REMARKS ON SOME SIMPLE VARIANTS OF RANDOM CONTEXT GRAMMARS[1]

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ABSTRACT

It is known that the expressive power of random context grammars is the same with or without the following restrictions: (1) in every rule either the permitting set or the forbidding set is empty and the other one is a singleton and (2) each rule that rewrites the same nonterminal symbol have the same permitting and forbidding sets. It is also known that the permitting variants of these restricted random context grammars are equivalent to permitting random context grammars. In this paper we show a similar result concerning the forbidding case. We show that, when erasing rules are allowed, the forbidding variants of these restricted random context grammars are equivalent to forbidding random context grammars.

It is also known that forbidding random context grammars are weaker than the computationally complete random context grammars. Thus, it is natural to ask how many permitting symbols are required in a random context grammar to achieve computational completeness. We show that every recursively enumerable language can be generated by a random context grammar having restrictions similar to (1) and (2) above and using only one permitting nonterminal symbol.

Keywords: Formal languages; Random context grammars; Forbidding context; Generative power

1. Introduction

Context-free (CF) grammars are among the most extensively studied objects in the theory of formal languages. They are used in many areas of computer science, like compiler construction, document type definition of markup languages, and natural language processing. Moreover, CF grammars have several efficiently decidable problems. One such problem is the membership problem, where the task is to decide whether a given CF grammar generates a given word or not. However, it is well known that context-free languages (i.e., the languages generated by CF grammars) are not powerful enough to capture all aspects of natural and programming languages.

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