Lecture 3

Monday, May 13, 2019 1:31 PM

DFA NFA

$A = (Q, \Sigma, \delta, q_0, F)$

- Q = finite set of states
- Σ = input alph.
- $q_0 \in Q$ init state
- $F \subseteq Q$
- $\delta : Q \times \Sigma \to Q$

- state diagram
- table

δ	a
q	q'

$L(A) = \{ x \in \Sigma^* \mid A$ on x, $q_0 \xrightarrow{x} q \in F \}$

A language $L \subseteq \Sigma^*$ is regular if it's accepted by some ~~F~~A.

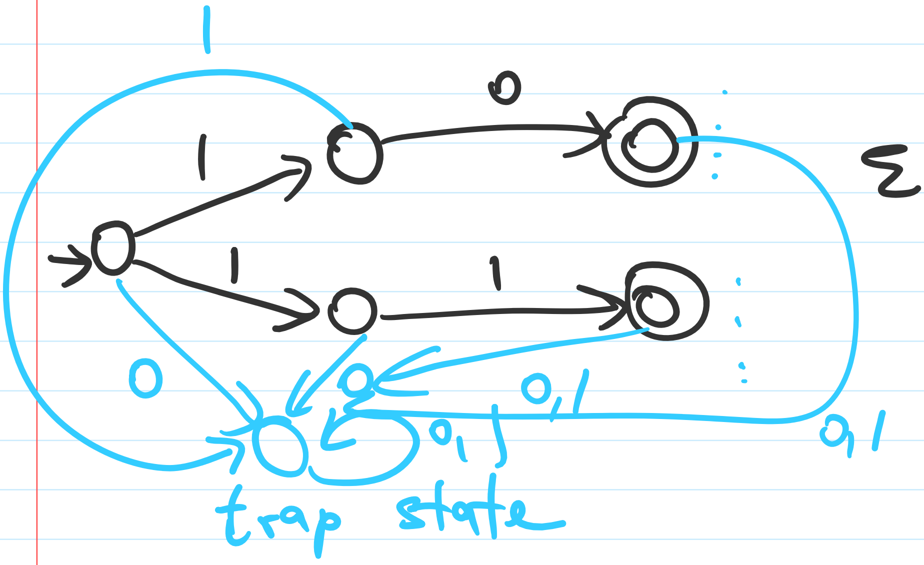
<u>NFA</u> : Nondet. FA

$B = (Q, \Sigma, \delta, q_0, F)$

- $\delta : Q \times \Sigma_\varepsilon \to \underline{\mathcal{P}(Q)}$

$\delta : Q \times \Sigma_\varepsilon \to \mathcal{P}(Q)$

$\Sigma_\varepsilon = \Sigma \cup \{\varepsilon\}$ — Set of all subsets of Q



$\Sigma = \{0,1\}$

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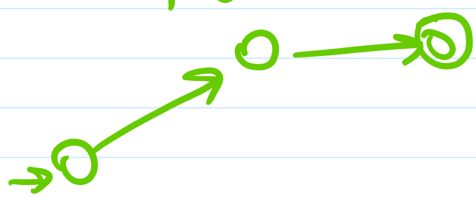

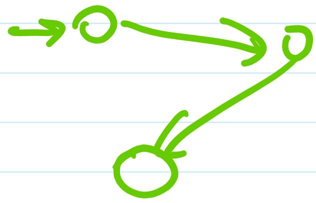

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We'll show : NFA $\equiv$ DFA.

Regular Operations (Expressions)

- Union $\cup$: $A \cup B = \{w \mid w \in A \text{ or } w \in B\}$
- Concatenation $\circ$: $A \circ B = \{xy \mid x \in A \ \& \ y \in B\}$
- Star $*$:

$$A^* = \bigcup_{k \geq 0} A^k, \text{ where } A^k = \underbrace{A \circ \ldots \circ A}_{k \text{ times}}$$

$$A^* = \{x_1 \ldots x_k \mid k \geq 0, \ x_i \in A\}$$

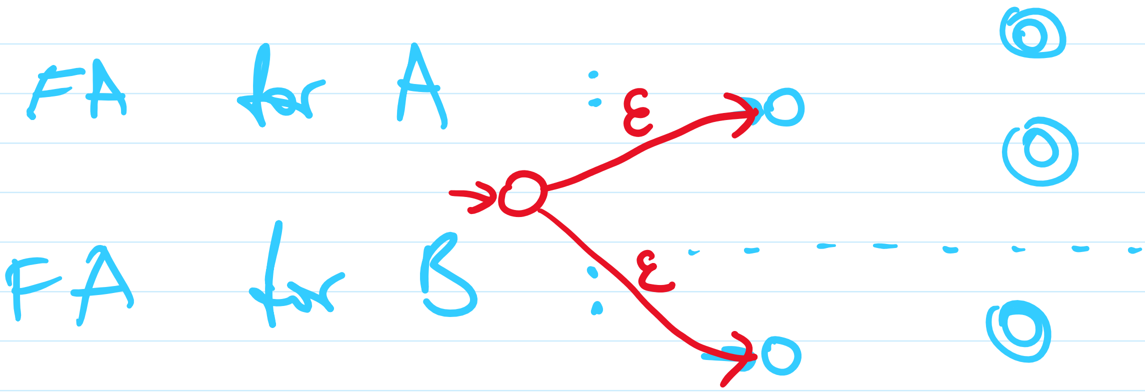
$\{0,1\}^*$

Claim: The class of reg. languages is closed under reg. operations.

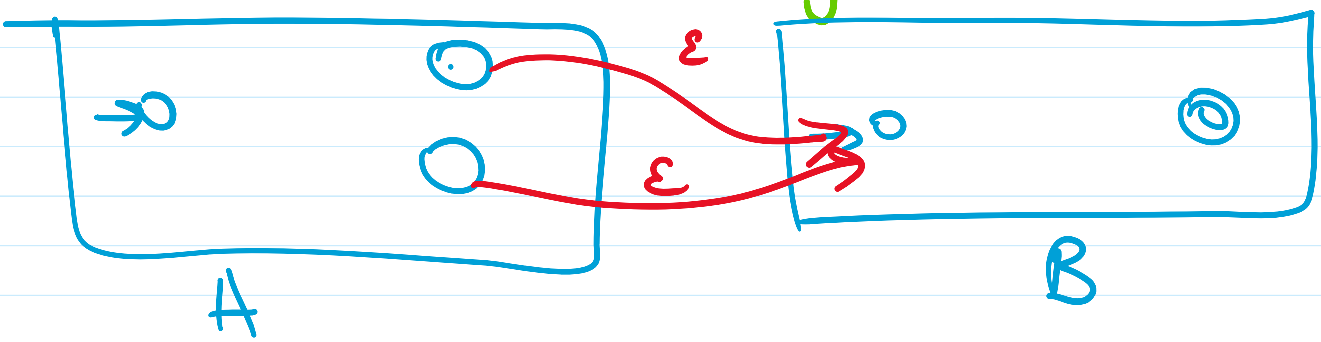
Proof:

A, B : regular languages

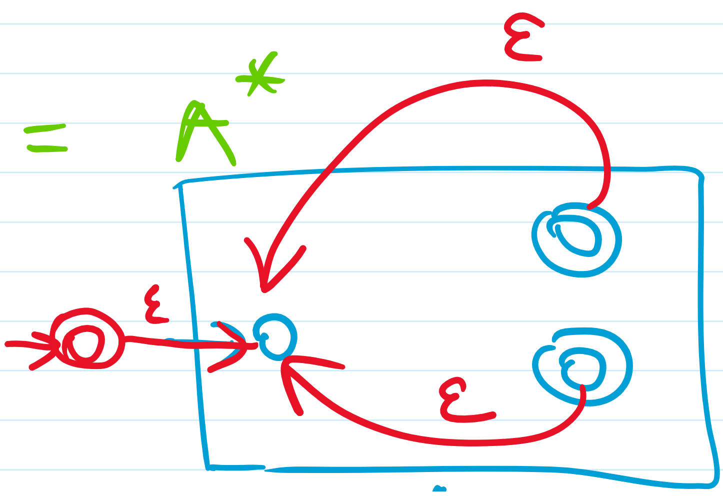
$C = A \cup B$ is also regular

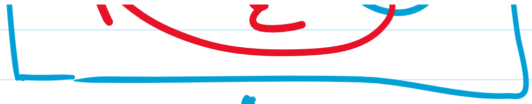


$C = A \circ B$ is also regular



$C = A^*$





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