Disc 6 - Automata

Wednesday, October 9, 2019 9:03 AM

Languages

1) Find language AB given A = {"aa", "c"} and B = {"b"}

{"aab", "cb"}

Regex Review

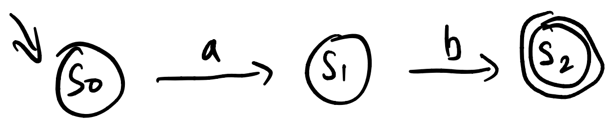
1) Write the regex that accepts binary numbers containing "101"

[01]*101[01]*

11011

Automata

1) Show a DFA that accepts "ab"



2) Formally define the DFA from 1)

5-tuple: (Σ, Q, q_0, F, δ}

all states in the DFA

starting state

{Final states}

set of all transitions

Σ: {a, b}

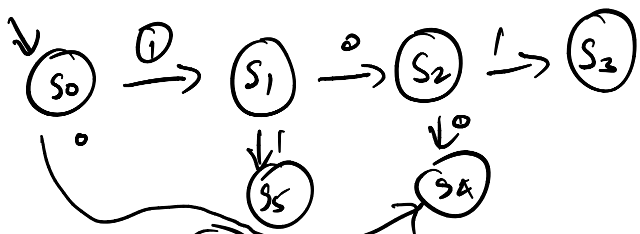
Q: {s_0, s_1, s_2}

q_0: s_0

F: {s_2}

δ: {
in, char, final
(s_0, a, s_1),
(s_1, b, s_2)
}

3) Show an NFA that accepts binary numbers containing "101"

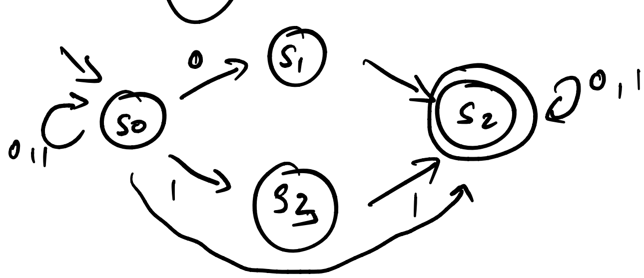


multiple transition state with same character

Empty transitions

4) Show an NFA that accepts binary numbers with either "00" or "11"

[01]*00|11 [01]*



Alphabet: set of all possible chars a string can contain

E.g. Binary : $\{0, 1\}$ Σ

English : $\{a\text{-}z\ A\text{-}Z\}$

Phone # : $\{0\text{-}9, -, +, (\ )\}$

email id : $\{a\text{-}z, @, ., 0\text{-}9\}$

String: any finite sequence of chars from alphabet. (S)

set

$\to \{\varepsilon, 0, 1, 00, 11, 10, 01 \dots\} =$ S

Permutations of every alphabet

$\to \{\varepsilon, a, b \dots z, aa, ab \dots\} =$ arbitrarily big

$\{aaa, aab, \dots aba, \dots zzz\} \to$ finite

Language: is a set of strings (L)

Operations:

① **Concatenation:** L_1, L_2 $L_1 = \{a, b\}, L_2 = \{1, 2\}$

$$L_1 L_2 = \{xy \mid x \in L_1 \ \&\&\ y \in L_2\}$$

$$= \{a1, a2, b1, b2\}$$

② **Union:** $L_1 \cup L_2 = \{x \mid x \in L_1 \ || \ x \in L_2\}$

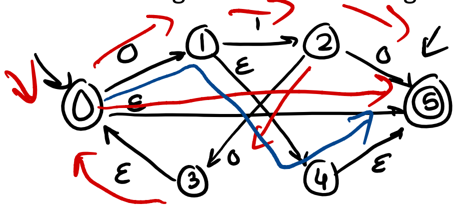
$$= \{a, b, 1, 2\}$$

③ **Kleene Closure:** K(*)

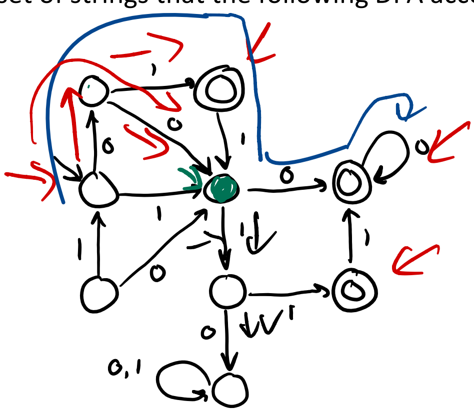
$$L_1^* = \{x \mid x = \varepsilon \ || \ a \ || \ b \ || \ aa \ || \ ab \dots$$

5) Find the set of strings that the following NFA accepts:

$\{\varepsilon \mid 010 \mid 01(001)^* 0 \mid 0\}$



a. Find the set of strings that the following DFA accepts:



$\{ 000^+$

$01 \mid 0111?\,0^+$ $\to 0$

0011

$01111?0^* \}$ $\to 1$