

SOME NEW ASPECTS OF WORD-LENGTH CONTROLLED DTOL SYSTEMS

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ABSTRACT

In this paper we discuss some new aspects of word-length controlled DTOL systems, including decision problems, growth functions, and the case where the control function is periodic. The issues considered here are mainly motivated by applications of slender languages to cryptography and the fact that all word-length controlled propagating DTOL systems generate slender languages. We describe a cryptosystem with a slender language as a key. Then we define growth functions of word-length controlled DTOL systems and show that there are upper and lower bounds of growth functions of word-length-controlled propagating DTOL systems. Finally we show that word-length controlled DTOL systems with periodic control functions generate unions of DOL sequences.

Keywords: DTOL system, growth function, slender language, stream cryptography

1. Introduction

The studies of controlled grammars and DTOL systems are an important branch of the theory of formal languages [3]. A controlled rewriting-system consists of two parts: a control part which selects a morphism (or a production) to be applied to the current sentential form (or word) and a rewriting part which creates a new sentential form from the current one by the production. In most controlled rewriting-systems, for example, matrix, graph, and regular controlled systems, the control part selects productions without regard to the resulting sentential forms generated by the rewriting part. In the appearance-checking control mechanism, however, a production chosen depends on the result of the rewriting part. A new control mechanism of the latter type has been proposed in [8]. A word-length controlled (or wlc for short) DTOL system, in which the length of the current word selects the morphism to be applied to the word, is investigated in [8].

A wlcDTOL system generates a sequence of words while a DTOL system, in general, generates a sequence of sets of words. So wlcDTOL systems might be called “another” doubly deterministic tabled OL system. The first doubly deterministic tabled OL system was introduced by K. Culik II and D. Wood [2] which is a special case of regular controlled DTOL systems, that is, the control set has the form uv^* where u and