

# Regular languages

→ finite Automata

→ Regular Expression

$a \rightarrow$  Input Symbol  $\rightarrow$  what kind of string is accepted.

$\{ \overset{0}{a}, \overset{2}{aa}, \overset{4}{aaaa}, \overset{6}{aaaaaa}, \dots \} \rightarrow$  RS

Regular language  $\rightarrow$  Even set of strings

$\{ \Lambda, \underline{00}, 00\underline{00}, 0000\underline{00} - - - \}$

Regular language is  $\rightarrow$  Every set  
of strings

Regular Expression  $(00)^*$   $\begin{matrix} * = 0 & * = 1 \end{matrix}$   
 $\begin{matrix} * = 2, & 00 & * = 3 \\ & & - - - - - \end{matrix} \{ \Lambda, 00, 0000, 000000 - - - - - \}$

Regular  
Expression

→ Regular Set  
→ Regular Language

$(00)^*$  → Even Set of 0's & 1's  
RE

$\Sigma a$

## Properties of $R_1$ & $R_2$

- Set Union  $\rightarrow R_1 \cup R_2 =$
- Concatenation
- Closure(iteration)
- Set intersection
- Complementation

$$R_1 = aa^* = \{a, \overset{RS}{aa}, aqa - - - \}$$
$$R_2 = a^* = \{1, a, aa, aqa - - - \}$$

$R1 \cup R2$

$\{a, aa, aaa - - - -\} \rightarrow \text{Except Null}$   
 $\cup$   
 $\{\Lambda, a, aa, aaa - - - -\} \rightarrow \text{Any no of } \Lambda$   
union  
 $\{ \Lambda, a, aa, aaa - - - -\}$   
 $\Downarrow$   
 $aa^* \cup a^* \Rightarrow a^* \Rightarrow \text{Any no of } a's$

$R_1 = a \rightarrow R_1 \Rightarrow \text{only } a \text{ is accepted}$

$R_2 = aa \Rightarrow \text{only } aa$

$R_1 R_2 = aaa$

Concatenation

$R_1 R_2 = \underbrace{aaa} = RE$

$\rightarrow \text{only } aaa \text{ is accepted.}$

Concatenation  
1)

2)

$2 RE \rightarrow RE$   
 $2) RL = RL$

$R \Rightarrow a \rightarrow \text{only } a$

$$\underbrace{R^*} = \underbrace{a^*} = \text{Any no of } a^{\text{ts}}$$

Closure of  $R$  is also  $R \in R^*$

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Closure of  $a$  is  $a^* \Rightarrow \frac{h \cdot h}{\text{Any no of } a's}$

Any no?

$\mathbb{Z} \rightarrow (\mathbb{Q}/\mathbb{Z})^* \rightarrow \text{even no of a's}$

$RS_1 \cap RS_2 \Rightarrow$  find common

Intersection  $\rightarrow a^* \cap (a^*)^* = (aa)^*$

$\Sigma^1, aa, aaaa - - - - -$   
 $\Downarrow$   
 $\underbrace{(aa)^*}_{\text{R.E.}} \rightarrow \underbrace{\text{Even no of } a's}_{\text{R-L.}}$



$R.S_1 = \{ \underline{a}, \xrightarrow{(aa)^*} aa, aaaa, aaaaaa, \dots \}$

$R\bar{S}_1 =$  All set of strings not included in  $R.S_1$

$R\bar{S}_1 \neq \{ a, aqa, aqaqa, \dots \}$

$R.E = \underline{aa^*}$

$R-h =$  Accepting odd no of  $a$ 's

1) Union  
2) Intersection  
3) Concatenation  
4) Closure  
5) Intersection

$R-S \Rightarrow RE \rightarrow R-d$