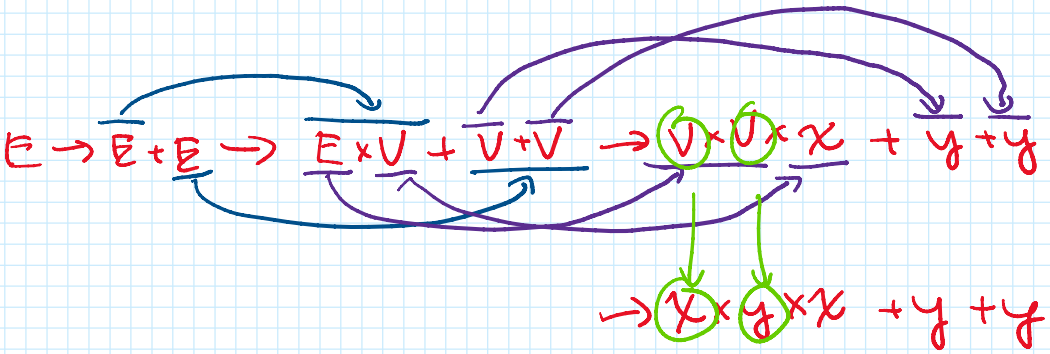
CS 173 Lecture 15b: Grammar Trees

Parse Tree / Grammar Tree

Visualizing recursive derivation of a string from a CFG.



Better way of showing the steps!

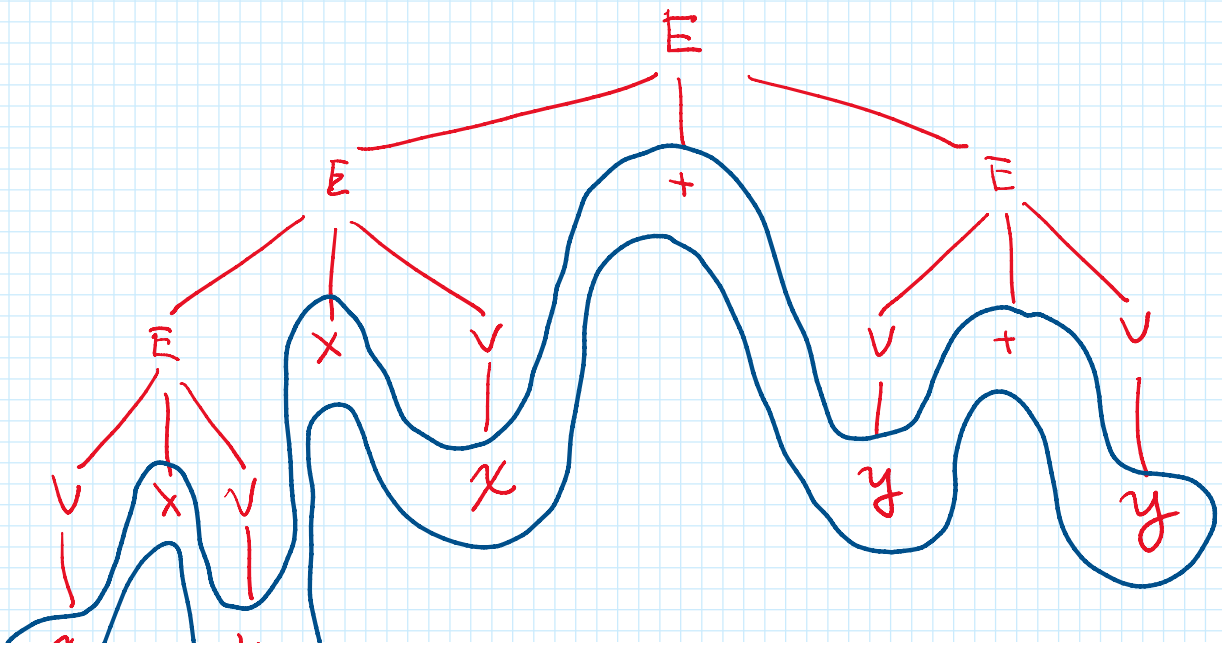
$$E \to E+E \mid E \times V \mid V+V \mid V \times V$$
$$V \to x \mid y$$

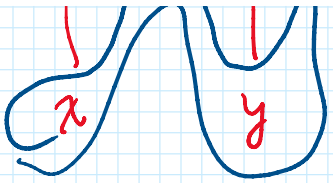
Root: starting symbol

internal nodes: symbols

leaves: terminals

children: symbols/terminals from prod rule chosen.



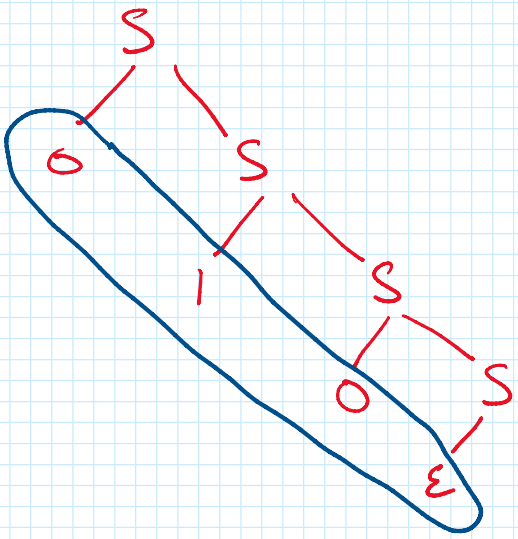


read terminals (leaves) from left to right $x \times y \times x + y + y$

$S \to 0S \mid 1S \mid \varepsilon$ ∞

empty string

CFG generates all binary strings.



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When are strings generatable by a CFG?

If yes: Give a parse tree
(Show a derivation, i.e. there is a series of recursive choices starting symbol ⇝ string)

If no: reason? explain why no parse tree exists.

$S \to SS \mid Sac \mid ca \mid ba$

Q: cabaac generatable by this CFG?

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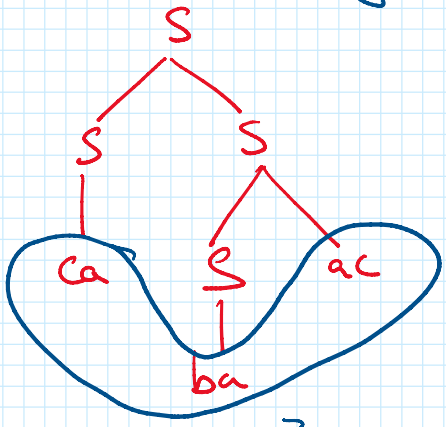
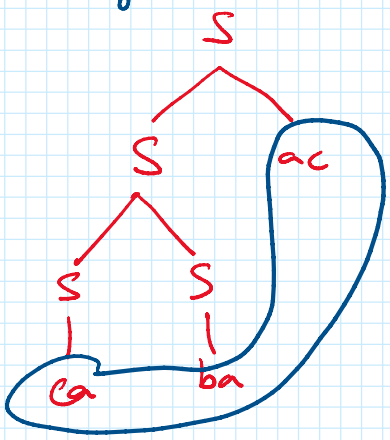


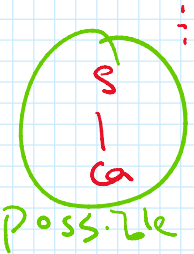


Can exist more than one parse tree for a string → ambiguity

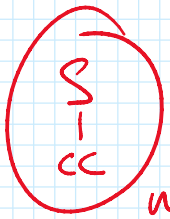
Q: caCC ?

No. every prod rule generates an even amount of terminals

So we would need to produce



possible



not

brief explanation