lecture 2 Gramma

Eg. 1

$\Sigma = \{a, b\}$. then $\Sigma^* = \{\varepsilon, a, b, aa, ba, ab, bb, aaa, \cdots\}$

pay attention to the differences ε. $\{\}$. and $\{\varepsilon\}$

Eg 2. $E \to i$

$E \to E+E$

$E \to E*E$

$E \to (E)$

Derivations of $(i+i)$

$E \Rightarrow (E) \Rightarrow (E+E) \Rightarrow (i+E) \Rightarrow (i+i)$

Eg. 3 G_1: $S \to bA$

$A \to aA \mid a$

From the Start Symbol S, we have

$S \Rightarrow bA \Rightarrow ba$

$S \Rightarrow bA \Rightarrow baA \Rightarrow baa$

$S \Rightarrow bA \Rightarrow baA \Rightarrow baaA \Rightarrow \cdots \Rightarrow ba\cdots a$

$L(G_1) = \{b a^n \mid n \geq 1\}$ start with b, followed by n. a, $n \geq 1$

Eg. 4 G_2: $S \to AB$

$A \to aA \mid a$

$B \to bB \mid b$

$L(G_2) = \{a^m b^n \mid m, n \geq 1\}$

Eg. 5 Construct a grammar G_3 and let

$L(G_3) = \{a^n b^n \mid n \geq 1\}$

$S \to aSb \mid ab$

Eg. 6. rightmost derivation

$E \Rightarrow (E) \Rightarrow (E+E) \Rightarrow (E+i) \Rightarrow (E*E+i) \Rightarrow (E*i+i) \Rightarrow (i*i+$

leftmost derivation

$E \Rightarrow (E) \Rightarrow (E+E) \Rightarrow (E*E+E) \Rightarrow (i*E+E) \Rightarrow (i*i+E) \Rightarrow (i*i+$

Eg. 7.

using context-free grammar we can obtain

$$L = \{ a^n b^n c^i \mid i \geq 1, n \geq 1 \}$$

$S \to AB$

$A \to aAb \mid ab$

$B \to cB \mid c$

but we cannot use context-free grammar to obtain

$$L = \{ a^n b^n c^n \mid n \geq 1 \}$$

$S \to aSBA$ $\quad AA' \to AB$

$S \to abB$ $\quad bA \to bb$ context-sensitive grammar

$BA \to BA'$ $\quad bB \to bc$

$BA' \to AA'$ $\quad cB \to cc$

$L_0 = \{ \alpha c \alpha \mid \alpha \in (a|b)^* \}$ only can be described using Type-0 grammar.

Context-free grammar has the ability to describe most syntax structure of modern program language.