

GENERAL CD GRAMMAR SYSTEMS AND THEIR SIMPLIFICATION

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ABSTRACT

The present paper studies general CD grammar systems, whose components are general grammars, so they are computationally complete, and it investigates them working under the $*$ mode and t mode. Most importantly, the paper presents two types of transformations that turn arbitrary general grammars into equivalent two-component general CD grammar systems with a context-free component and a non-context-free component. From the first type of transformations, the non-context-free component results with two rules of the form $11 \rightarrow 00$ and $0000 \rightarrow \varepsilon$, while the other type of transformations produces the non-context-free component with two rules of the form $11 \rightarrow 00$ and $0000 \rightarrow 2222$. Apart from this significant reduction and simplification, the paper describes several other useful properties concerning these systems and the way they work. A formulation of several remarks and open problems closes this paper.

Keywords: general grammars, CD grammar systems, simulated non-context-free rules, homogeneous rules, evenly homogeneous rules

1. Introduction

The present paper, which assumes a familiarity with formal language theory (see [8, 15]), concerns grammar systems (see [1]). It concentrates its attention on two-component CD grammar systems working under the $*$ and t modes. Recall that under the former mode the context-free versions of these systems obviously generate only the family of context-free languages. More surprisingly, under the latter mode they are no more powerful than ordinary context-free grammars either. To increase their power, the present paper uses general CD grammar systems, whose components are general grammars, that are computationally complete—that is, they characterize the family of recursively enumerable languages. Most importantly, however, the paper explains how to turn arbitrary general grammars into equivalent two-component general CD grammar systems of very reduced and simplified forms.

To give an insight into this study in a greater detail, take any general grammar G . This paper demonstrates two types of transformations that turn G into a