

16.11.2021

Seminar 8 – CFG, Recursive Descendent Parser

1. Given the CFG grammar below, give a leftmost/rightmost derivation for w .

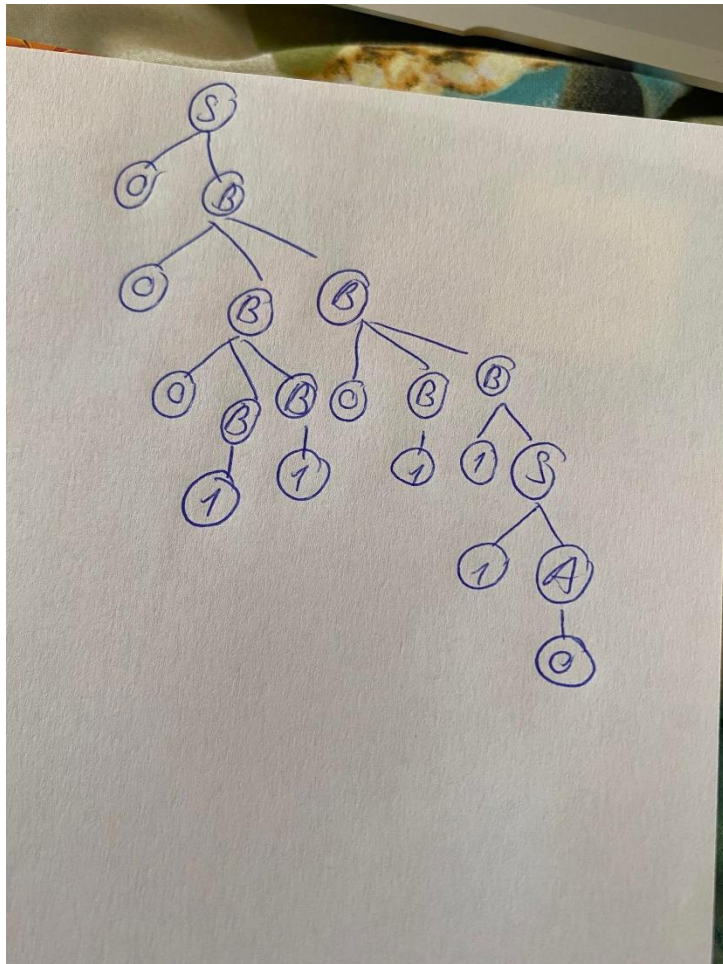
a. $G = (\{S, A, B\}, \{0, 1\}, \{S \rightarrow 0B \mid 1A, A \rightarrow 0 \mid 0S \mid 1AA, B \rightarrow 1 \mid 1S \mid 0BB\})$,
 $w = 0001101110$

@B Andrada T.

Leftmost: 1886686723

$S \Rightarrow 0B \Rightarrow 00BB \Rightarrow 000BBB \Rightarrow 0001BB \Rightarrow 00011B \Rightarrow 000110BB \Rightarrow 0001101B \Rightarrow 00011011S \Rightarrow$
 $000110111A \Rightarrow 0001101110$

#IW Andrada T.



Rightmost:1872387166

$S \Rightarrow 0B \Rightarrow 00BB \Rightarrow 00B1S \Rightarrow 00B11A \Rightarrow 00B110 \Rightarrow 000BB110 \Rightarrow 000B1S110 \Rightarrow 000B10B110 \Rightarrow 000B101110 \Rightarrow 0001101110$

HW – parse tree as graph

b. $G = (\{E, T, F\}, \{a, +, *, (,)\}, \{E \rightarrow E + T \mid T, T \rightarrow T * F \mid F, F \rightarrow (E) \mid a\})$

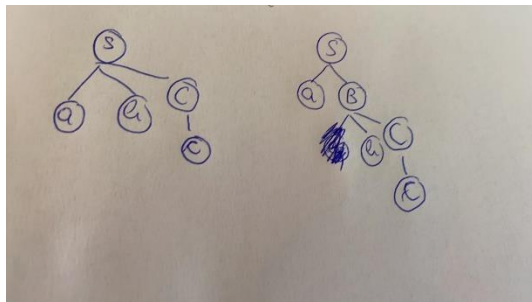
$w = a * (a + a) -$ HW

2. Prove that the following grammars are ambiguous

a. $G_1 = (\{S, B, C\}, \{a, b, c\}, \{S \rightarrow abC \mid aB, B \rightarrow bC, C \rightarrow c\}, S)$

#IW Andrada T.

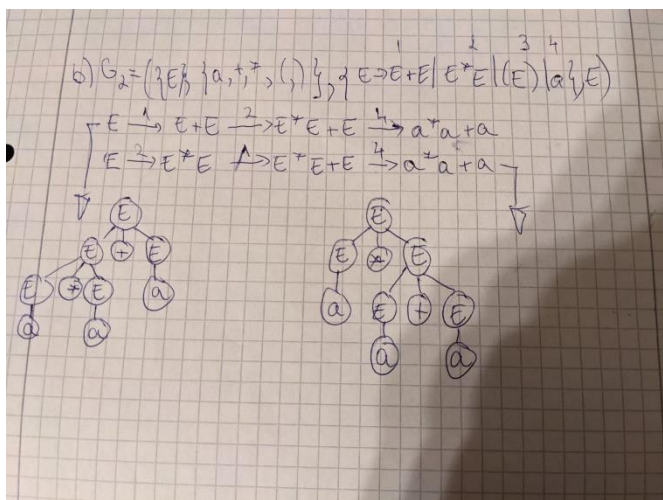
$w = abc$



b. $G_2 = (\{E\}, \{a, +, *, (,)\}, \{E \rightarrow E + E \mid E * E \mid (E) \mid a\}, E)$

#IW Alexandra T. David T., Andrada T., Liviu V.

$w = a * a + a$



3. Given the CFG $G = (\{S\}, \{a, b, c\}, \{S \rightarrow aSbS \mid aS \mid c\})$, parse the sequence $w = aacbc$ using rec. desc. parser.

$(S_1) : S \rightarrow aSbS$

$(S_2) : S \rightarrow aS$

$(S_3) : S \rightarrow c$

#VA Alin T.

$(q, 1, \epsilon, S) \mid\text{-exp } (q, 1, S_1, aSbS) \mid\text{-adv } (q, 2, S_1a, SbS) \mid\text{-exp } (q, 2, S_1aS_1, aSbSbS) \mid\text{-adv}$
 $(q, 3, S_1aS_1a, SbSbS) \mid\text{-exp } (q, 3, S_1aS_1aS_1, aSbSbSbS) \mid\text{-mi } (b, 3, S_1aS_1aS_1, aSbSbSbS) \mid\text{-at}$
 $(q, 3, S_1aS_1aS_2, aSbSbS) \mid\text{-mi } (b, 3, S_1aS_1aS_2, aSbSbS) \mid\text{-at } (q, 3, S_1aS_1aS_3, cbSbS) \mid\text{-adv}$
 $(q, 4, S_1aS_1aS_3c, bSbS) \mid\text{-adv } (q, 5, S_1aS_1aS_3cb, SbS) \mid\text{-exp } (q, 5, S_1aS_1aS_3cbS_1, aSbSbS) \mid\text{-mi}$
 $(b, 5, S_1aS_1aS_3cbS_1, aSbSbS) \mid\text{-at } (q, 5, S_1aS_1aS_3cbS_2, aSbS) \mid\text{-mi } (b, 5, S_1aS_1aS_3cbS_2, aSbS) \mid\text{-at}$
 $(q, 5, S_1aS_1aS_3cbS_3, cbS) \mid\text{-adv } (q, 6, S_1aS_1aS_3cbS_3c, bS) \mid\text{-mi } (b, 6, S_1aS_1aS_3cbS_3c, bS) \mid\text{-bk}$
 $(b, 5, S_1aS_1aS_3cbS_3, cbS) \mid\text{-at } (b, 5, S_1aS_1aS_3cb, SbS) \mid\text{-bk } (b, 4, S_1aS_1aS_3c, bSbS) \mid\text{-bk}$
 $(b, 3, S_1aS_1aS_3, cbSbS) \mid\text{-at } (b, 3, S_1aS_1a, SbSbS) \mid\text{-bk } (b, 2, S_1aS_1, aSbSbS) \mid\text{-at}$
 $(q, 2, S_1aS_2, aSbS) \mid\text{-} \dots \mid\text{-} (q, 6, S_1aS_2aS_3cbS_3c, \epsilon) \mid\text{-succ } (f, 6, S_1aS_2aS_3cbS_3c, \epsilon)$

Parse tree: $S_1S_2S_3S_3$