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Topic 05: Formal Languages and Computation - Demonstration of Selected Algorithms

Transformation to Chomsky/Greibach Normal Form, Removal of Left Recursion

Abstract

In our presentation, we will demonstrate three different algorithms for transformation of any context-free grammar G to an equivalent context-free grammar that satisfies certain properties. We assume that students are familiar with basic knowledge related to the simplification of context-free grammars such as elimination of useless symbols, elimination of erasing rules (ε-rules) and elimination of simple rules. From the domain of simplification of context-free grammars, the definition of proper context-free grammar will be mentioned.

In the first section, we will describe an algorithm for transformation of any proper context-free grammar G to an equivalent proper grammar in Chomsky normal form, in which each of its rules has on right-hand side either a terminal or two non-terminals. The process of transformation will be afterwards demonstrated on a simple grammar.

In the next section, we will introduce and demonstrate an algorithm which describes how to convert a proper context-free grammar G to an equivalent non-directly-left-recursive context-free grammar G'.

In the third and last section, an algorithm for transformation of any context-free grammar G to an equivalent context-free grammar in Greibach normal form will be introduced. A context-free grammar in Greibach normal form has the right-hand side of every rule started with a terminal and followed by zero or more non-terminals. This algorithm assumes that its input is a non-left-recursive context-free grammar G'.

The presentation does not cover detailed description of the algorithms (statement-by-statement), it is targeting on the main concepts and their demonstration on appropriate context-free grammars - for didactic purposes.