

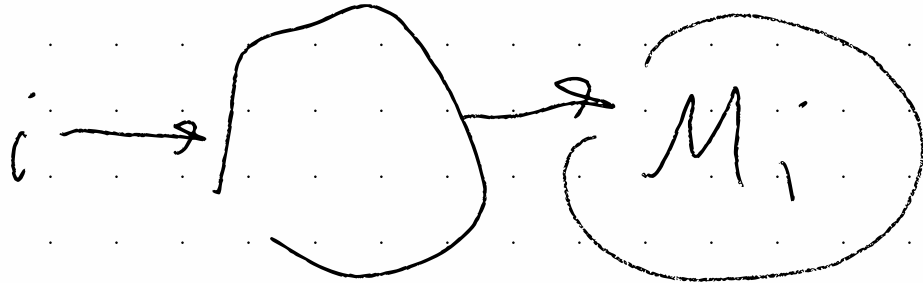
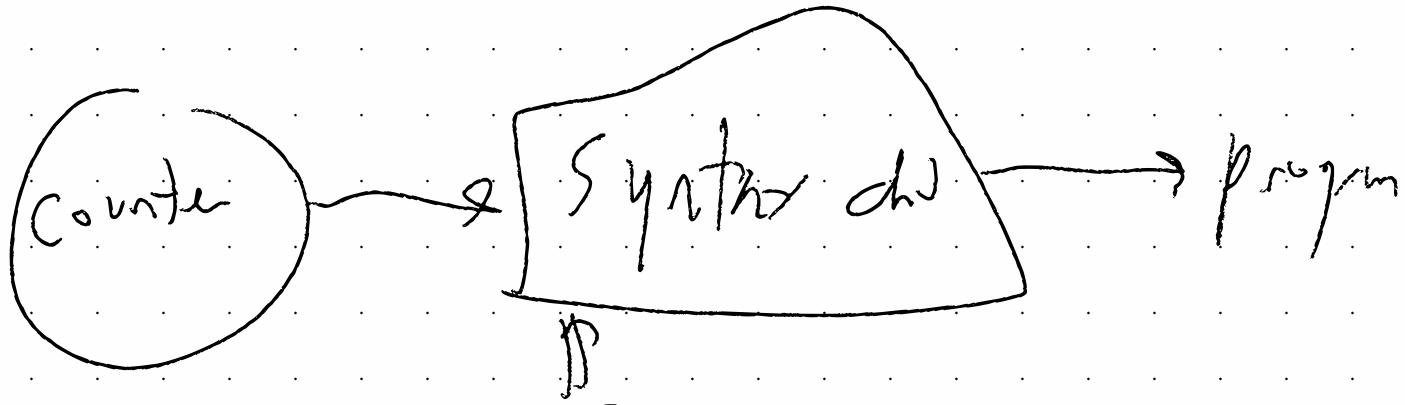
$M_i(j)$

run the i 'th
machine on the
 j 'th input

$$M_i(j) = \begin{cases} T & \text{accept} \\ F & \text{reject} \\ \perp & \text{loops} \end{cases}$$

$$\mathbb{Z} \times \mathbb{Z} \rightarrow \{T, f, \perp\}$$

M_i ihl program



$i \rightarrow M_i$

$$\perp^* = F \cup \perp$$

| $A(i, j)$ | i | 2 | 3 | 4 |
|-----------|---------|---------|---------|---------|
| M_1 | \perp | \perp | \perp | \perp |
| M_2 | \perp | \perp | \perp | \perp |
| M_3 | \perp | \perp | \perp | \perp |
| M_4 | \perp | \perp | \perp | \perp |

$$U(i, j) = M_j(j)$$

In case $M_j(j) \Rightarrow$ can
we know this

$$H(i, j) \rightarrow \{T, F\}$$

$$\uparrow T^x = T \cup F$$

$H(i, j)$

| | 1 | 2 | 3 | 4 |
|--------|---|---|---|-----|
| M_1 | T | F | F | F |
| M_2 | F | F | T | T |
| M_3 | F | T | T | T |
| $D(j)$ | F | T | F | ... |

from $H(i, j)$
reverse

$D(j) = \sim H(3, j)$

| | | | |
|---|---|---|-----|
| T | F | F | F |
| F | F | T | T |
| F | T | T | T |
| F | T | F | ... |

$$D(j) = \sim H(i, j)$$

$$D = M_k$$

$$\begin{aligned} D(k) &= \sim H(k, k) \\ &= \sim M_k(k) \\ &= \sim D(k) \end{aligned}$$

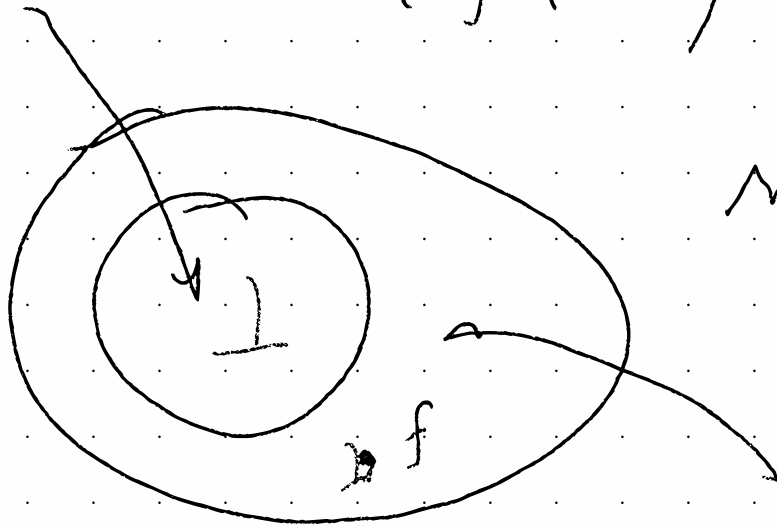
$H(i, j)$

" not

reversible

Recursion = Recognizing L

of Recognizing $\sim L$



$$M_L(i) = \begin{cases} \top \\ \perp \end{cases}$$

$$M_{\sim L}(i) = \begin{cases} \perp \\ \top \end{cases}$$

$A(i, j)$ is not recursive

$\sim A(i, j)$ is not even Σ^1_1
recognizable