Tree-Restricted General Grammars and Their Context-freeness

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Abstract

Demonstrating that some languages are context-free is important because compilers work only with context-free grammars. Therefore, proving that the language generated by a given grammar is context-free is an essential problem that needs to be studied in depth.

Firstly, this presentation provides basic knowledge to understand the main result such as general grammars, Kuroda normal form, derivation trees, sentential forms, and context-freeness. Then, we introduce derivation trees for general grammars in Kuroda normal forms. Within these trees, it defines context-dependent pairs of nodes, which corresponds to rewriting two neighbouring symbols by a non-context-free rule. It shows that the language generated by a general grammar in Kuroda normal form is context-free if there is a constant k such that every sentence w in the generated language is the frontier of a derivation tree in which any pair of neighbouring paths contains k or fewer context-dependent pairs of nodes. It is also necessary to explain how to apply the achieved results to demonstrate the context-freeness of a language. In the presentation, a simplified step-by-step proof scheme will be demonstrated, so we make it clear how to use it.

Therefore, the presentation provides a take on the construction of context-free grammar from a general grammar with a certain condition met, where it is proven that languages generated by these grammars are equivalent. The tool of these capabilities can bring many advantages and fill the gap in the theory of formal languages since this problem is undecidable.