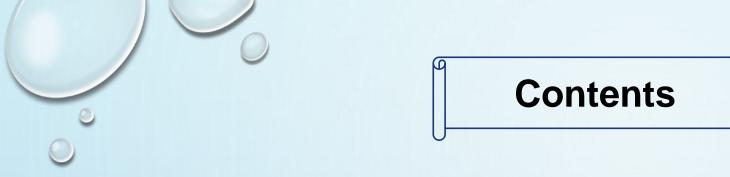


Conversion of CFG to CNF



- 1. Remove ε-productions (Step 1)
- 2. Remove unit productions (Step 2)
- 3. Remove terminals in long productions (Step 3)
- 4.Convert long productions to binary productions (Step 4)





Remove Null Production

Remove ε-productions and add alternatives without nullable variables.

Before:

$$S \rightarrow ABe \mid DAB$$

$$A \to a \mid \epsilon$$

$$\mathsf{B} \to \mathsf{b}$$

$$\mathsf{D} \to \mathsf{C} \mid \mathsf{d}$$

$$C \to \epsilon$$

After:

$$S \rightarrow ABe \mid Be \mid DAB \mid AB \mid DB \mid B$$

$$A \rightarrow a$$

$$\mathsf{B}\to\mathsf{b}$$

$$\mathsf{D} \to \mathsf{d}$$



Remove Unit Production

Replace rules like $A \to B$ with actual rules from B .Here Only unit production is B so We remove it.

Before:

$$S \rightarrow ABe \mid Be \mid DAB \mid AB \mid DB \mid B$$

$$A \rightarrow a$$

$$\mathsf{B}\to\mathsf{b}$$

$$\mathsf{D} \to \mathsf{d}$$

After

$$S \rightarrow ABe \mid Be \mid DAB \mid AB \mid DB \mid b$$

$$A \rightarrow a$$

$$\boldsymbol{B} \to \boldsymbol{b}$$

$$\boldsymbol{D} \to \boldsymbol{d}$$



Replace Terminals in Long Productions

Introduce new variables for terminals in long RHS.

Before:

 $S \rightarrow ABe \mid Be \mid DAB \mid AB \mid DB \mid b$

 $A \rightarrow a$

 $\mathsf{B}\to\mathsf{b}$

 $D \rightarrow d$

After:

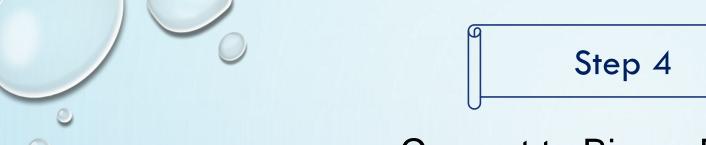
 $S \rightarrow ABY \mid BY \mid DAB \mid AB \mid DB \mid b$

 $A \rightarrow a$

 $\mathsf{B}\to\mathsf{b}$

 $\mathsf{D} \to \mathsf{d}$

 $Y \rightarrow e$



Convert to Binary Productions

Break RHS with 3 or more variables into binary productions

Before:

 $S \rightarrow ABY \mid BY \mid DAB \mid AB \mid DB \mid b$

 $A \rightarrow a$

 $B \rightarrow b$

 $\mathsf{D} \to \mathsf{d}$

 $Y \rightarrow e$

After:

 $S \rightarrow XY \mid BY \mid DX \mid X \mid DB \mid b$

 $X \to AB$

 $Y \to e$

 $A \rightarrow a$

 $\mathsf{B}\to\mathsf{b}$

 $\mathsf{D}\to\mathsf{d}$



Thank you all