ABC karakterek veges nem ures halmaza,

pl:

$$V = \{a, b, c\}$$

szo ABC elemeibol alkotott veges sorozat,

pl:

$$ab, ccc, \varepsilon \quad \text{(ures szo)}$$

szonak hossza trivialis

pl:

$$u = abc \qquad |u| = 3$$

tukrozes reverse tulajdonkeppen

$$u^{-1} = cba$$

konkatenalas

$$v := bb, \quad uv = abcbb \quad vu = bbabc$$

$\boldsymbol{V^*}$: V felett osszes lehetseges szo

$\boldsymbol{V^+}$: $V^* \setminus \varepsilon$

$$\forall w \in V^* : \varepsilon w = w\varepsilon = w$$

$$\forall u, v \in V^* : (uv)^{-1} = v^{-1}u^{-1}$$

iteralt (hatvany) i-edik hatvanya egy szonak az onmagaval vett i-szeres konkatenaltja

$$u^0 := \varepsilon, \quad u^i := uu^{i-1} \qquad (i \geq 1)$$

pl:

$$u = abc, \quad u^0 = \varepsilon, \quad u^1 = abc, \quad u^2 = abcabc, \quad u^3 = abcabcabc, \quad \ldots$$

nyelv szavak tetszoleges halmaza

$$L \subseteq V^*$$

pl:

$$L_1 = \{a, ab\}, \quad L_2 = \{c\}, \quad L_3 = \{bc\}, \quad L_4 = \{a^n b^n \mid n \geq 0\}, \quad L_5 = \{(ab)^n \mid n \geq 0\}$$

ezeken lehet ertelmezni muveleteket:

$$L_4 \cap L_5 = \{\varepsilon, ab\}$$

nyelvek konkatenaltja a nyelvbeli szavakat konkatenealjuk es osszevetjuk az eredmenyt

pl:

$$L, L' \subseteq V^* : LL' = \{wv, u \in L, v \in L'\}$$

$$L_1 L_2 \cap L_1 L_3 = \{abc\}$$

$$L_1 L_2 \cup L_1 L_3 = \{ac, abc, abbc\}$$

kiegeszites

$$\Phi L = L\Phi = \Phi \text{ (ures nyelv + L)}$$

$$\{\varepsilon\}L = L\{\varepsilon\} = L \text{ (ures szobol allo nyelv + L)}$$

Nyelv iteraltja hasonlo az elozo iteralthoz

$$L^0 := \{\varepsilon\}, \quad L^i := LL^{i-1} \quad (i \geq 1)$$

Lezart

$$L^* = \bigcup_{i \geq 0} L^i, \quad L^+ = \bigcup_{i \geq 1} L^i$$

$$L^+ \stackrel{?}{=} L^* \setminus \{\varepsilon\}$$

$$L^* = \underbrace{L^0}_{\{\varepsilon\}} \cup \underbrace{\bigcup_{i \geq 1} L^i}_{L^+}$$

$$L^+ = L^* \setminus \{\varepsilon\} \Longleftrightarrow \varepsilon \notin L$$

generativ grammatika

egy modszer arra hogy tudjunk nyelveket megadni

hivatalosan ez egy NTSR rendezett negyes

$G = (N, T, S, R)$

$$\left.\begin{array}{l} N - \text{nemterminalis abc, veges nem ures halmaz } (0 < |N| < +\infty) \\ T - \text{terminalis abc, veges nem ures halmaz } (0 < |T| < +\infty) \end{array}\right\} N \text{ es } T \text{ diszjunktak } \ (N \cap T = \emptyset)$$

S - startszimbolum, $(S \in N)$

R - atirasi szabalyok halmaza $(R \subseteq (N \cup T)^* N (N \cup T)^* \times (N \cup T)^*, \quad |R| < +\infty)$

$(x, y) \in R \sim x \to y$

$$\alpha, \beta \in (N \cup T)^*, \quad \alpha \underset{G}{\Longrightarrow} \beta : \exists u, v \in (N \cup T)^*, \quad (x, y) \in R, \quad \alpha = uxv, \quad \beta = uyv$$

pl:

$$G_1 = (\{S\}, \{a, b\}, S, R)$$

$$R = \{S \to aSb, \quad S \to \varepsilon\}$$

$aSaSb \underset{G_1}{\Longrightarrow} aaSbaSb$

$aSaSb \underset{G_1}{\Longrightarrow} aaSb$

$aSaSb \underset{G_1}{\Longrightarrow} aSaaSbb$

$aSaSb \underset{G_1}{\Longrightarrow} aSab$

$\alpha \overset{*}{\underset{G}{\Longrightarrow}} \beta : \alpha = \beta \quad \text{vagy} \quad \exists \gamma_1, \gamma_2, ..., \gamma_n \in (N \cup T)^* : \alpha = \gamma_1, \beta = \gamma_n, \gamma_i \underset{G}{\Longrightarrow} \gamma_{i+1} \quad (i = 1, ..., n-1)$

$L(G) = \left\{ u \in T^* : S \overset{*}{\underset{G}{\Longrightarrow}} u \right\}$

1

$L(G_1) = ?$

$S \underset{G_1}{\Longrightarrow} \underline{\underline{\varepsilon}}$

$S \underset{G_1}{\Longrightarrow} aSb \underset{G_1}{\Longrightarrow} \underline{\underline{ab}}$

$S \underset{G_1}{\Longrightarrow} aSb \underset{G_1}{\Longrightarrow} aaSbb \underset{G_1}{\Longrightarrow} \underline{\underline{aabb}}$

$S \underset{G_1}{\Longrightarrow} aSb \underset{G_1}{\Longrightarrow} aaSbb \underset{G_1}{\Longrightarrow} aaaSbbb \underset{G_1}{\Longrightarrow} \underline{\underline{aaabbb}}$

$\vdots$

$L(G_1) = \{a^n b^n \mid n \geq 0\}$

2

$G_2 = (\{A, B\}, \{a, b\}, A, \{A \to aB \mid \varepsilon, B \to bA\})$

$L(G_2) = ?$

$A \Longrightarrow \varepsilon$

$A \Longrightarrow aB \Longrightarrow abA \Longrightarrow ab$

$A \Longrightarrow aB \Longrightarrow abA \Longrightarrow abaB \Longrightarrow ababA \Longrightarrow abab$

$A \Longrightarrow aB \Longrightarrow abA \Longrightarrow abaB \Longrightarrow ababA \Longrightarrow ababaB \Longrightarrow ababab$

$\vdots$

$L(G_2) = \{(a, b)^n \mid n \geq 0\}$

3

$G_3 = (\{S, X, Y\}, \{a, b, c\}, S, \{S \to abc \mid aXbc, Xb \to bX, Xc \to Ybcc, bY \to Yb, aY \to aaX \mid aa\})$

$S \Longrightarrow \underline{\underline{abc}}$

$S \Longrightarrow aXbc \Longrightarrow abXc \Longrightarrow abYbcc \Longrightarrow aYbbcc \Longrightarrow \underline{\underline{aabbcc}}$

$S \Longrightarrow aXbc \Longrightarrow abXc \Longrightarrow abYbcc \Longrightarrow aYbbcc \Longrightarrow aaXbbcc \Longrightarrow aabXbcc \Longrightarrow aabbXcc \Longrightarrow aabbYbccc \Longrightarrow aabYbbccc \Longrightarrow aaYbbbccc \Longrightarrow \underline{\underline{aaabbbccc}}$

$\vdots$

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