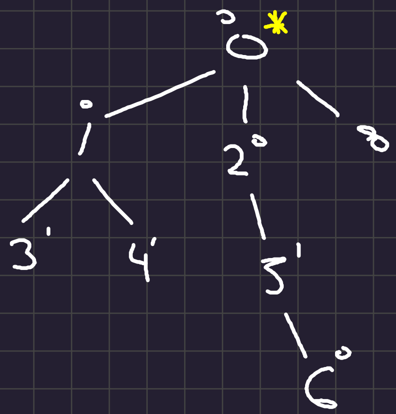
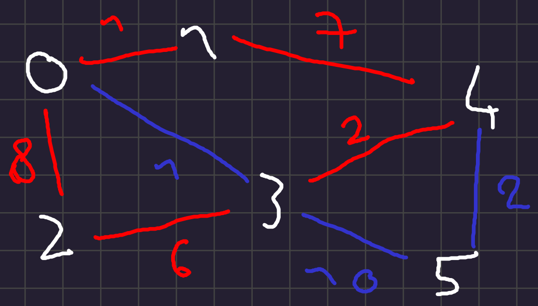
FAEDO (JOI SPRING CAMP 2014/15)



TERZANI JOI 19 SPRING CAMP



CASA

~~0,0~~

RIN

~~0,0~~

31·2

$N \cdot 31 \cdot 2 \sim N = 900$

CASA

~~1,1~~

2,8

$\boxed{4,7}$

~~4,3~~

7

RIN

~~3,1~~

5,11

$\boxed{5,9}$

2

5

$N[(20 \cdot 2) + 11]$

$N[20 \cdot 2 + 11]$

$N \leq 1100$

$N[9 \cdot 2 + 11] = 5$

$= 58000$

CARDUCCI - BOI 22 COMMUNICATION

- $N = 3$ — 3 stringhe tali che nessuna stringa S sia raggiungibile da tutte e tre

0000
1111
0110
1001

1° modo:

Divido il range in 4 range uguali:

$4\lceil \log_2 N \rceil$ bit $= 120$ bit

2° modo:

Corrompo una stringa lunga K:

- o corrompo il primo bit $\Rightarrow$ Corrompo i restanti $k-2$
- o non lo corrompo $\Rightarrow$ Corrompo i restanti $k-1$

Sono $F_n \sim \left(\frac{1+\sqrt{5}}{2}\right)^n \ll 2^n$

In particolare con $k=4$ ho 8 modi di essere corrotto e 16 messaggi inviabili.

Quindi separo il messaggio in pacchetti da 4:

- i primi 3 bit comunicano com'è stato rotto il pacchetto precedente
- il quarto passa un bit.

Devo inviare 3 bit x, y, z e mando

$xyzx$

$4 + 4(26) + 4 + 4 = 116$

<u>Soluzione</u>

C = valori possibili assumendo ultimo bit giusto
W = " sbagliato

Scelgo I_c, I_w, D_c, D_w in modo tale che
invio 1 se e solo se

$$X \in I_c \cup I_w$$

Se ricevo 1:

$$\bar{C} = I_c \cup I_w$$
$$\bar{W} = D_c$$

Se ricevo 0:

$$\bar{C} = D_c \cup D_w$$
$$\bar{W} = I_c$$

$$|I_c| = \lceil C/2 \rceil \qquad |I_w| = \lfloor W/2 \rfloor$$

C 

FERMI   Egoi24   day1 D

1 1 0 0 1 0

1 2 0 4 3 5

5 4 3 2 1 0

a b

a b⊕a

b b⊕a

→ b a

1 2 3 4 5 0   1 2 3 4 5 0

→ 2 3 4 5 0 1

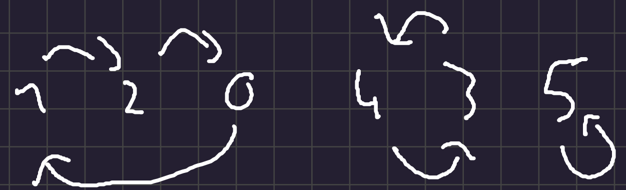
1	1	1	1	1	1
	2	2	2	2	2
		3	3	3	3
			4	4	4
				5	5
					0

1
~~2~~
~~3~~
~~4~~
~~5~~
~~0~~

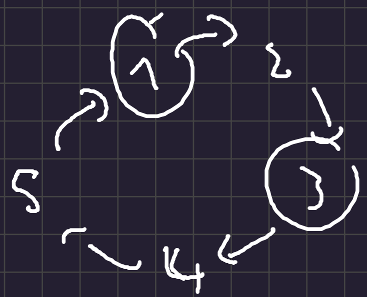
1 2 3 4 5 0

1 1 2 3 4 5
2 3 4 5 0

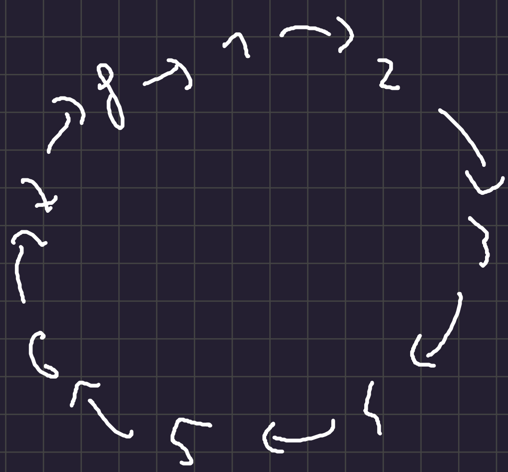
0 1 2 3 4 5
ø ø ø ø ø

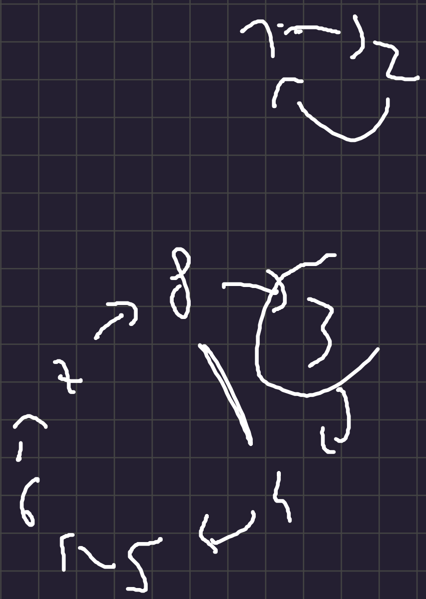


$3 \cdot \lceil \log M \rceil$



w = 6





w = 5 ~ 95 point

Matrici permutazione

$$P = \begin{pmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} x_3 \\ \vdots \\ \vdots \end{pmatrix}$$

Matrici triangolari

SUPERIORE

$$U = \begin{pmatrix} 1 & 0 & 0 & 1 \\ & 1 & 1 & 1 \\ & & 1 & 0 \\ & & & 1 \end{pmatrix} \qquad L = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} \cdot \\ \cdot \\ \cdot \end{pmatrix}$$

$$f : x \mapsto Lx$$

Decomposizione LU

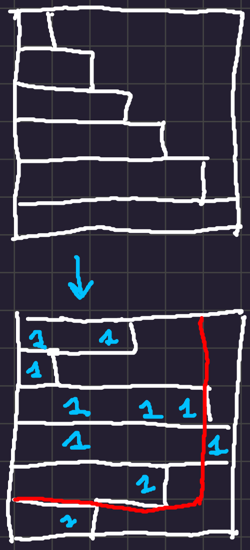
$$\begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \end{pmatrix} \rightsquigarrow \begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix} \rightsquigarrow \begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \end{pmatrix}$$

$$\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} R_0 \\ R_1 \\ R_2 \\ R_3 \end{pmatrix} \rightsquigarrow \begin{pmatrix} R_0 \\ R_1 \\ R_1 \oplus R_2 \\ R_3 \end{pmatrix}$$

$$\boxed{P}A = \boxed{L}\boxed{U} \qquad P = L_2 \cdot U \cdot L_1$$

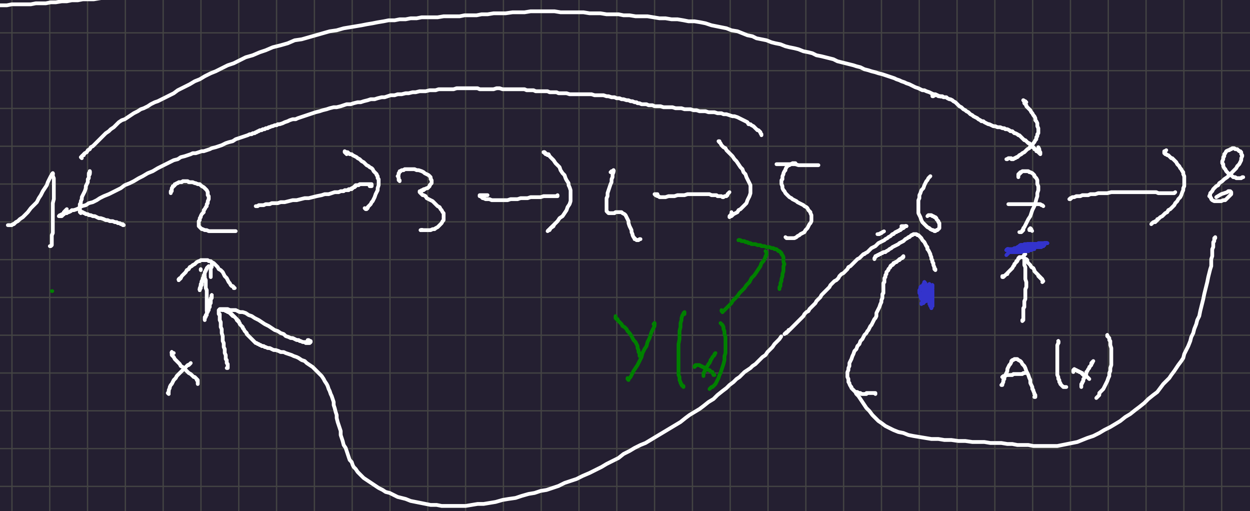
$$P = L \cdot U \cdot A^{-1}$$

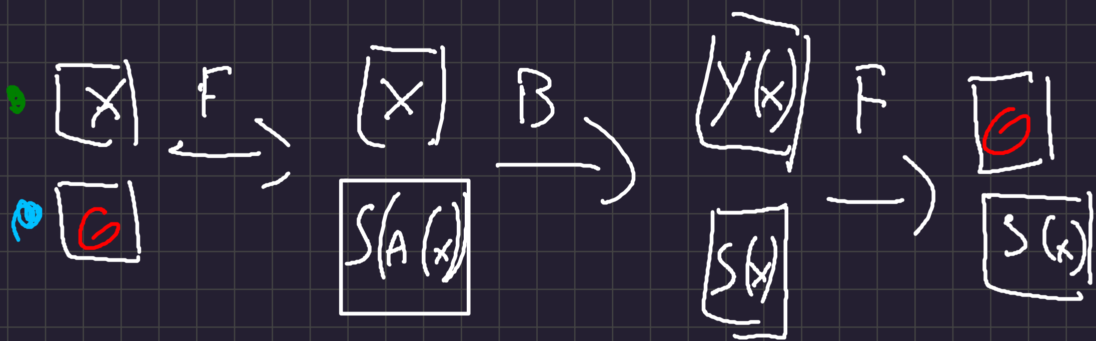


A

PA

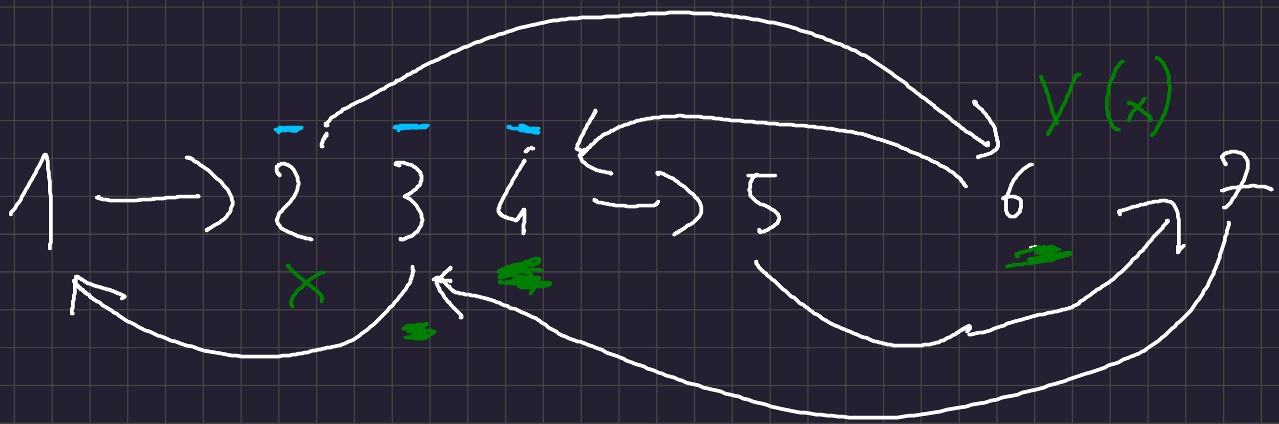
$$\left(A \;\middle|\; I \right) \rightsquigarrow \left(I \;\middle|\; A^{-1} \right)$$





$x \to S(x)$ $\qquad$ $T(x) \to x$

$b[x] = \bullet \text{ XOR } \bullet$



$y(T(x))$

x

$\underline{T(x)}$

$T(y(T(x)))$

$\vdots$

$\boxed{x}$ $\boxed{S(A(x))}$ $\xrightarrow{B}$ $\boxed{y(x)}$ $\boxed{S(x)}$

$y(x)$

$y(A(x))$

$A(x)$

$T(y(A(x)))$

$T(y(T(y(A(x)))))$