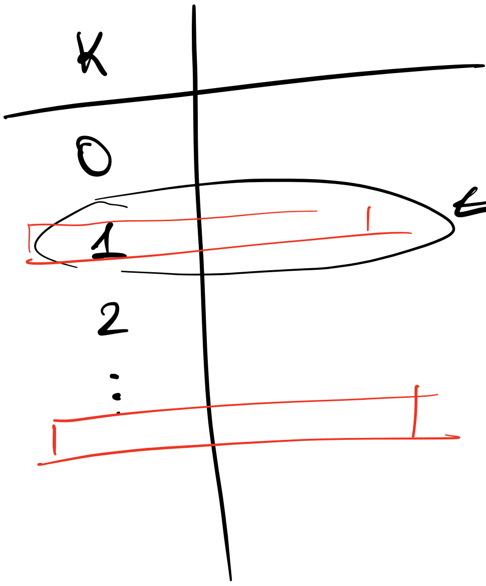
STRUTTURA DI CLARK PER LA SELECT



posizione del k-esimo 1

$t = \#$ uni in $\underline{b}$

I LIVELLO

$P_0, P_1, P_2, \dots, P_{\frac{t}{\log n \log\log n}}$

Memorizzo solo gli uni in posizione multipla di

$\log n \log\log n$

SPAZIO

$\le n$

$$\frac{t}{\log n \log\log n} \log n \le \frac{n}{\cancel{\log n} \log\log n} \cancel{\log n} =$$

$$= \frac{n}{\log\log n} = o(n)$$

$7 = \log n \log\log n$

II LIVELLO

$21°$ $\qquad$ $28°$

P_i $\qquad$ P_{i+1}

1531, $\qquad$ 1834

Chiamo

$r_i = P_{i+1} - P_i \ge \log n \log\log n$

$\boxed{\text{CASO II A}}$ $\quad r_i \geq (\log n \log\log n)^2$

(SPARSO)

Memorizziamo esplicitamente le posizioni dei $\log n \log\log n$ uni intermedi, come offset da P_i.

$\boxed{\text{SPAZIO}}$

$$(\log n \log\log n) \log r_i \leq$$

moltiplico e divido per $\lg n \lg\lg n$

$$\leq \frac{(\log n \log\log n)^2 \log r_i}{\log n \log\log n} \leq$$

$r_i \leq n$

$$\leq \frac{r_i \log r_i}{\log n \log\log n} \leq$$

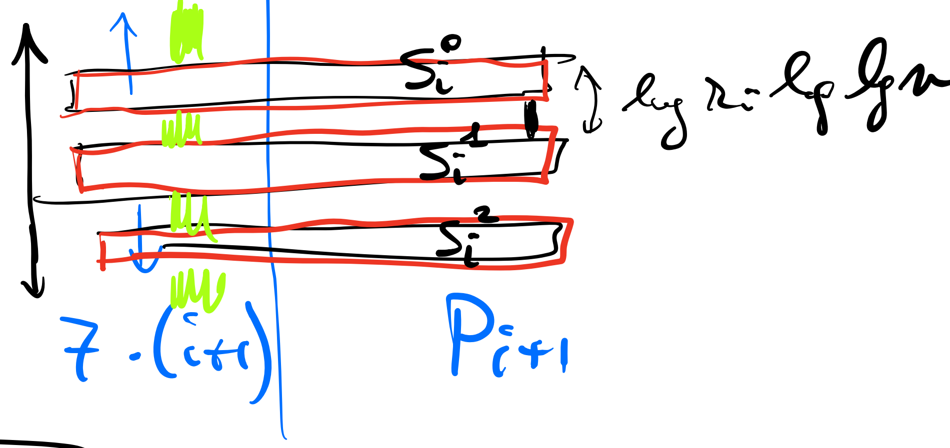
$$\leq \frac{r_i \cancel{\log n}}{\cancel{\log n} \log\log n} = \frac{r_i}{\log\log n}$$

$\boxed{\text{CASO II B}}$ $\quad r_i < (\log n \log\log n)^2$

Memorizziamo solo le posizioni multiple di $\log r_i \log\log n$ come offset da P_i

$7 \cdot i \mid P_i$

$\log n \log\log n$



$\boxed{\text{SPAZIO}}$

$$\frac{\overbrace{\log n \log\log n}^{\le r_i}}{\cancel{\log r_i}\,\log\log n}\,\cancel{\log r_i} \le$$

$$\le \frac{r_i}{\log\log n}$$

P_i ________ P_{i+1}

$$\le \frac{r_i}{\log\log n} = \frac{P_{i+1}-P_i}{\log\log n}$$

BIT CHE SERVONO NEI CASI IIA E IIB

$$\le \sum_{i=0}^{\frac{t}{\log n \log\log n}-1} \frac{P_{i+1}-P_i}{\log\log n} = \text{somma telescopica}$$

$$= \frac{P_{\frac{t}{\log n \log\log n}} - P_0}{\log\log n} \le \frac{M}{\log\log n} =$$

$= o(n)$

$r_i < (\log n \log\log n)^2$

III LIVELLO
SOLO PER IL CASO II B

Se siamo tra p_i e p_{i+1},
ma $r_i < (\log n \log\log n)^2$,
abbiamo memorizzato esplicitamente solo le posizioni

$S_i^0, S_i^1, \dots S_i^{\frac{\log n \log\log n}{\log r_i \log\log n}}$

multiple di $\log r_i \log\log n$

$$S_i^j \qquad\qquad S_i^{j+1}$$

$$\overline{r_i^j} = S_i^{j+1} - S_i^j$$

1) $\overline{r_i^j} \geq \log r_i \log\log n$

2) $\overline{r_i^j} \leq r_i < (\log n \log\log n)^2$

CASO III A

$\overline{r_i^j} \geq \log \overline{r_i^j} \log r_i$

$(\log\log n)^2$

(SPARSO)

Memorizziamo esplicitamente le posizioni intermedie come offset da S_i

$\boxed{\text{SPAZIO}}$

$$\left(\log r_i \log\log n\right) \log \overline{r_i^j} =$$

$$= \frac{\log r_i (\log\log n)^2 \log \overline{r_i^j}}{\log\log n}$$

moltiplico e divido per $\log\log n$

$$\leq \frac{\overline{r_i^j}}{\log\log n}$$

$\boxed{\text{CASO III B}}$ $\underbrace{\overline{r_i^j} < \log \overline{r_i^j} \log r_i (\log\log n)^2}$

Si usa il Four-Russians Trick.

S_i S_j

<u>Oss. 1</u>: $\log \overline{r_i^j} \leq \log r_i \leq$

$$\leq \log\left(\log n \,(\log\log n)^2\right) =$$

$$= 2\log\log n + 2\log\log\log n$$

$$\leq 4\log\log n$$

<u>Oss. 2</u>: $\overline{r}_i^j < \underbrace{\log \overline{r}_i^j}_{\leq 4\log\log n} \, \underbrace{\log r_i}_{\leq 4\log\log n} (\log\log n)^2$

$$\leq 16(\log\log n)^2(\log\log n)^2$$

$$= 16(\log\log n)^4$$

Four - Russians Trick

$$\overline{r}_i^j$$

$$\leq \underbrace{2}_{n^\circ \text{ tabelle}} \; \underbrace{\overline{r}_i^j}_{\text{righe}} \; \underbrace{\log \overline{r}_i^j}_{\substack{n^\circ \text{ bit} \\ \text{per valore}}} \leq$$

$$\overset{\text{Oss. 2}}{\leq} \underbrace{2^{16(\log\log n)^4}} \cdot 16(\log\log n)^4 \log\left(16(\log\log n)^4\right) =$$

$$= 2^{16}(\log n)^4 \cdot 16(\log\log n)^4 \log\left(16(\log\log n)^4\right)$$

$= o(n)$