SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

COMPILIER @Liu Yepang 2019

for SUSTech CSE

HomeWork 3
Edited by

汪至圆

11610634

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SHENZHEN

1 Consider the following context-free grammar G

$$S \to SS + |SS * |a$$

1.1 Is the string a+a∗a in L(G)? [20 points]:

No, it isn't in L(G). For this grammar, the first two character of the string must be aa or the string just have a single character a.

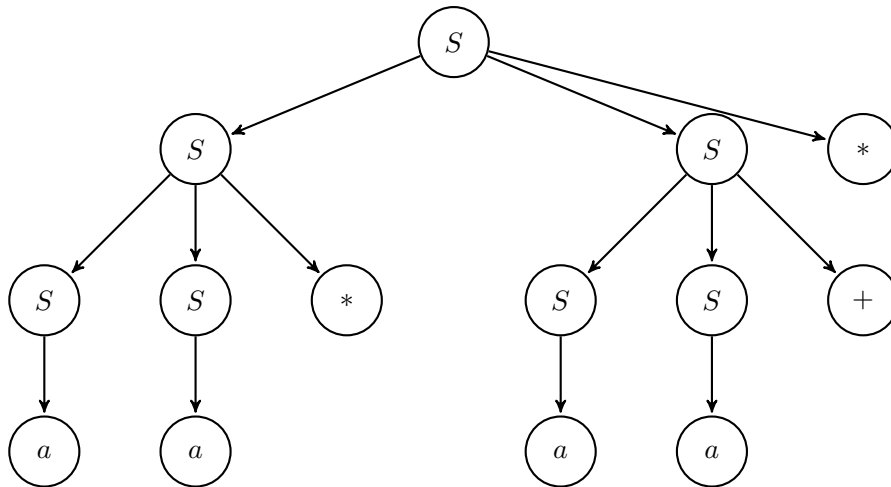## 1.2 Give a leftmost derivation for the string aa∗aa+∗. [20 points]:

$$S \to SS* \to SS * S* \to aS * S* \to aa * S* \to aa * SS + * \to aa * aS + * \to aa * aa + *$$

1.3 Give a rightmost derivation for the stringaa∗aa+∗. [20 points]:

$$S \to SS* \to SSS + * \to SSa + * \to Saa + * \to SS * aa + * \to Sa * aa + * \to aa * aa + *$$

1.4 Give a parse tree for the string aa ∗ aa + ∗. [20 points]:

1.5 Give an equivalent grammar without immediate left recursions. [20 points]

$S \to aS'$

$S' \to S + S'|S * S'|\epsilon$

2 Optional Exercises (20 bonus points)

2.1 Exercise 1: Consider the following context-free grammar:

$$短语 \rightarrow 人 \mid 短语 \ \ 动词 \ \ 短语$$

$$动词 \rightarrow 喜欢 \mid 不喜欢$$

$$人 \rightarrow 你 \mid 我 \mid 他$$

The grammar can produce sentences such as "我喜欢你". Is the grammar ambiguous? If yes, please give one sentence and its multiple parse trees. If no, state the reason. [5 points for the yes/no answer and 15 points for the justification]

Yes, it's ambiguous. For example, for the sentence "我不喜欢他喜欢你", we can get two parse tree like below: