

Petri Net Controlled Grammars with a Bounded Number of Additional Places*

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Abstract

A context-free grammar and its derivations can be described by a Petri net, called a *context-free Petri net*, whose places and transitions correspond to the nonterminals and the production rules of the grammar, respectively, and tokens are separate instances of the nonterminals in a sentential form. Therefore, the control of the derivations in a context-free grammar can be implemented by adding some features to the associated cf Petri net. The addition of new places and new arcs from/to these new places to/from transitions of the net leads grammars controlled by *k-Petri nets*, i.e., Petri nets with additional *k* places. In the paper we investigate the generative power and give closure properties of the families of languages generated by such Petri net controlled grammars, in particular, we show that these families form an infinite hierarchy with respect to the numbers of additional places.

Keywords: grammars, grammars with regulated rewriting, Petri nets, Petri net controlled grammars

1 Introduction

It is well-known fact that context-free grammars are not able to cover all phenomena of natural and programming languages, and also with respect to other applications of sequential grammars they cannot describe all aspects. On the other hand, context-sensitive grammars are powerful enough but have bad features with respect to decidability problems which are undecidable or at least very hard. Therefore it is a natural idea to introduce grammars which use context-free rules and have a device which controls the application of the rules. The monograph [2] gives a summary of this approach.

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