20/2/2023

CS 704

Theorem 1 (Observation table is well-defined) is proved by a sequence of lemmas

Lemma 2: Assume that (S, E, T) is a closed, consistent observation table. For the acceptor $M(S,E,T)$ & for all

$$s \in (S \cup S.A),$$

$$\delta(q_0, s) = row(s).$$

Proved by induction on the length of s.

Lemma 3: Assume that (S, E, T) is a closed, consistent table. Then, the acceptor $M(S, E, T)$ is consistent with the function T.

That is $\forall s \in (S \cup S.A)$, $e \in E$

$$\delta(q_0, s \cdot e) \in F \text{ iff } T(s, e) = 1$$

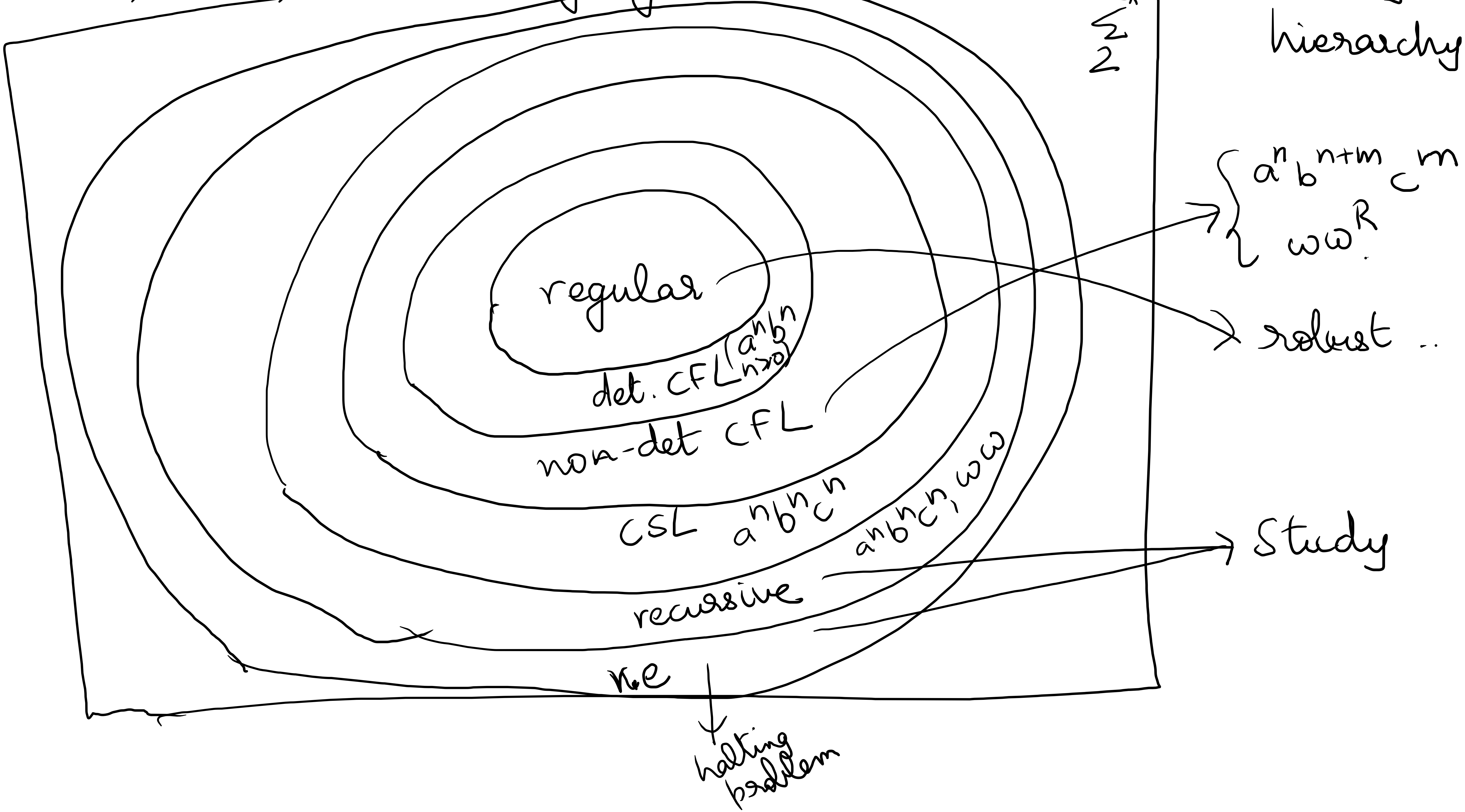
Proved by induction on the length of e.

Regular languages:

- Robust, closed under several properties
- DFA $\equiv$ NFA
- Reg. exp.
- $MSO(\Sigma, \leq)$
- Solve arithmetic linear constraints
- Learn FSA for regular languages by using positive & negative samples & a minimally adequate teacher.

Σ, Σ^*, 2^{Σ^*} → languages

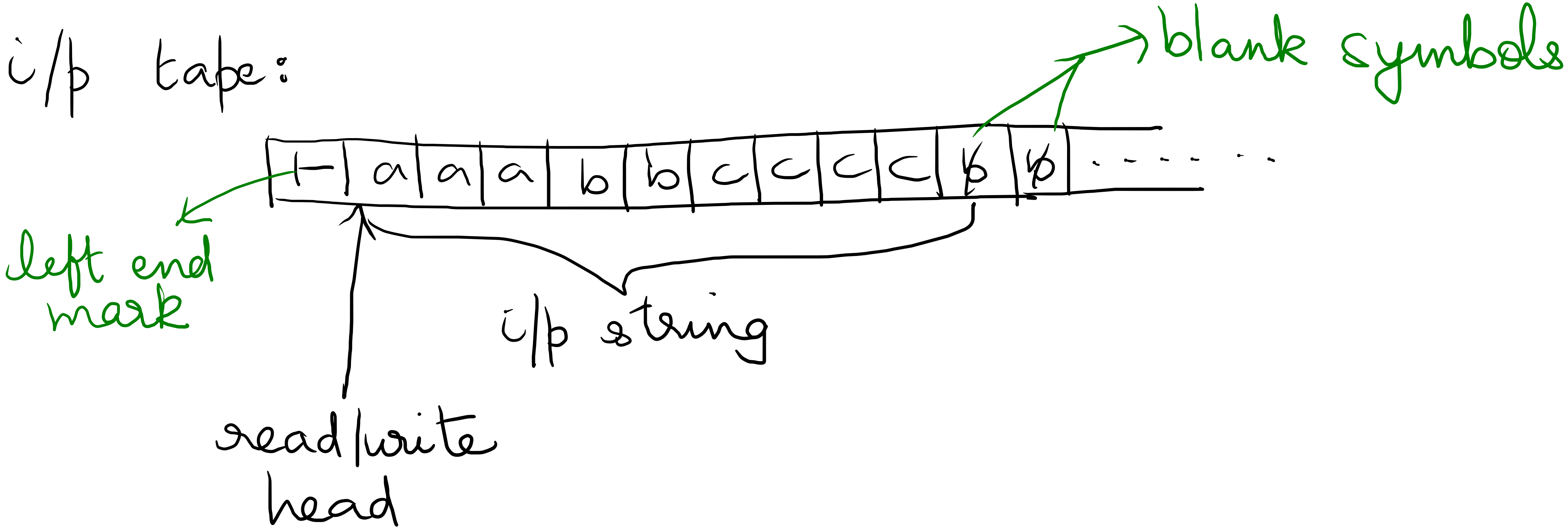
Chomsky hierarchy

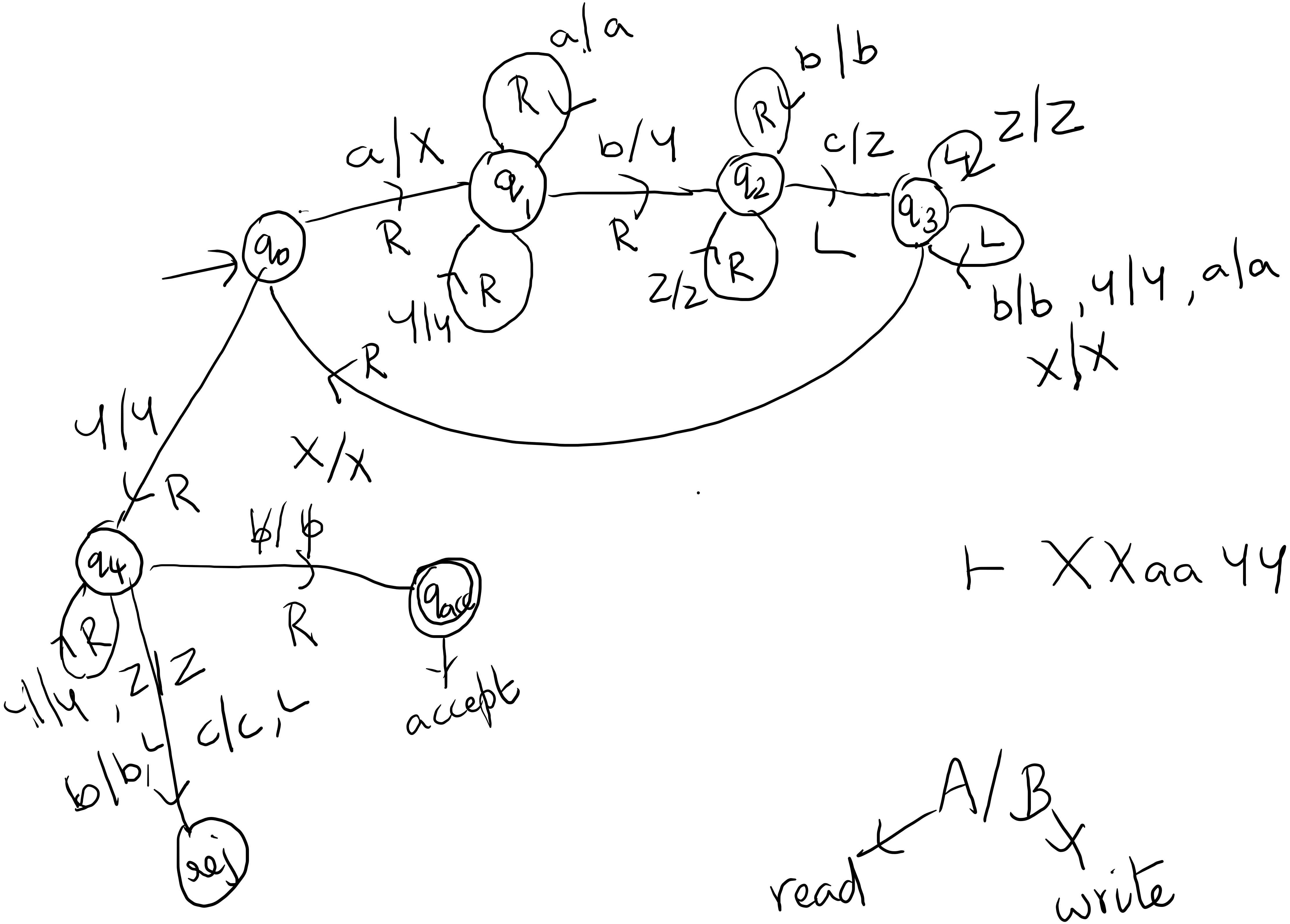


Turing machines

Give a Turing machine for $\{a^n b^n c^n \,/\, n \geq 1\}$, $\Sigma = \{a, b, c\}$

i/p tape:





a → X
b → Y
c → Z

⊢ X X a a Y Y Z Z c c ␢ ␢ ␢

A/B

read write

L - move left

R - move right

Give a Turing machine for unary addition

$\{1^m \# 1^n \# 1^{m+n} \mid m, n \geq 0\}$ $\Sigma = \{1, \#\}$

$\{1^m \# 1^n \# 1^{m-n} \mid m, n \geq 0, m > n\}$

equivalent to

$\{1^{m-n} \# 1^n \# 1^m \mid m, n \geq 0, m-n+n = m\}$

$\{1^m \# 1^n \# 1^{m*n} \mid m, n \geq 1\}$

Give a TM for $\{a^p \mid p > 0, p \text{ is prime}\}$.