Descriptional Complexity of Some Regulated Rewriting Grammars

Lakshmanan Kuppusamy
Professor, School of Computer Science & Engineering
Head, Department of Computational BioSciences
VIT, Vellore - 632 014. klakshma@vit.ac.in

Abstract: It is well known that the set of context-free languages is a strict subset of the set of recursively enumerable languages. Analogously, a type-2 (or context-free) grammar cannot simulate a type-0 grammars. However, if we control or regulate the application of the context-free rules, then we can make the grammar to simulate a type-0 grammar. Several regulations are associated with these grammars and are called *regulated rewriting* grammars. Some of them are (i) Matrix rewriting grammars (ii) Graph-Controlled grammars (iii) Semi-Conditional grammars. Descriptional complexity investigates the economical measures required for a grammatical device, automaton, or a rewriting system for a succinct representation of a formal language class.

In this talk, we are going to concentrate on semi-conditional grammars and their variants *simple semi-conditional* and *generalized forbidden grammars*. In a semi-conditional grammar, the derivations are controlled by permitting string and/or forbidden string that are associated with each rule and is known as *conditional* rule. The maximum lengths of permitting strings of permitting and forbidden strings refer to the *degree* of the system. Besides degree, the number of nonterminals and the number of conditional rules are considered to be descriptional complexity measures. We will see the *computational completeness* results of the above said systems with minimal/succinct sizes of measures. Our proofs include some novel ideas and effective use of Geffert normal forms. In the sequel, we will review some results available in the literature; many of the results are contributed by Prof. Alexander Meduna and his research group.