Theoretical Computer Science – Exercise 5

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Jochen Schmidt

Technische Hochschule Rosenheim

Please prepare the following exercises at home prior to the tutorial:

Exercise 1

Given is the following formal grammar:

$V = \{S, X\}$, $\Sigma = \{u, v, w\}$, $P = \{ S \rightarrow uSv, S \rightarrow X, X \rightarrow vXu, X \rightarrow v, X \rightarrow w \}$, start symbol: S

a) Of what Chomsky-type is this grammar?
b) Derive the word Wort uv^2wu^2v.
c) List all the shortest words, i.e., all words that can be created by using the productions only once (instead of recursively).
d) Give the language that is produced by this grammar in set notation.

Exercise 2

Built a context-free grammar that generates the language $L = \{ a^i b^j c^k \mid i = j \text{ or } j = k; i, j, k \in \mathbb{N}_0 \}$.

We will do the following exercises together during the tutorial:

Exercise 3

Construct a formal grammar for the set of all correct arithmetic expressions with natural numbers using the “+” and “*” operations and the usual parentheses; e.g., 42 + (3 * (4 + 32)) * 674.