$L_d = \{ M_i \mid M_i \nvDash w_i \}$ $\quad$ $\underline{L_d \notin RE}$

$L_u = \{ (M, w) \mid M \vDash w \}$ $\quad$ $L_u \in RE$

$L_u \overset{?}{\in} R$

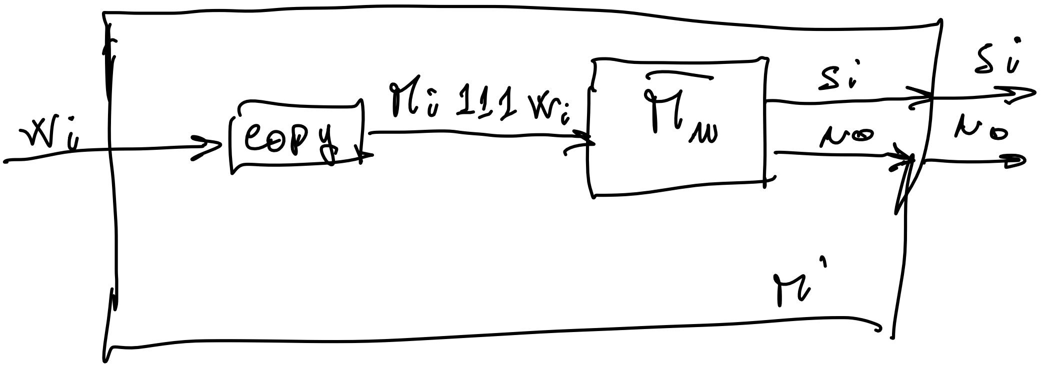
THEOREM: $L_u \notin R$

DIM:

SUPPONIAMO PER ASSURDO CHE $L_u \in R$.

SE $L_u \in R$, ALLORA $\overline{L_u} \in R$

SE $\overline{L_u} \in R$, ALLORA $\overline{M_u}$ CHE DECIDE $\overline{L_u}$



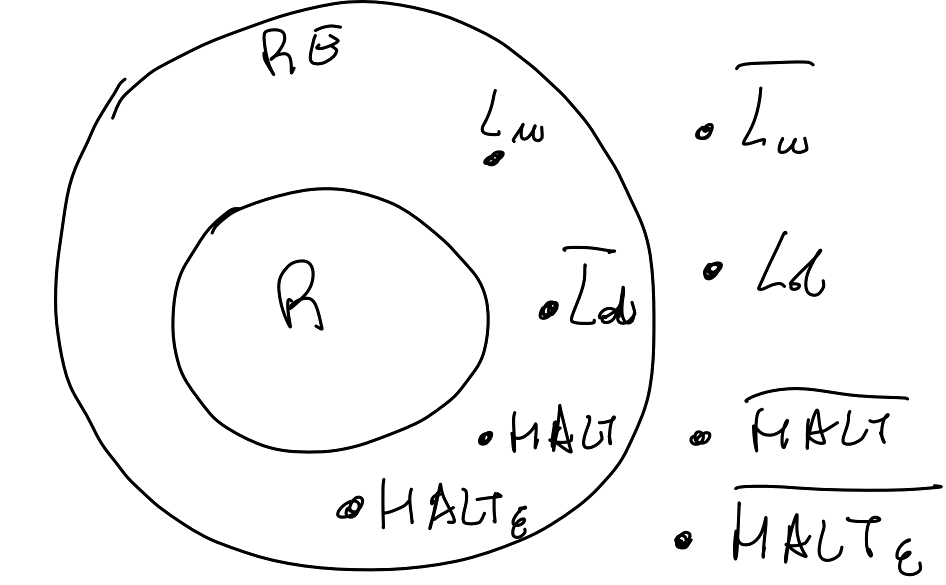
QUAL È IL LINGUAGGIO RICONOSCIUTA DA M'? $\mathcal{L}(M')$

→ SI: ALLORA $M_i \nvDash w_i$

→ NO: ALLORA $M_i \vDash w_i$ $\quad$ $\mathcal{L}(M') = L_d$

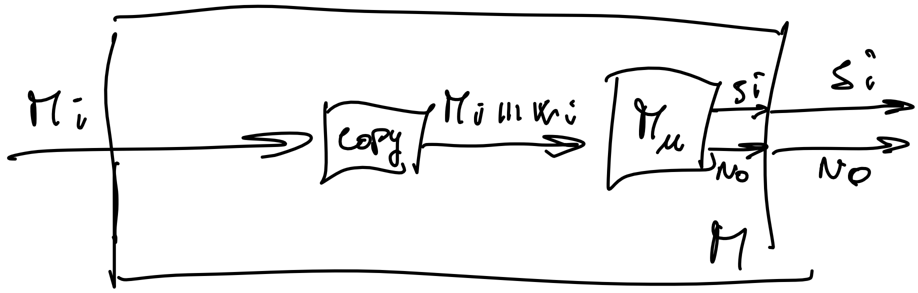
POICHÉ $L_d \notin RE$, NON È POSSIBILE CHE $\mathcal{L}(M') = L_d$: CONTRADDIZIONE

$\Rightarrow \overline{L_u} \overset{?}{\in} RE$



THEOREM: $\overline{L_d} \in RE$ $\overline{L_d} = \{M_i \mid M_i \models w_i\}$

<u>DIM:</u>



- $M_i \in \overline{L_d} \Rightarrow M$ RISPONDE SI
- $M_i \notin \overline{L_d} \Rightarrow M$ RISPONDE NO
  OPPURE M NON RISPONDE

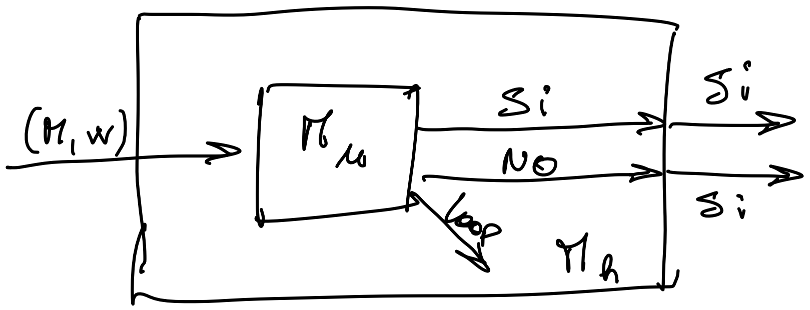
$\overline{L_d} \notin R$

$HALT = \{ (M, w) \mid M$ SI ARRESTA SU $w \}$

$L_u = \{ (M, w) \mid M$ ACCETTA $w \}$

THEOREM: $HALT \in RE$

<u>DIM</u>:



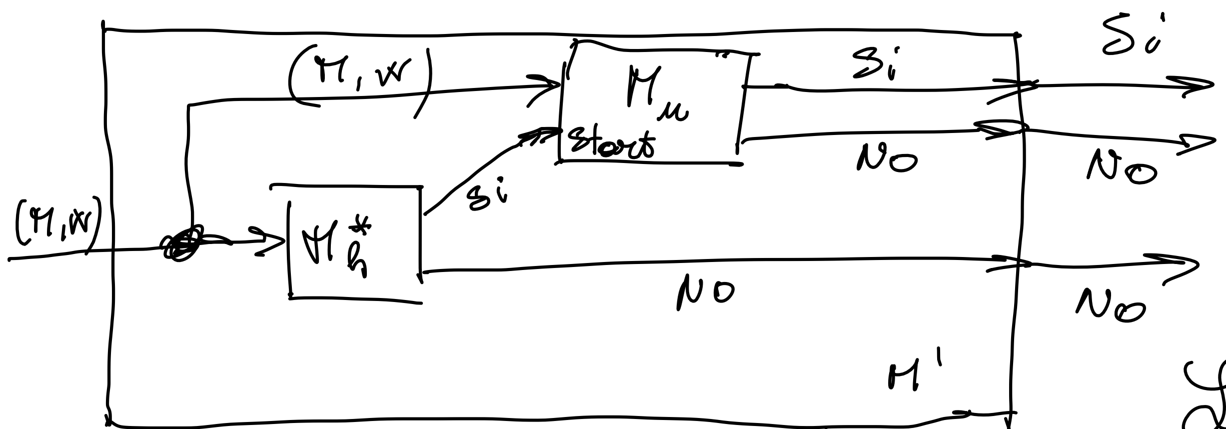
$\mathcal{L}(M_h) = HALT$

- $(M, w) \in HALT \Rightarrow M_h$ RISPONDE SI
- $(M, w) \notin HALT \Rightarrow M_h$ NON RISPONDE SI

THEOREM: <u>$HALT \notin R$</u>

<u>DIM</u>:

SUPPONIAMO PER ASSURDO CHE $HALT \in R$
ALLORA ESISTE UNA MACCHINA M_h^* CHE <u>DECIDE</u> HALT



L_u

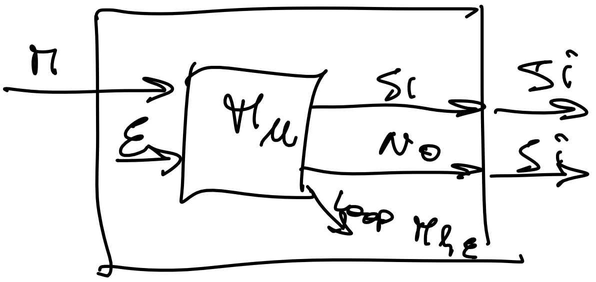
$\parallel$

$\mathcal{L}(M')$?

- M' RISPONDE SI $\Rightarrow$ M F W
- M' RISPONDE NO $\Rightarrow$ M RISPONDE NO SU w OPPURE M NON SI ARRESTA SU w (loop)

$HALT_\varepsilon = \{ M \mid M$ SI ARRESTA SU $\varepsilon \}$

<u>THEOREM:</u> $HALT_\varepsilon \in RE$



$\mathcal{L}(M_{h_\varepsilon}) = HALT_\varepsilon$

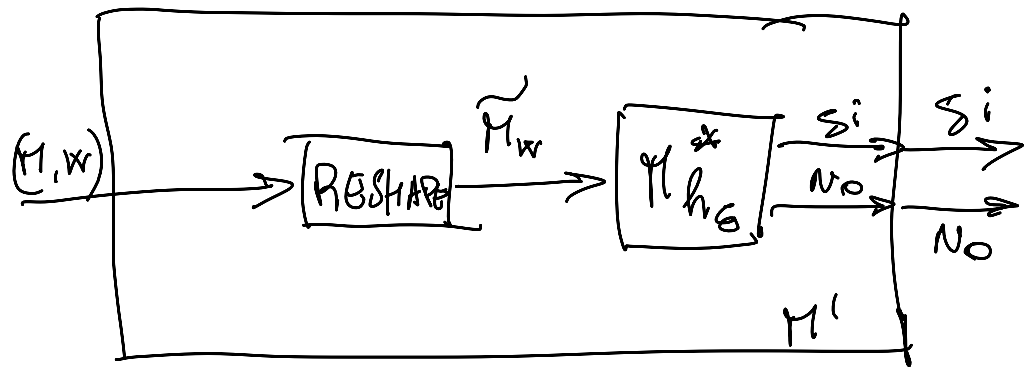
- $M \in HALT_\varepsilon \Rightarrow M_{h_\varepsilon}$ RISPONDE SI
- $M \notin HALT_\varepsilon \Rightarrow M_{h_\varepsilon}$ NON RISPONDE SI

THEOREM: $HALT_\varepsilon \notin R$

<u>DIM:</u>

SUPPONIAMO X ASSURDO CHE $HALT_\varepsilon \in R$

ALLORA ESISTE $M^*_{h_\varepsilon}$ CHE <u>DECIDE</u> HALT



$\mathcal{L}(M')$?

$\tilde{M}_w$: SCRIVE SU NASTRO w, QUINDI SI COMPORTA COME M

- M' DICE SI $\Rightarrow M$ SI ARRESTA SU w
- M' DICE NO $\Rightarrow M$ NON SI ARRESTA SU w

M' DECIDE HALT : <u>CONTRADDIZIONE</u>