DESCRIPTIONAL COMPLEXITY OF BLOCK-SYNCHRONIZATION CONTEXT-FREE GRAMMARS [1] [2]

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ABSTRACT

We consider the descriptional complexity of block-synchronization context-free grammars, BSCF grammars. In particular, we consider the number of necessary situation and begin symbols as complexity measures. For weak and strong derivations, one begin symbol and two situation symbols are sufficient to generate all respective language families. Surprisingly, one situation symbol with equality synchronization is also sufficient to generate all weak derivation BSCF languages. The family of synchronized context-free languages (SCF languages) generated by grammars with one situation symbol using equality synchronization gives a language family properly between that of E0L and ET0L languages. Some normal forms are also presented for all variations. In addition, we show that either prefix or equality synchronization can be used to describe all weak and strong derivation languages.

Keywords: Rewriting systems, synchronization, parallelism, L Systems, indexed languages

1. Introduction

Synchronization was introduced by Hromkovič to model communication between parallel computations of Turing Machines and alternating machines (see [6]). A similar synchronization mechanism was introduced in [10] to extend top-down tree automata. The yields of these tree languages were studied by Jürgensen and Salomaa (see [7]). They created synchronized context-free grammars (SCF grammars), a rewriting system whereby nonterminals are ordered pairs, the second coordinate containing a so-called situation symbol or the empty word. For a derivation tree of a word to be accepting, for any two branches, the path of situation symbols from the root to the leaves must be in prefix relation.