

CSCF 301 - Lecture 28: Parsing I

$P \rightarrow Stmt ; Smt$

Stmt \rightarrow if Cond { }

$$\Sigma = \{0, 1, \dots, 9, +, -, *, /, (), \}\$$

$$E \rightarrow E + E$$

(1)

$$\begin{array}{c} | \\ E - E \\ | \\ E \times E \\ | \\ E / E \\ | \\ (E) \\ | \quad 0 \quad 1 \quad 2 \quad \dots \end{array}$$

$$\textcircled{1} \quad E \Rightarrow \overline{E+E}$$

$$\overline{E+E} \Rightarrow \overline{E}$$

$$\overline{E} + \overline{E} \star \overline{E}$$

$$\overline{1} + \overline{E} \star \overline{E}$$

$$\overline{1} + \overline{1} \star \overline{E}$$

$$1 + 1 \star 4$$

$$\begin{aligned}
 ② E &\rightarrow \underline{E} + \underline{E} \\
 &\Rightarrow 1 + \underline{E} \\
 &\Rightarrow 1 + \underline{E} * \underline{E} \\
 &\quad | + 1 * \underline{E} \\
 &\quad | + 1 * 4
 \end{aligned}$$

$$\omega = 1 + 1 * 4$$

left-most derivation

$$\begin{array}{c}
 \textcircled{3} \\
 \text{rightmost derivation} \\
 \boxed{E} \Rightarrow E \star \underline{E} \\
 \begin{array}{c}
 E \star 4 \\
 = \\
 \underline{E + E} \star 4 \\
 = \\
 \underline{E + 1} \star 4 \\
 = \\
 1 + 1 \star 4
 \end{array}
 \end{array}$$

$$\textcircled{4} \quad E \Rightarrow \underline{E+E} \\ \Rightarrow E - E + E$$

Diagram 2 shows a binary tree with root E. The left child is E and the right child is E. The left E has a left child E and a right child E. The left E has a left child I and a right child E. The right E has a left child I and a right child E. The left E has a left child I and a right child E.

Diagram 3 shows a binary tree with root E. The left child is E and the right child is E. The left E has a left child E and a right child E. The left E has a left child I and a right child E. The right E has a left child I and a right child E. The left E has a left child I and a right child E.

$$\textcircled{1} \quad \begin{array}{c} \text{C} \\ | \\ \text{C} + \text{H}_2 \xrightarrow{\text{Cu}} \text{CH}_3 \end{array}$$

2

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graph TD
    E1[E] --> E2[E]
    E1 --> E3[E]
    E2 --> I1[I]
    E3 --> E4[E]
    E3 --> E5[E]
    E4 --> I2[I]
    E5 --> I3[I]
    E5 --> I4[I]
  
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Def: A grammar is **ambiguous** if some string w has more than one parse tree.

Equivantly: A grammar is **ambiguous** if there is more than one left-most derivation for some string.

Ex. A

$G_1:$

$$\begin{aligned} S &\rightarrow \epsilon \\ S &\rightarrow aSa \\ S &\rightarrow bSb \end{aligned}$$

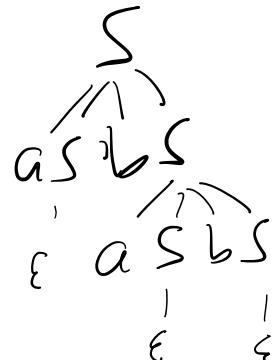
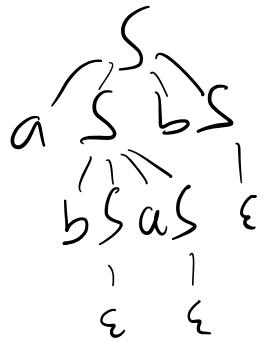
$G_2:$

$$\begin{aligned} S &\rightarrow \epsilon \\ S &\rightarrow aSbS \\ S &\rightarrow bSaS \end{aligned}$$

$$S \Rightarrow aSbS$$

~~abSaSbS~~

$$\begin{aligned} S &\Rightarrow aSbS \\ aSb &aSbS \\ &\downarrow \quad \downarrow \quad | \\ &\{\quad \epsilon \quad \epsilon \end{aligned}$$



Backtracking

top-down
w \in Σ^*

bottom-up
 $w \in \Sigma^*$

