$$\begin{array}{r} {}^{1} \\ 56 \\ 16 \\ \hline 72 \end{array}$$

$$\begin{bmatrix} 5 \\ 1 \\ 7 \end{bmatrix} \begin{bmatrix} 6 \\ 6 \\ 2 \end{bmatrix} \qquad \cancel{\begin{bmatrix} 1 \\ 5 \\ 1 \end{bmatrix} \begin{bmatrix} 6 \\ 6 \\ 6 \end{bmatrix}}$$

Regular language

DFA/NFA accept

Regular expressions

$\circ, \cup, *$

$$(a \cup b)\circ b\circ a^* \left\{ \begin{array}{l} abaaa \\ ab \\ bbaa \\ \\ \cancel{ba} \end{array} \right.$$

R is a regular expression if

R is:

1. a for some $a \in \Sigma$
2. ε - empty string
3. $\emptyset$ - no string
4. $(R_1 \cup R_2)$ R_1, R_2 are reg. expr.
5. $(R_1 \circ R_2)$ ''
6. R_1^* R_1 reg. expr

$A \cup BC^*$

precedence order $*, \circ, \cup$

$R^+ = RR^*$

Σ^* any string over Σ

R^k = k occurrences of R

$L(R)$ language defined by R

contain exactly 1 a $\quad \Sigma = \{a, b\}$

$$b^* a b^*$$

contains string aba

$$(a \cup b)^* aba (a \cup b)^*$$

$$\Sigma^* aba \Sigma^*$$

even a's

$$\underbrace{(b^* a b^* a b^*)^*}$$

odd a's

$$b^* a(\qquad)$$

$$1^* \emptyset = \emptyset$$

$$1^* \circ \varepsilon = 1^*$$

$$\emptyset^* = \{\varepsilon\}$$

$$R \cup \emptyset = R$$

A language is regular if and only if some regular expression defines it.

I. If a language is described by a regular expression, then it is regular.

Suppose R is a regular expression. Show $L(R)$ is regular.

Construct an NFA that recognizes $L(R)$

6 cases:

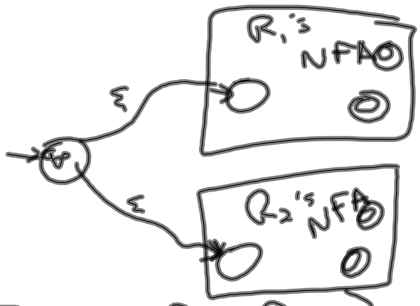
1. $R = a$ for some $a \in \Sigma$

   $L(R) = \{a\}$

2. $R = \varepsilon$

3. $R = \emptyset$

4. $R = R_1 \cup R_2$



5. $R = R_1 \circ R_2$
6. $R = R_1^*$

$\Big\}$ see other constructions

$(a+b)\bar{c}^{*}$