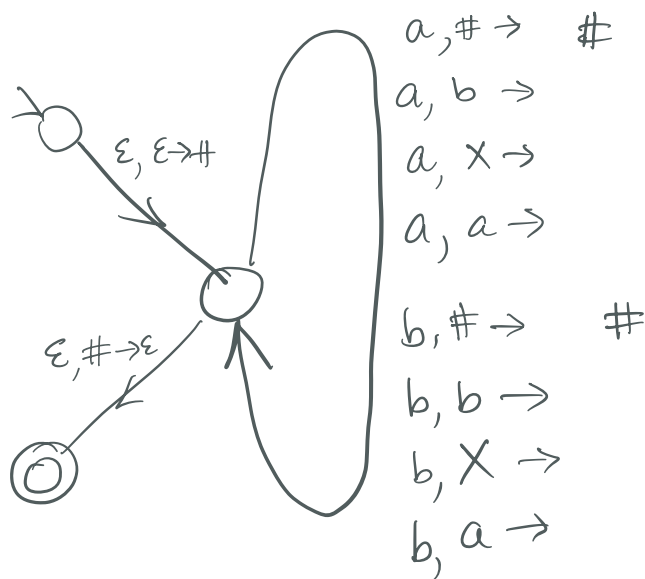


Tutorial - Parsers: Top-Down + Bottom-Up.

aa b

Give a natural PDA for $\{w \in \{a,b\}^* \mid \#_a(w) = 2\#_b(w)\}$.



Strategy

- bottom of stack.

- use stack to record what you expect to see ("pop + match")

Stack legend:

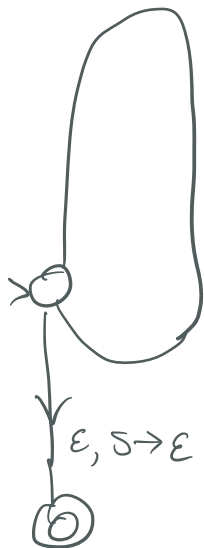
- b = "need to see b on input"
- X = "need to see an a and b"
- a = "need to see an a"

CFG for " $\#_a(w) = 2\#_b(w)$ " :

$$S \rightarrow SaSbSbS \mid SaSbSaS \mid SbSaSaS \mid \epsilon$$

Top-Down Parser for the language

Bottom-Up Parser for the language



$$1. S \rightarrow (S) \mid SS \mid \varepsilon$$

construct Top-Down & Bottom-Up Parser PDAs for the language.

2. Give a CFG, natural PDA, and B.U. Parser for $\{a^i b^n : n \geq 0, i = n \text{ or } i = 2n\}$

3. Give a CFG, natural PDA, and T.D. Parser for $\{ww' \mid w \in \{a,b\}^* \text{ and } w' = w^R \text{ or } w' = a^{|w|}\}$

4. $L_4 = \{w \in \{a,b\}^* \mid \text{first, last, and middle symbols of } w \text{ are identical. } |w| \text{ is odd}\}$

Give CFG, natural PDA for L_4 , and prove L_4 is not regular.