

# Two Power-Decreasing Derivation Restrictions in Generalized Scattered Context Grammars\*

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## Abstract

The present paper introduces and discusses generalized scattered context grammars that are based upon sequences of productions whose left-hand sides are formed by nonterminal strings, not just single nonterminals. It places two restrictions on the derivations in these grammars. More specifically, let  $k$  be a positive integer. The first restriction requires that all rewritten symbols occur within the first  $k$  symbols of the first continuous block of nonterminals in the sentential form during every derivation step. The other restriction defines derivations over sentential forms containing no more than  $k$  occurrences of nonterminals. As its main result, the paper demonstrates that both restrictions decrease the generative power of these grammars to the power of context-free grammars.

**Keywords:** scattered context grammar; grammatical generalization; derivation restriction; generative power.

## 1 Introduction

Scattered context grammars are based upon finite sets of sequences of context-free productions having a single nonterminal on the left-hand side of every production (see [5]). According to a sequence of  $n$  context-free productions, these grammars simultaneously rewrites  $n$  nonterminals in the current sentential form according to the  $n$  productions in the order corresponding to the appearance of these productions in the sequence. It is well-known that they characterize the family of recursively enumerable languages (see [8]).

In this paper, we generalize these grammars so that the left-hand side of every production may consist of a string of several nonterminals rather than a single nonterminal. Specifically, we discuss two derivation restrictions in scattered context grammars generalized in this way. To explain these restrictions, let  $k$  be a constant. The first restriction requires that all simultaneously rewritten symbols

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