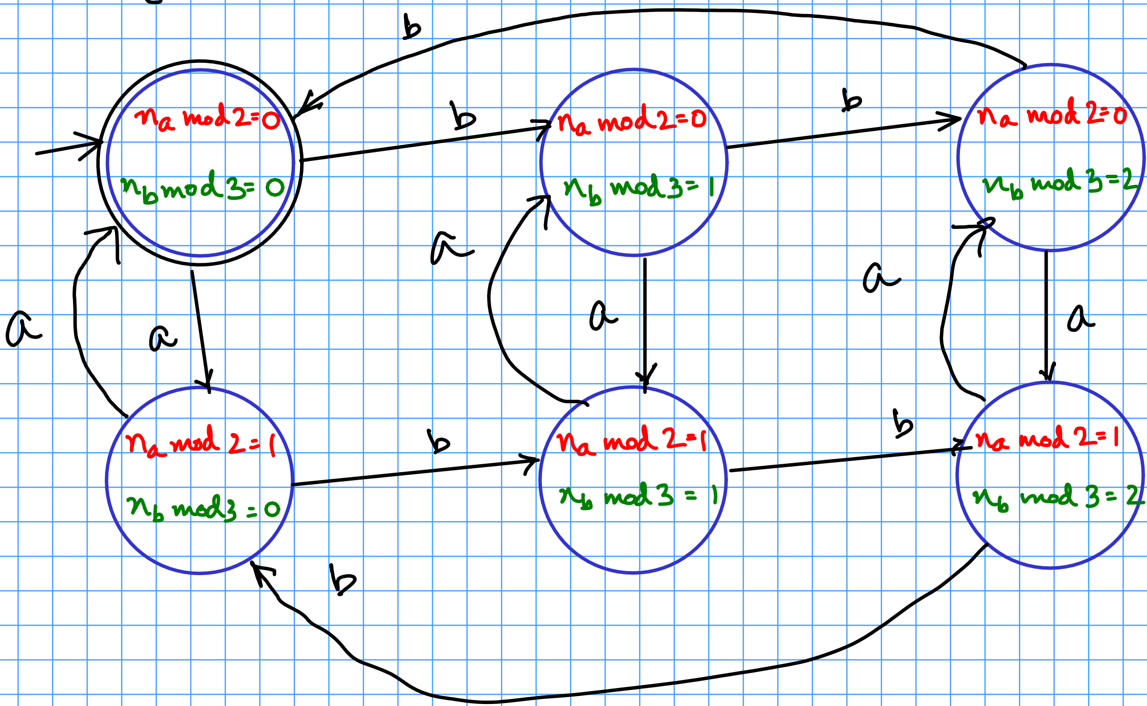
Finite Automata

$\Sigma = \{a, b\}$

$L = \{ \omega \in \Sigma^* \mid n_a(\omega) \text{ div by } 2 \text{ and } n_b(\omega) \text{ div by } 3 \}$



$$\Sigma = \{a, b\}$$

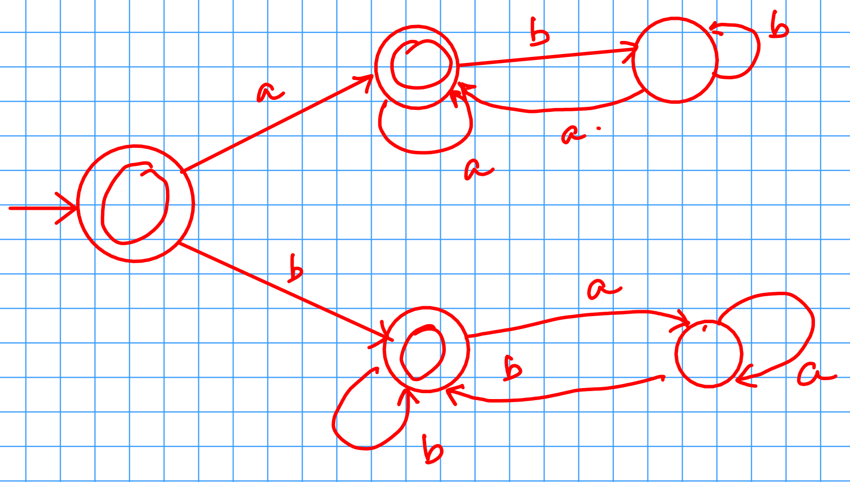
$$\cancel{L' = \{\omega \in \Sigma^* \mid n_a(\omega) = n_b(\omega)\}}$$

$$L = \{\omega \in \Sigma^* \mid n_{ab}(\omega) = n_{ba}(\omega)\}$$

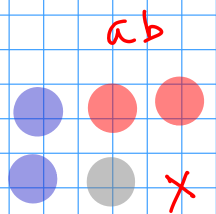
$$\omega = abaababab$$

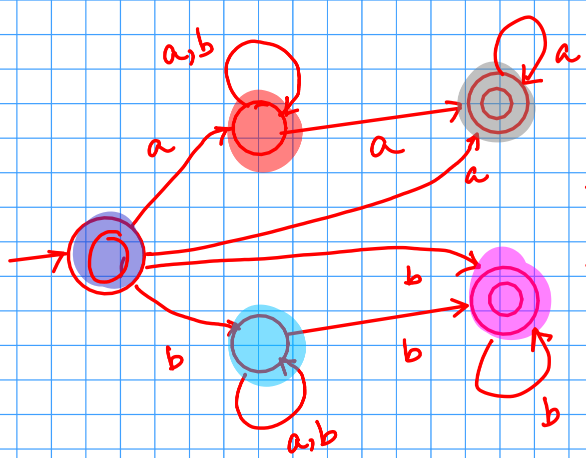
$$n_{ab}(\omega) = 3$$

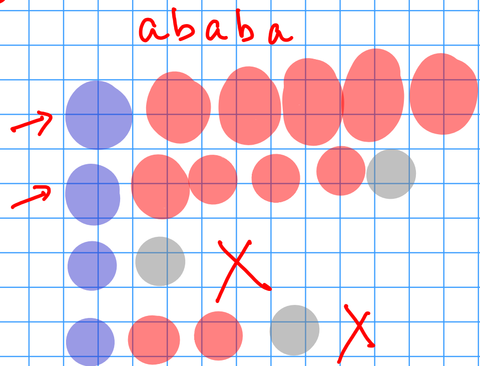
$$n_{ba}(\omega) = 2$$



Deterministic Finite Automata.







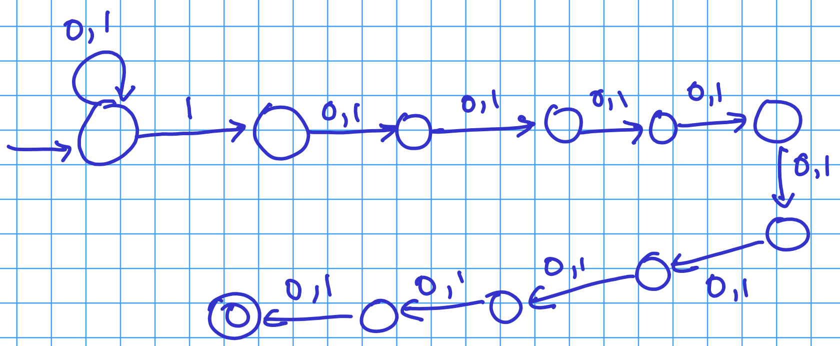
Non-det FA

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

$L = \{ w \in \Sigma^* \mid |w| \geq 10, \ 10^{\text{th}} \text{ letter from end is } 1 \}$

2^{10} states

$0\ 1\ 1\ 0\ 1\ 1\ 1\ 1\ 0\ 1\ 0$



968, 969, 971, 970, 967

alphabet

$Q_0 \subseteq Q$

DFA: $(Q, \Sigma, q_0, \delta, F)$

NFA

Set of states

initial state $q_0 \in Q$

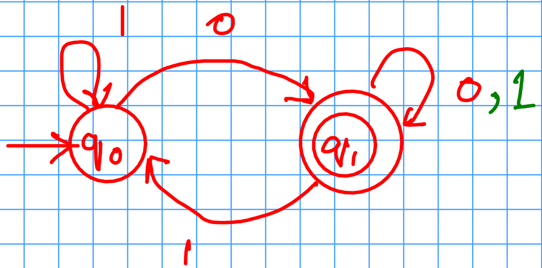
$F \subseteq Q$

Set of final states

$\delta: Q \times \Sigma \to 2^Q$

Transition fn.

$\delta: Q \times \Sigma \to Q$

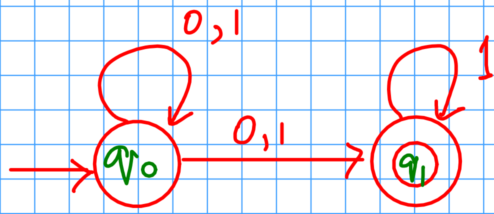


$(\{q_0, q_1\}, \{0, 1\}, \{q_0\}, \delta, \{q_1\})$

$\delta:$

Q	Σ	Q
q_0	1	$\{q_0\}$
q_0	0	$\{q_1\}$
q_1	0	$\{q_1\}$
q_1	1	$\{q_0, q_1\}$

A:



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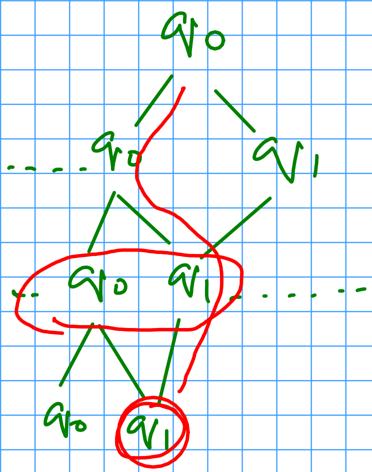
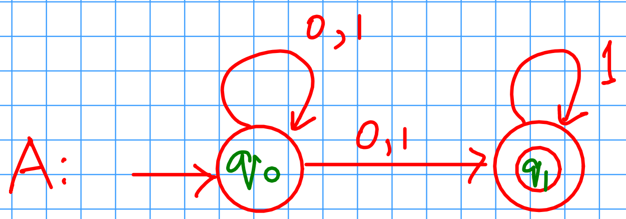
ϵ

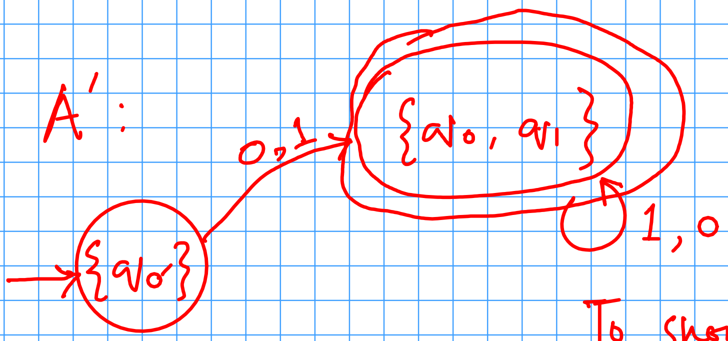
$L(A) = \{ w \in \{0,1\}^* \mid w \text{ is accepted by } A \}$

$L(A) = \Sigma^* \setminus \{\epsilon\}$

Q	Σ^*	2^Q
q_0	0	$\{q_0, q_1\}$
q_0	00	$\{q_0, q_1\}$
q_0	01	$\{q_0, q_1\}$
q_0	011	
	0111111	







$$\overset{q_0}{\{q_0, q_1\}} \cup \overset{q_1}{\{q_1\}}$$

To show: $L(A') = L(A)$

1. $L(A') \subseteq L(A)$
2. $L(A) \subseteq L(A')$

$S \subseteq Q$

$$\delta'(S, 0) = \bigcup_{q \in S} \underbrace{\delta^{NFA}(q, 0)}_{\subseteq Q}$$