TM's and DFA's.

Sunday, August 25, 2019 2:52 PM

TM

Q, Γ

$\delta : Q \times \Gamma \to Q \times \Gamma \times \{L, R\}$

$q_0 \in Q$

$F \subseteq Q \mid q_A, q_R$.

$L = \{0^n 1^n\}$

- If first is 0, erase it and look for first 1 and mark it
  ↳ (else reject)

  go back to first blank, next 0.

$L = \{a^i b^j c^k \mid i + j = k\}$

- Input ... mark] repeat

Find next a, erase, find c, mark] repeat

Find next b, erase, find c, mark] repeat

if not empty — reject.

if unexpected character — reject.

Back to DFA's

$Q, \Sigma, \delta: Q \times \Sigma \to Q, q_0, F.$

L_1 is regular (recognized by DFA)

L_2 is regular

$\Rightarrow$ $L_1 \cap L_2$ is regular

How about $L_1 \cup L_2$?

$$L_1 \cup L_2 = \overline{\overline{L_1} \cap \overline{L_2}}$$

L is regular $\Rightarrow$ $\overline{L}$ is regular $(F = \overline{F})$

L is regular $\Rightarrow$ $\bar{L}$ is regular ($F = F$)

So same construction as $L_1 \cap L_2$, but..

$Q = Q_1 \times Q_2$

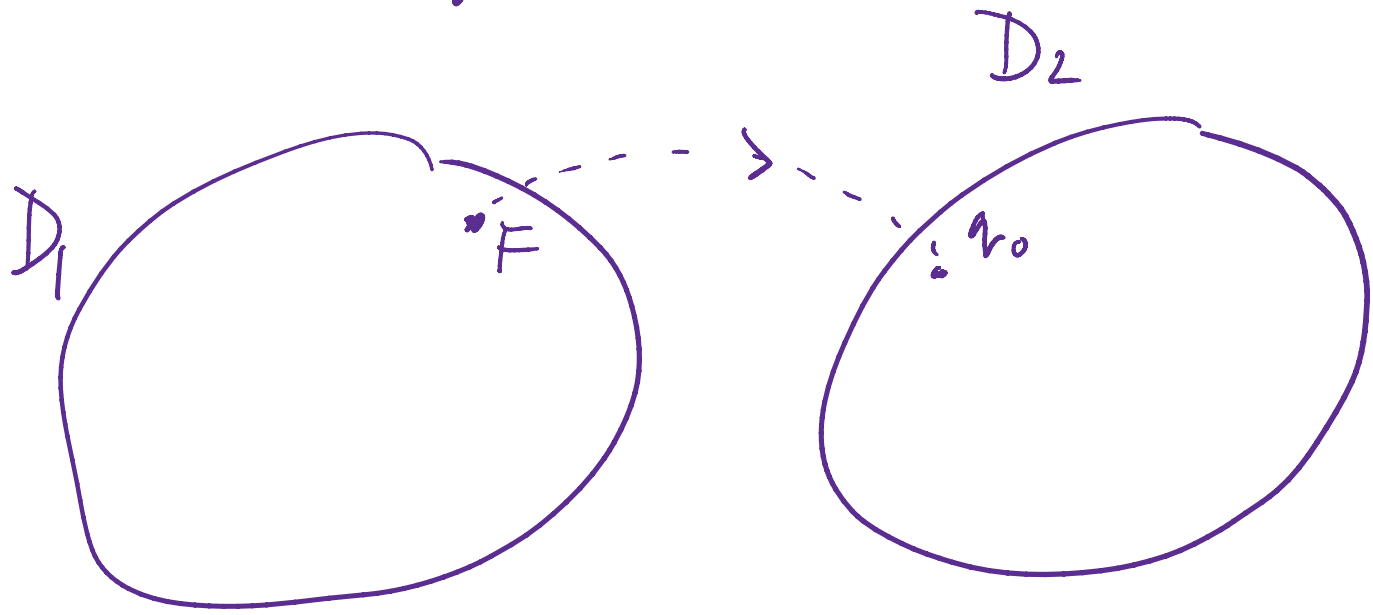
$\delta((q_1, q_2), a) = (\delta_1(q_1, a), \delta_2(q_2, a))$

$q_0 = (q_{01}, q_{02})$

$F = \{(q_1, q_2) : q_1 \in F_1 \text{ or } q_2 \in F_2\}$.

How about $L = \{ab \mid a \in L_1, b \in L_2\}$?

L_1, L_2 are regular.



jump? "ε" transition

Can take when desired.

D accepts if ∃ some choice of ε's that leads to <u>accept</u>.

(Note: empty string ∈ L_1, L_2).

Non-deterministic Finite Automaton (NFA)

——————— TM (NTM)... later

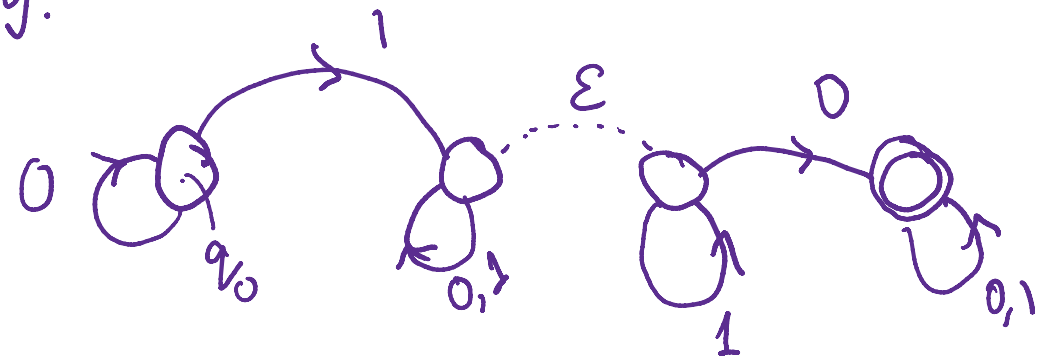
Is this more powerful ?!

i.e. ∃ language L accepted by an NFA but not by any DFA?

<u>OR</u>

Any NFA ⟶ DFA ?

e.g.



$0^* 1 \{0,1\}^* 0 \{0,1\}^*$