

TMs and DFAs.

Sunday, August 25, 2019

2:52 PM

TM

Q, Γ

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

$q_0 \in Q$

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

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

100...0 | 1 1 1 1

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

go back to first blank, next 0.

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

r. Init - ... find r 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

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

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 ($F = \bar{F}$)

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

$$Q = Q_1 \times Q_2$$

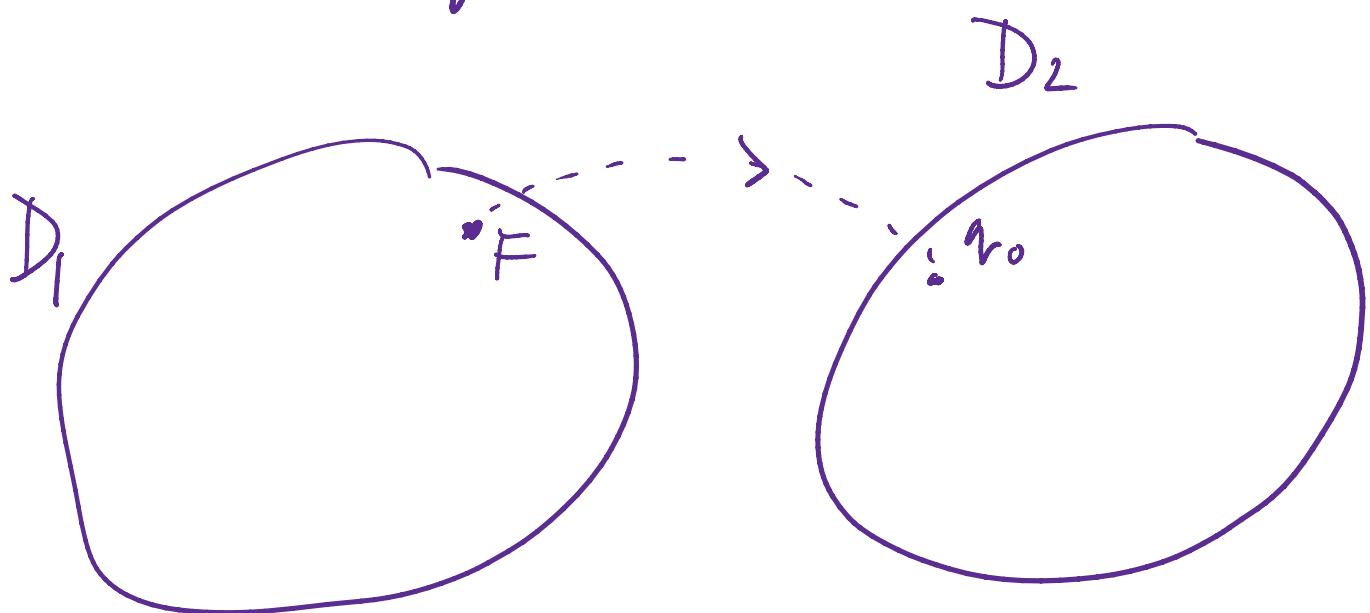
$$\delta((q_1, q_2), a) = (\delta_1(q_1, a), \delta_2(q_2, a))$$

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

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

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 \exists some choice of ε's
that leads to accept.

(Note: empty string $\in L_1, L_2$).

Non-deterministic Finite Automaton (NFA)

_____ TM (NTM) ... later

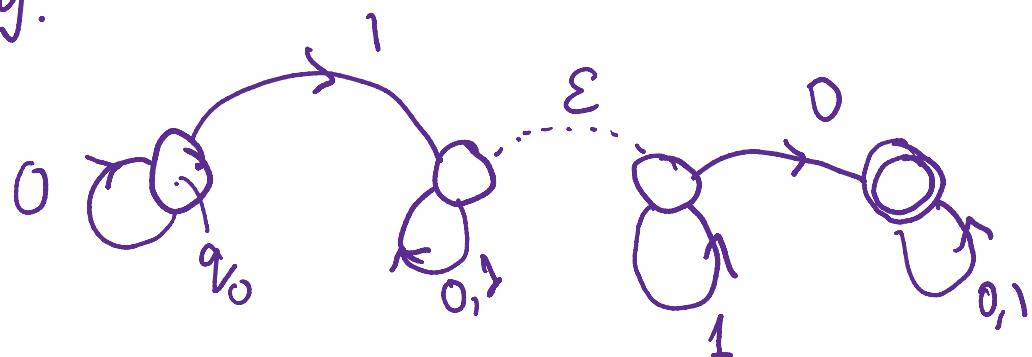
Is this more powerful?!

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

OR

Any NFA \rightarrow DFA ?

e.g.



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

