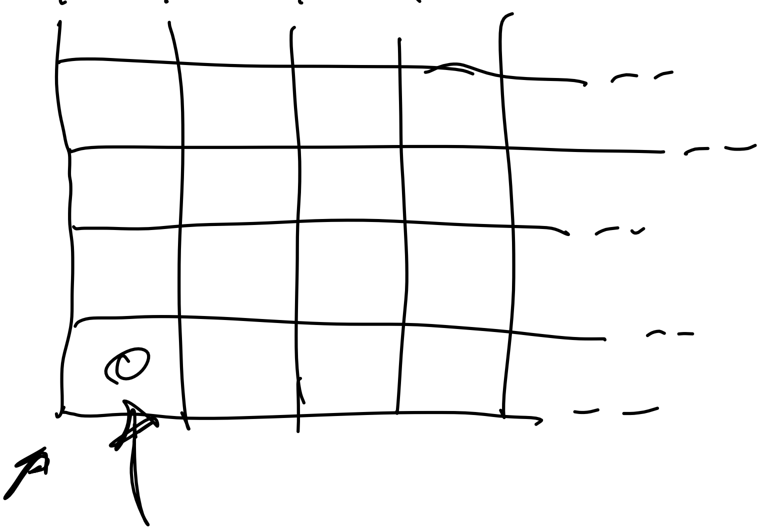
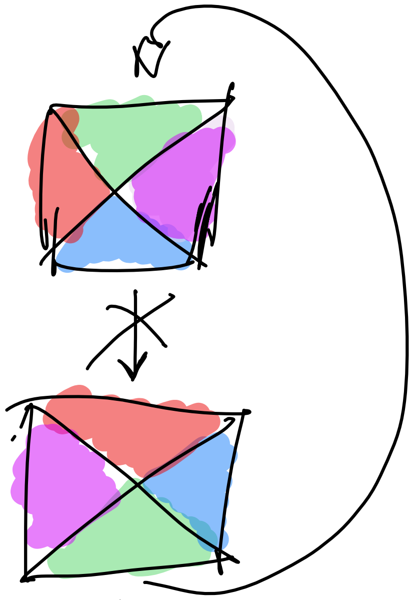
TILING





d_0

INPUT: $T = (D, d_0, H, V)$

D: un insieme finito di tipi di piastrelle

$d_0 \in D$: è il tipo di piastrella ammessa in posizione $(0,0)$

$H \subseteq D \times D$: (regole di affiancamento orizzontale)

$V \subseteq D \times D$: (regole di affiancamento verticale)

$f : \mathbb{N} \times \mathbb{N} \to D$

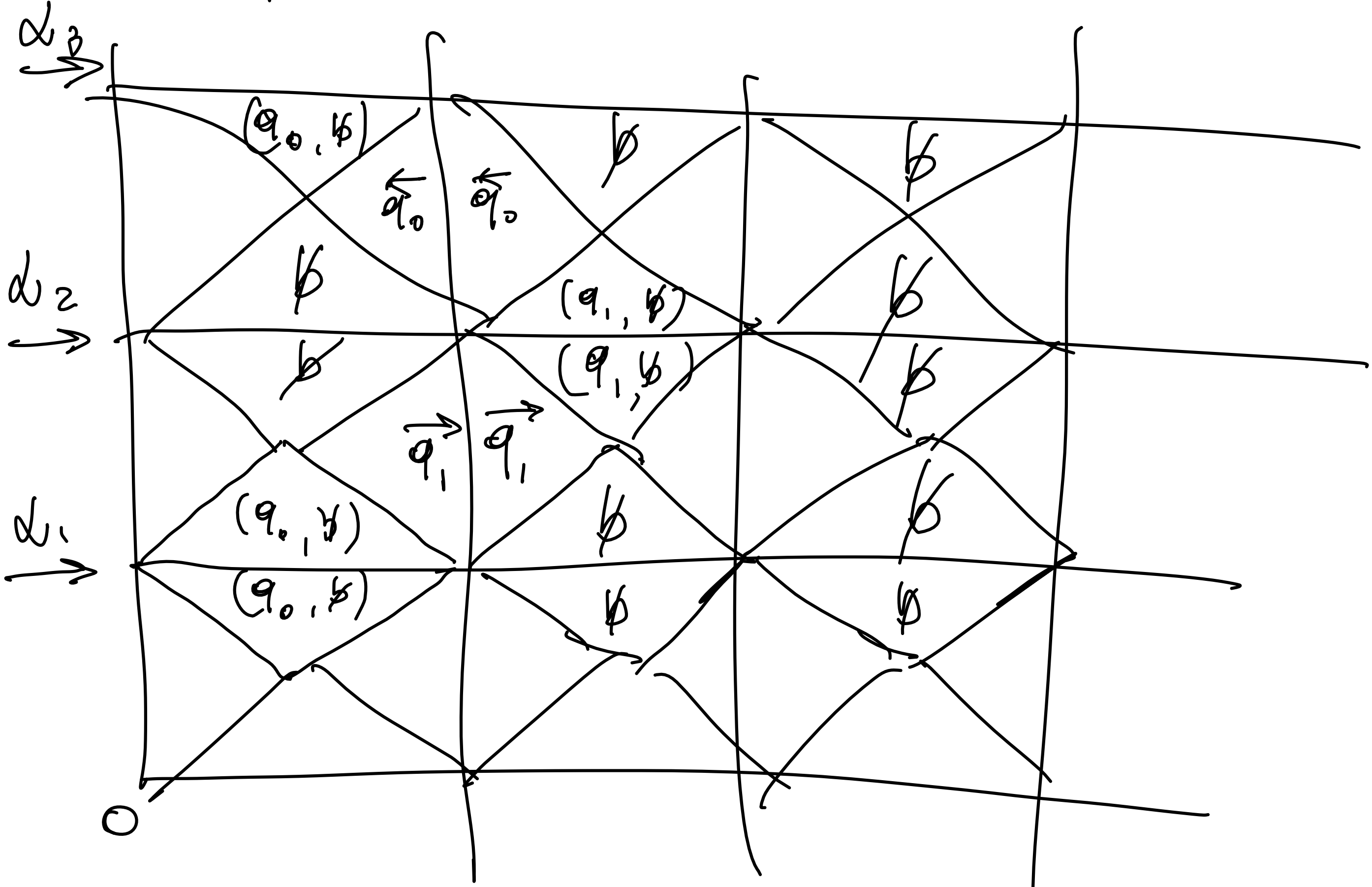
- $f(0,0) = d_0$
- $(f(m,n), f(m+1,n)) \in H \quad \forall m,n \in \mathbb{N}$
- $(f(m,n), f(m,n+1)) \in V \quad \forall m,n \in \mathbb{N}$

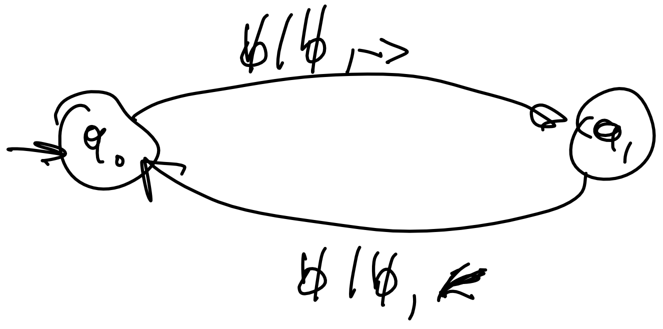
$\overline{HALT_\varepsilon} \leq TILING$

$M \xrightarrow{\;g\;} T = g(M)$

$\alpha_1 \vdash \alpha_2 \vdash \alpha_3 \vdash \text{----}$

$0\,1\,q_3\,\boxed{1}\,1\,0$





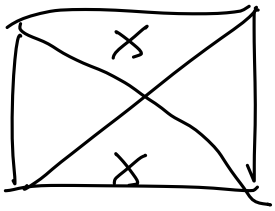
$q_0 \not b\ \not b\ \not b\ \not b$

$\Downarrow$

$\not b\ q_1\ \not b\ \not b\ \not b$ ---

$q_0\ \not b\ \not b\ \not b$ --- ---

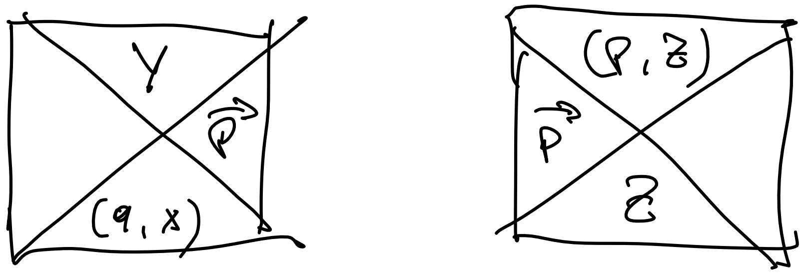
1)



$\forall X \in \Gamma$

2)

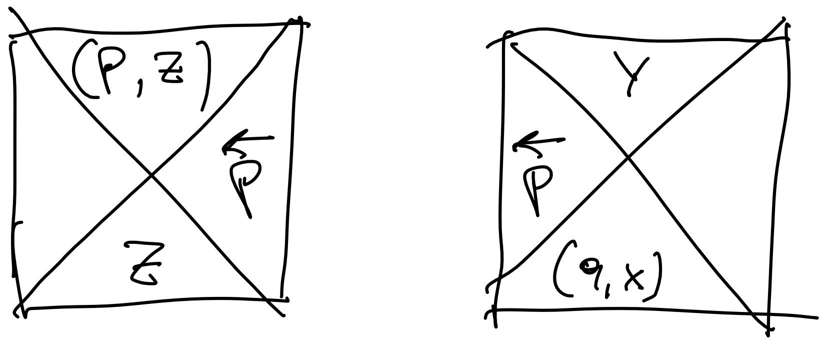
$q X Z \rightsquigarrow Y p Z$ $\delta(q, X) = (p, Y, \rightarrow)$



$\forall q, p \in Q \setminus F$

$\forall X, Y, Z \in \Gamma$

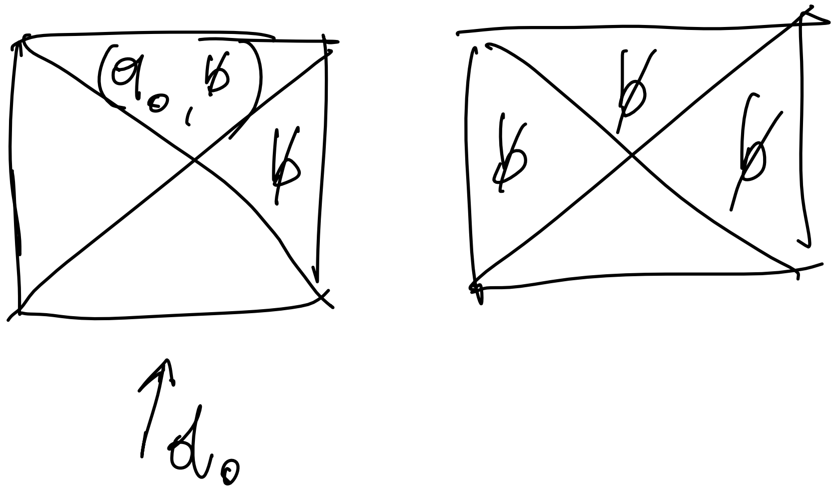
$Z q X \rightsquigarrow p Z Y$ $\delta(q, X) = (p, Y, \leftarrow)$

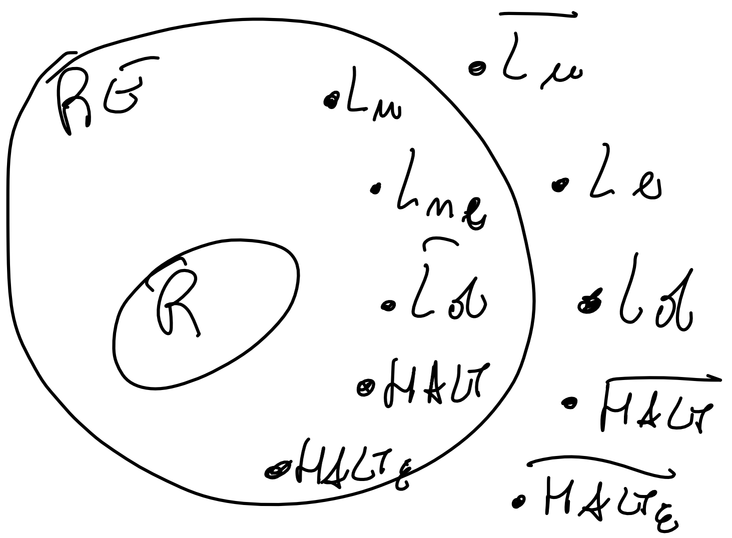


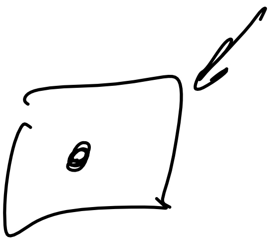
$\forall q, p \in Q \setminus F$

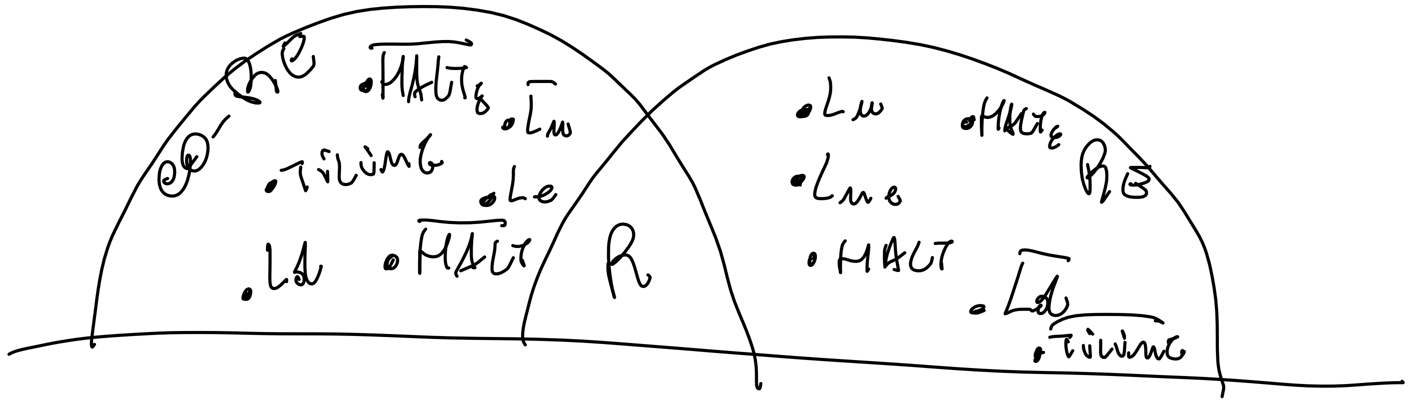
$\forall X, Y, Z \in \Gamma$

3)









- THEOREM: $R \neq RE$

- THEOREM: $co\text{-}RE \cap RE = R$

$\boxed{co\text{-}RE \cap RE \subseteq R}$

SIA L UN LINGUAGGIO $L \in coRE \cap RE$

SICCOME $L \in co\text{-}RE$, $\overline{L} \in RE$.

DAL FATTO CHE $L \in RE \wedge \overline{L} \in RE \Longrightarrow L \in R$

$\boxed{R \subseteq co\text{-}RE \cap RE}$

SIA $L \in R$. SE $L \in R$, ALLORA $\overline{L} \in R$

THEOREM: co-RE $\not\subseteq$ RE

SUPPONIAMO x ASSURDO CHE co-RE = RE

POICHÉ co-RE $\cap$ RE = R, SE FOSSE VERO CHE co-RE = RE, AVREMMO RE = R

CONTRADDIZIONE !!!

- THEOREM: SIANO A, B 2 LINGUAGGI TALI CHE $A \leq B$. SE $A \notin$ co-RE, ALLORA $B \notin$ co-RE

$HALT_\forall = \{ M \mid \forall w \; M$ SI ARRESTA SU $w \}$

PER DIMOSTRARE CHE

1) $HALT_\forall \notin$ RE
2) $HALT_\forall \notin$ co-RE

CI SERVONO <u>2</u> RIDUZIONI

1) UNA CHE TOLGA $HALT_\forall$ DA RE
2) " " " $HALT_\forall$ DA co-RE

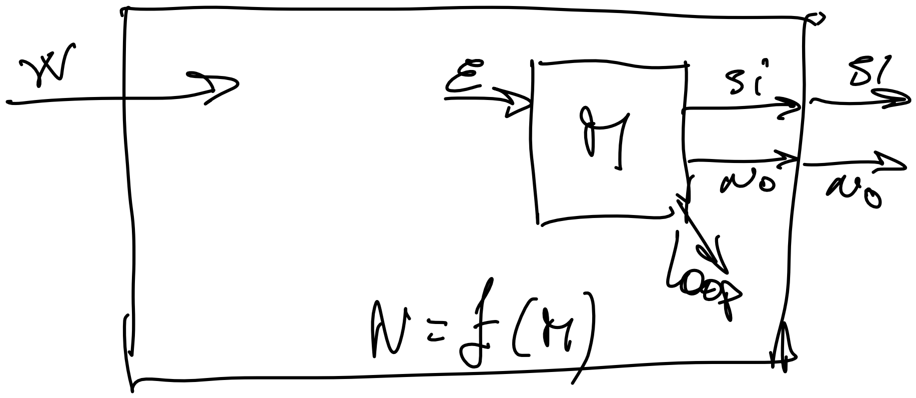
PER OTTENERE 1): $\overline{HALT_\varepsilon} \leq HALT_\forall$

PER OTTENERE 2): $HALT_\varepsilon \leq HALT_\forall$

PARTIAMO 2)

$$HALT_E \leq HALT_{\forall} \Rightarrow HALT_{\forall} \notin \text{co-RE}$$

$$M \xrightarrow{f} N = f(M)$$



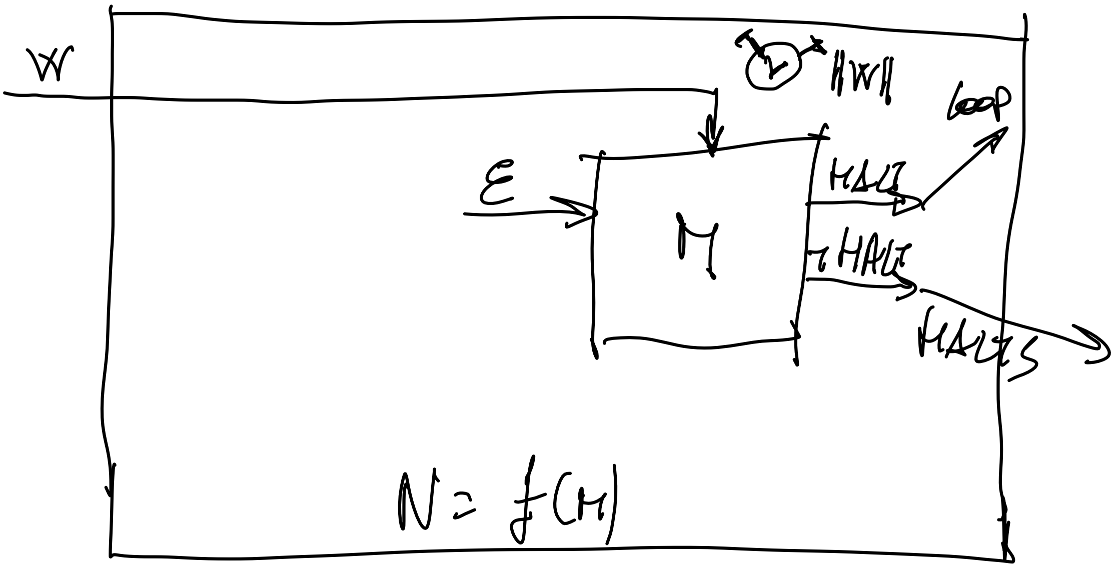
$\Rightarrow$) SUPPONIAMO CHE $M \in HALT_E$, DA CUI M SI ARRESTA SU ε SEGUE $\underline{N \in HALT_{\forall}}$

$\Leftarrow$) SUPPONIAMO CHE $\underline{M \notin HALT_E}$, DA CUI M <u>NON</u> SI ARRESTA SU ε SEGUE $\underline{N \notin HALT_{\forall}}$

CASO 1)

$\overline{HALT_E} \le HALT_\forall$

$M \xrightarrow{f} N = f(M)$



⇒) SUPPONIAMO CHE $M \in \overline{HALT_E}$

DA CUI M <u>NON</u> SI ARRESTA SU E

SEGUE $N \in HALT_\forall$

⇐) SUPPONIAMO CHE $M \notin \overline{HALT_E}$

DA CUI M SI ARRESTA SU E

M SI ARRESTA SU E IN t PASSI

SEGUE CHE N SI ARRESTA SU STRINGHE w DI LUNGHEZZA INFERIORE A t, ED M LOOPPA SU STRINGHE w DI LUNGHEZZA ALMENO t

DA CUI $N \notin HALT_\forall$