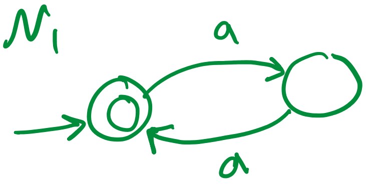
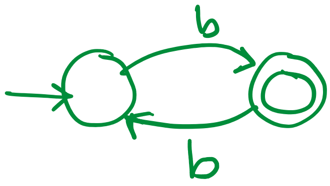
Lecture 10

Thursday, February 1, 2024 11:30 AM

N_1



N_2



* Draw an NFA N_3 such that

$$L(N_3) = L(N_1) \cdot L(N_2)$$

set concat

$aabbb \in L(N_1) \cdot L(N_2)$

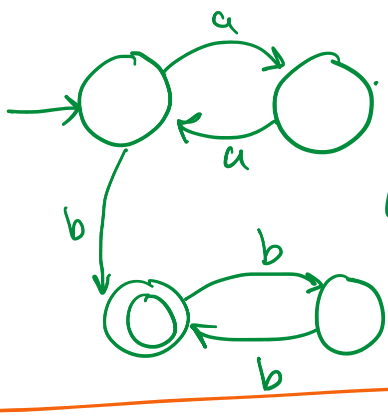
$aabb \notin L(N_1) \cdot L(N_2)$

$bbaaa \notin L(N_1) \cdot L(N_2)$

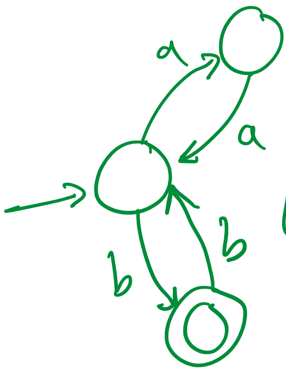
$bbbaa \notin L(N_1) \cdot L(N_2)$

$b \in L(N_1) \cdot L(N_2)$

$AB = \{xy : x \in A, y \in B\}$



right



wrong

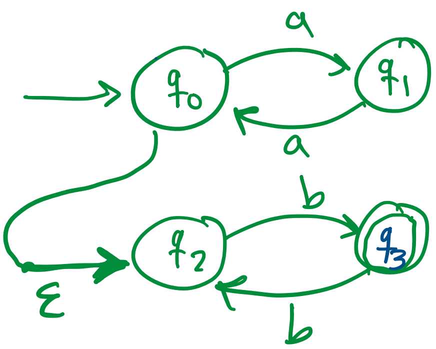
aa bb aab

NFAs with ε-transitions:

We extend $\Delta : Q \times \Sigma \to 2^Q$ to

$\Delta : Q \times (\Sigma \cup \{\varepsilon\}) \to 2^Q$ so that

the NFA can change its state without consuming any symbol.



a a b

$q_0 \xrightarrow{a} q_1 \xrightarrow{a} q_0 \xrightarrow{\varepsilon} q_2 \xrightarrow{b} q_3 \in F$

<u>Thm.</u> Any NFA with ε-transitions can be turned into an equivalent NFA (or DFA)

(if you're interested, check the book but we don't cover it)

Example: Assume you are given an NFA N_1. Describe an NFA N_2 such that

(a) $L(N_2) = L(N_1)^+$

(b) $L(N_2) = L(N_1)^*$

Recall: $A^* = A^0 \cup A^1 \cup A^2 \cup A^3 \cup \ldots$

$= \{x_1 x_2 x_3 \ldots : x_i \in A\} \cup \{\varepsilon\}$

$A^+ = A^1 \cup A^2 \cup A^3 \cup \ldots$

$= \{x_1 x_2 x_3 \ldots : x_i \in A\}$

e.g. $A = \{aa, bb\}$

$aa\,aa\,bb\,aa\,bb \in A^*$

$\in A^+$

$\varepsilon \in A^*$

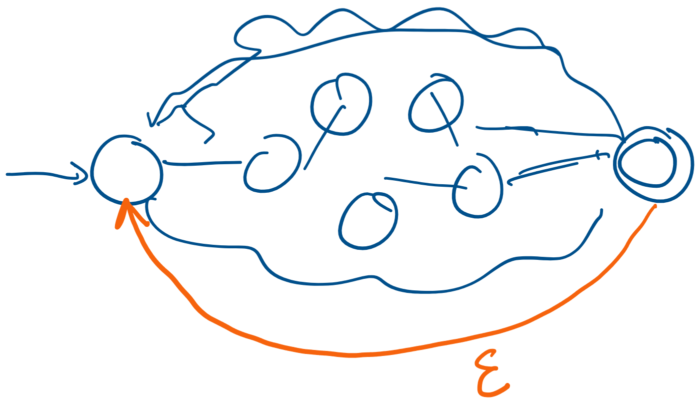
$\varepsilon \notin A^+$

$\varepsilon \in A^*$

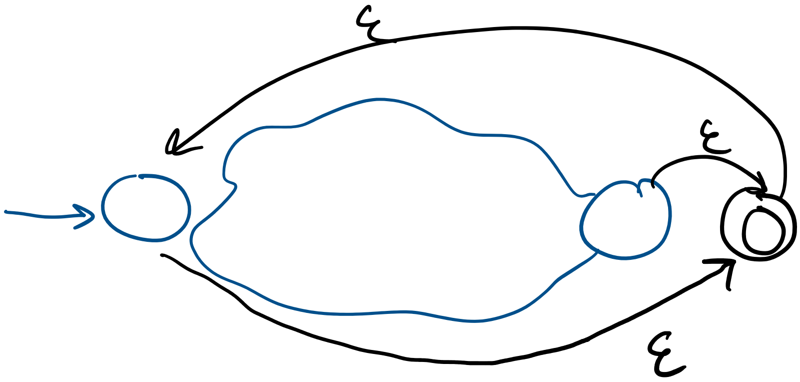
$\varepsilon \notin A^+$

$B = \{\varepsilon, aa, bb\}$

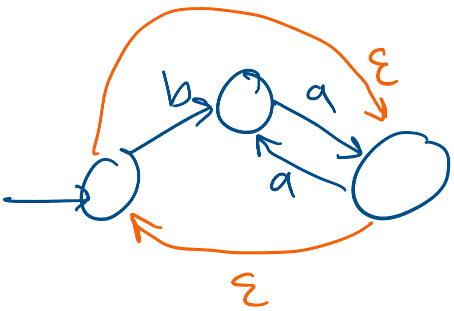
$B^+ = B^*$



$L(N_1)^+$ ✓



$L(N_1)^*$



counter example "aa"

* what if we have more than one start or accept states
* what about without using ε-transitions.