Grammar Examples

- G=(N,T,P,S) : ({S}, {a,b}, { S→aS, S→bS, S→a, S→b}, S), L(G)= ?
- S ⇒ a
- S ⇒ b
- S ⇒ aS ⇒ aa or S ⇒* aa
- S ⇒ aS ⇒ ab or S ⇒* ab
- S ⇒ bS ⇒ ba or S ⇒* ba
- S ⇒ bS ⇒ bb or S ⇒* bb
- Language L(G)={a,b,aa,ab,ba,bb.....} = {a,b}* - **ε**

Grammar Examples

- G=(N,T,P,S) : ({S,B}, {a,b}, { S→aB, S→a, B→bB, B→aB, B→a, B→b }, S), L(G)= ?
- $S \Rightarrow a$
- $S \Rightarrow aB \Rightarrow aa$ or $S \Rightarrow^* aa$
- $S \Rightarrow aB \Rightarrow ab$ or $S \Rightarrow^* ab$
- $S \Rightarrow aB \Rightarrow aaB \Rightarrow aaa$
- $S \Rightarrow aB \Rightarrow aaB \Rightarrow aab$
- $S \Rightarrow aB \Rightarrow abB \Rightarrow aba$
- $S \Rightarrow aB \Rightarrow abB \Rightarrow abb$
- Language L(G)={a,aa,ab,aaa,aab,aba,abb.....} = {w ∈ {a,b}* | w begins with symbol a}

Grammar Examples

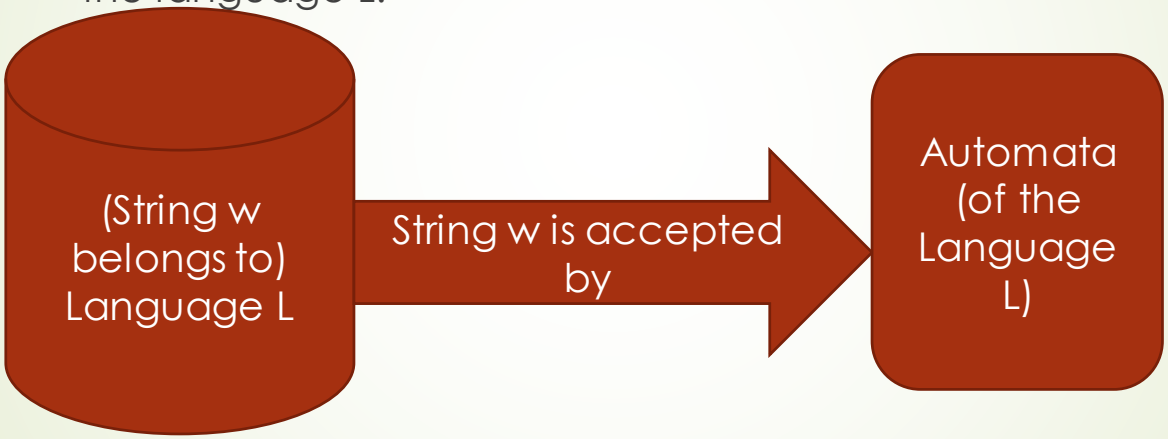
- G=(N,T,P,S) : ({S}, {a,b}, { S→aSb, S→ab }, S), L(G)= ?
- S ⇒ ab
- S ⇒ aSb ⇒ aabb
- S ⇒ aSb ⇒ aaSbb ⇒aaabbb
- S ⇒ aSb ⇒ aaSbb ⇒aaaSbbb ⇒aaaabbbb
- Language L(G)={ab,aabb,aaabbb,aaaabbbb.....} = {w ∈ {a,b}* | w is of the form $a^n b^n$, n>=1}

Language generated by a Grammar L(G)

- Language generated by a grammar L(G) is defined as **set of all possible sentences (strings of terminal symbols only)** that can be derived from / generated by the Grammar G.
- $L(G)=\{w \in \mathbf{T}^* \mid S \Rightarrow^* w$ under grammar $G\}$

Automata
Language accepting Device

- Automata of a language L accepts set of all possible sentences/strings in the language L.



Automata Types

1. Finite State Automata
2. Pushdown Automata
3. Linear Bounded Automata
4. Turing Machine

Languages, Grammars and Automata

Grammar	Language	Automata
Type 0 Grammar Unrestriced Grammar	Recursively Enumerable Language	Turing Machine
Type 1 Grammar Context Sensitive Grammar	Context Sensitive Language	Linear Bounded Automata
Type 2 Grammar Context Free Grammar	Context Free Language	Pushdown Automata
Type 3 Grammar Regular Grammar	Regular Language	Finite State Automata