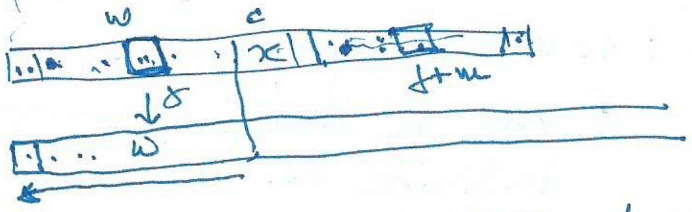
$c(M,x) = c_1 \dots c_n$.

$space(M,x)$ = cel mai mare număr de celule folosite pe o bandă auxiliară $(1-k)$ în calculul c.

$space_M(n) = \max\{space(M,x)\}$

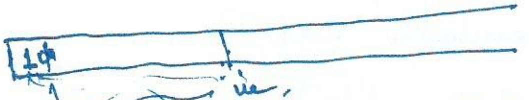
$SPACE_k(f(n)) = \{L \mid \exists\, M$ o MT cu k benzi, a.î. $L = L(M)$ și $space_M(n) \le f(n)\ \forall n \geq n_0\}$

Ex. $\underbrace{L = \{wcw \mid w \in \{a,b\}^+\}}_{n}$

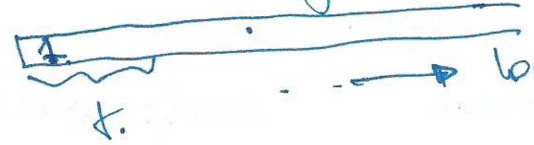


n/2

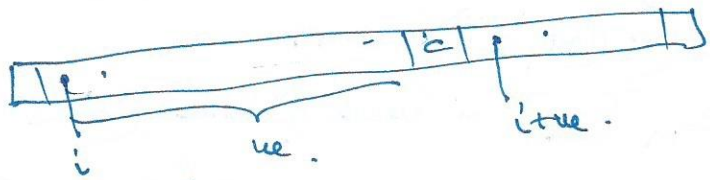
log n. 1,2 p.



în binar lungimea prefixului până la c.



→ log n.



! $O(f(n)) = O(cf(n))$!

Eliminarea constantelor

T $(D)(N)\ SPACE_k(f(n)) = (D)(N)\ SPACE_k(c\,f(n))$

$\forall c > 0$

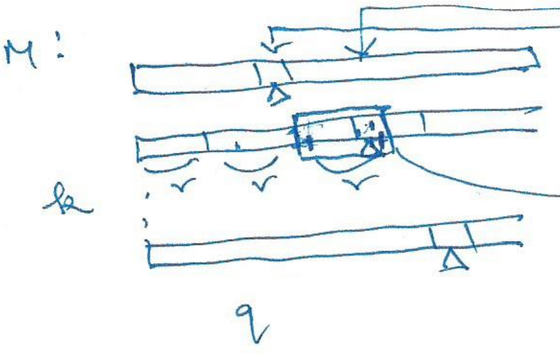
Dem Aleg N. Este suficient să dem.

(*) $\boxed{NSPACE_k(f(n)) \subseteq NSPACE_k(c\,f(n)) \quad 0 < c < 1}$

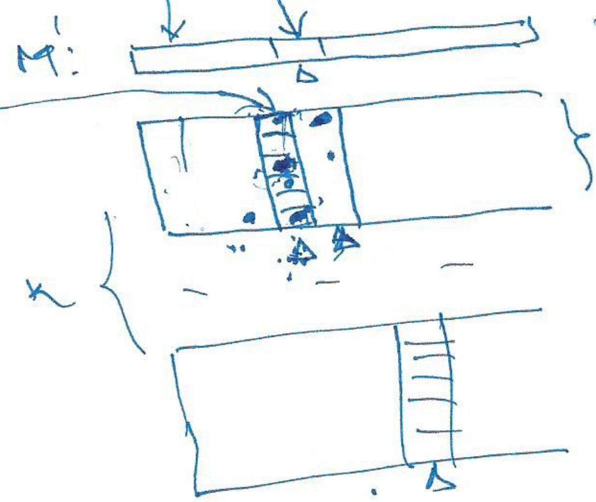
$c \geq 1 \quad NSPACE_k(f(n)) \subseteq NSPACE_k(c\,f(n))$

$0 < c < 1$

Dem. M a.î. $space_M(n) \le f(n) \leadsto M'$ a.î. $space_{M'}(n) \le c f(n)$ & $L(M) = L(M')$.



Aleg r a.î. $rc \ge 2$



$$space_{M'}(n) \le \left\lceil \frac{space_M(n)}{r} \right\rceil \le \frac{space_M(n)}{r} + 1 \le$$

$$\frac{c}{2} \cdot space_M(n) + 1 \le c\, space_M(n) \quad q$$

$$1 \le \frac{c}{2}\, space_M(n)$$

$rc \ge 2 \Rightarrow c \ge \frac{2}{r} \Rightarrow \frac{1}{r} \le \frac{c}{2}$

Dacă $1 \le \frac{c}{2}\, space_M(n)$

$$\frac{c}{2} \cdot f(n) + 1 \le c f(n) \iff 1 \le \frac{c}{2} f(n)$$

Dacă $1 \le \frac{c}{2} f(n)$ am terminat

Dacă $\cancel{2 \le c f(n)}$ $1 > \frac{c}{2} f(n) \Rightarrow f(n) < \left\lceil \frac{2}{c} \right\rceil$.

M' va conține k benzi a.î. spațiul său este mărginit de 1.

$f(n) < f'(n)$

$\longrightarrow f(n)$.

$\longrightarrow f'(n)$.