Sept 27

COMPSCI 3331

Fall 2022

What's next?

- Assignment 1: out now, due Oct 11.
- Quiz 1 tomorrow **IN CLASS**. in person, MC 110.
- Remaining material tomorrow - asynchronous.

no proof on the quiz.

2 questions.

Section 2.3.

Some questions ..

transition.

- Can a DFA match a prefix or suffix (ie: str*, obj*, db*, etc) or does each line have to match a single character to for each state ↑ one letter for each state currently.
- How do we start A1 Question 1? (Two proofs - Sept 21)

wild card system.

$L_1 \subseteq L_2$

$L^* = \bigcup_{i=0}^{\infty} L^i = \{\varepsilon\} \cup L \cup L^2 \cup \cdots$

$x \in L^* \Rightarrow \exists n \geq 0$ such that $y_1 y_2 \cdots y_n \in L$.

then $x = y_1 y_2 \cdots y_n$

↑

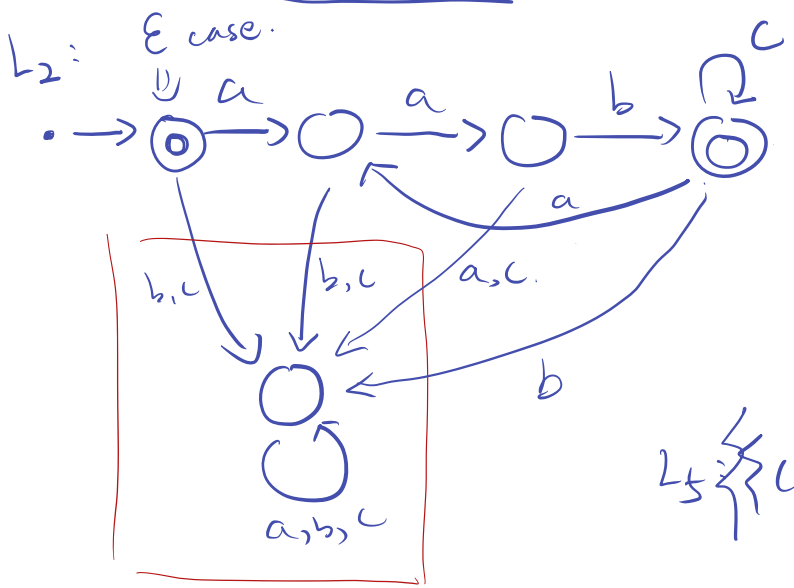
starting point.

DFAs

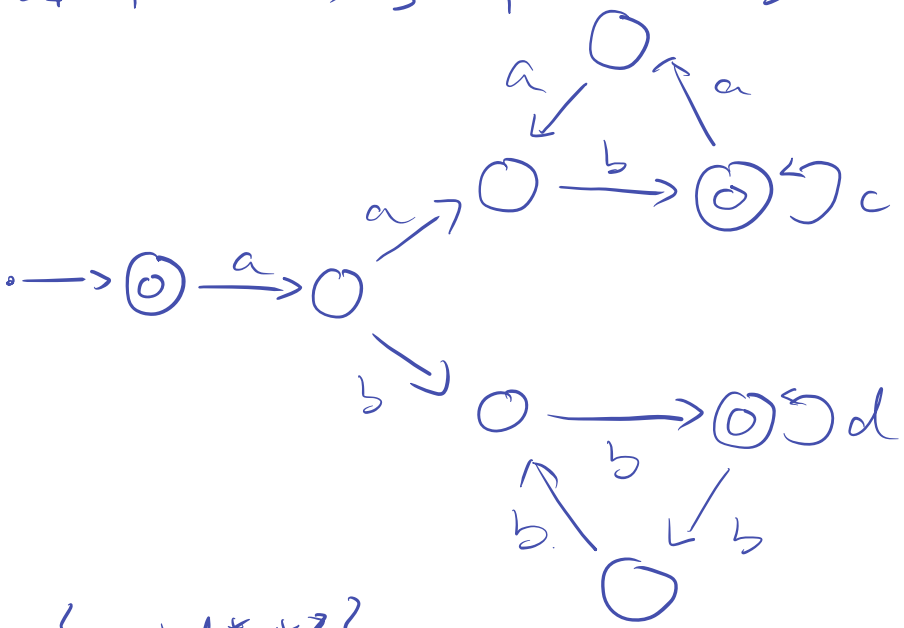
Build DFAs for the following languages.

- $L_2 = \{(aabc^*)^*\}$ ← any number of c.
- $L_3 = \{(abbd^*)^*\}$ → abb d*
- $L_4 = L_2 \cup L_3$

$L_4 = \{(aabc^*)^*\} \cup \{(abbd^*)^*\}$.



Sink stage.
all unspecified transitions should go into this stage.

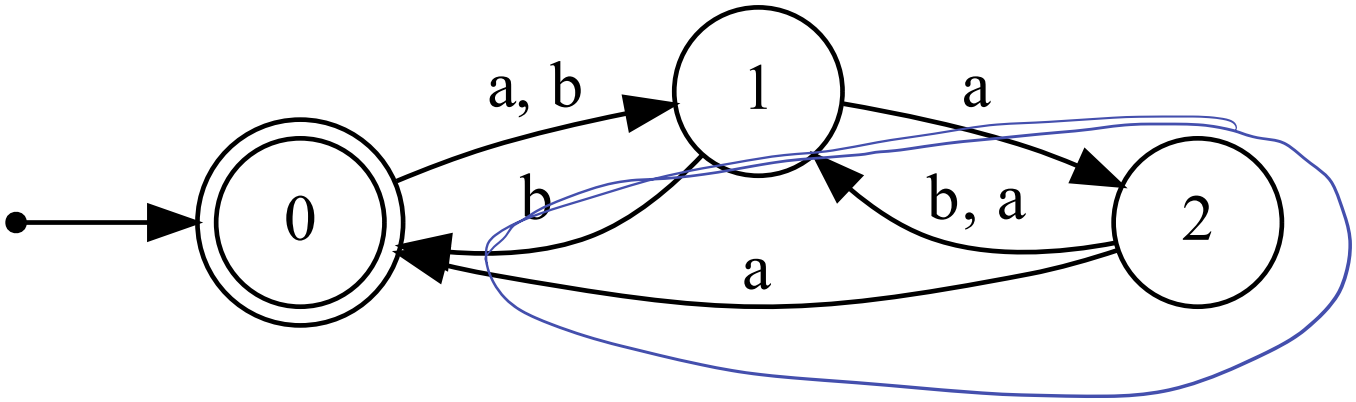


$L_5 = \{(aabc^*)^*\} \cup \{(aabd^*)^*\}$.

DFA must be determestic in each stage.

Sink stage is not added yet

NFAs



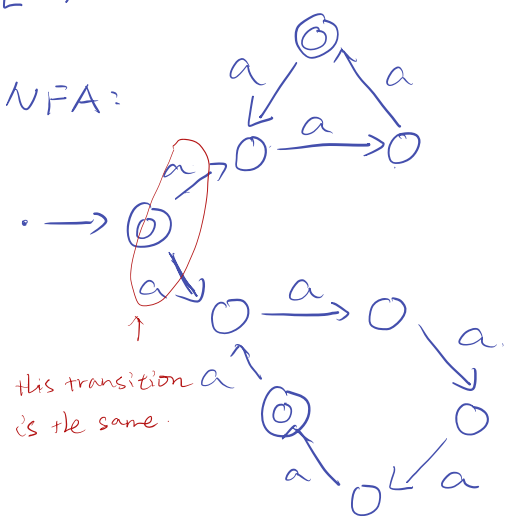
the difference is. in NFA, they could have multiple transition in each stage with same letter.

bua { 0 -> 1 -> 2 -> 0
      0 -> 1 -> 2 -> 1

* but 0 -> 1 -> 2 -> 1 is not the accepted path. 0 -> 1 -> 2 -> 1 is.

$L = \{a^i : i \equiv 0 \pmod 5 \vee i \equiv 0 \pmod 3\}$.

NFA:



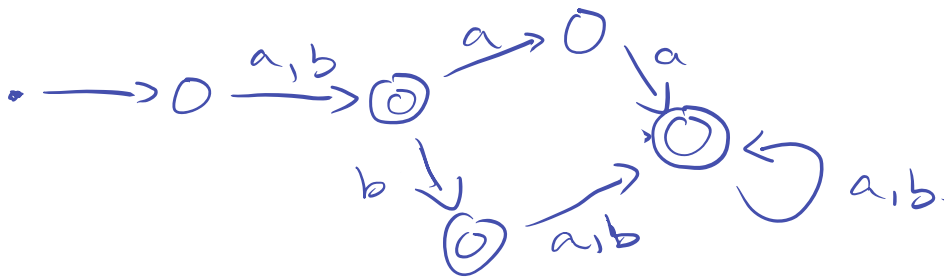
NFAs

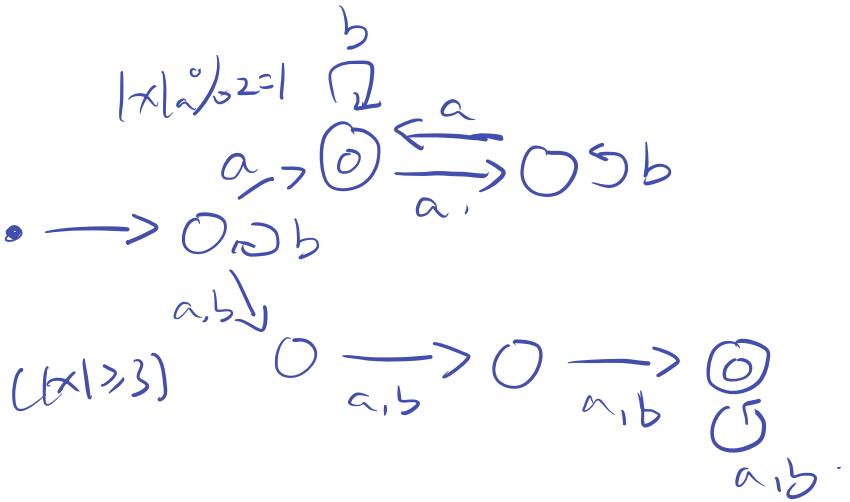
Which statements about NFAs are true?

- **A** In an NFA, there can be multiple transitions with the same label leaving one state. ✓
- **B** In an NFA, there must be more than one path through the NFA for **some** word.
- **C** To accept a word, every path from the initial state must end in a final state.
- **D** To accept a word, at least one path from the initial state must end in a final state. ✓
- **E** To **reject** a word, no paths from the initial state can end in a final state. ✓

NFAs

- $L_5 = \{x \in \{a,b\}^* \ : \ |x|_a \text{ is odd or } |x| \geq 3\}$





Subset Construction : Convert NFA to DFA.

- $M = (Q, \Sigma, \delta, q_0, F)$ be an NFA. $\delta : Q \times \Sigma \to 2^Q$. ($Q$: state, Σ: letter) $2^Q = \{P : P \subseteq Q\}$.
- Define a DFA $M_D = (2^Q, \Sigma, \delta_D, q_D, F_D)$.
- $\delta_D(P, a) =$
- $q_D =$
- $F_D =$

2^Q has 2^n subsets.
Q has n states.

the conversion from NFA to DFA could be expensive.

Subset Construction Example