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LINDENMAYER SYSTEMS WITH CONTROL BY IDEALS AND CODES

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ABSTRACT

In a conditional tabled Lindenmayer system, any table P is associated with a regular set $R(P)$, and P is only applicable to a sentential form x if $x \in R(P)$. We study the effect on the generative power if we use regular (right and left) ideals and (special) regular codes instead of arbitrary regular languages.

Keywords: Lindenmayer systems, controlled derivations, ideals, codes

1. Introduction

In the theory of formal languages, in order to increase the generative power, one imposes very often conditions to perform a step in the generation of words. By practical reasons as well as by theoretical considerations, it is very useful that one can check these condition by an efficient procedure. Thus one relates these conditions to regular languages for which the membership problem can be decided in linear time.

One type of such a restriction are conditional grammars introduced in [13]. With any rule r a regular language $L(r)$ is associated, and r can only be applied to a word x if x belongs to $L(r)$. In [21] it was shown that each recursively enumerable language can be generated by a conditional grammar. The books [9] and [17] summarize the classical results on these grammars.

Now, the process of checking the condition (given by a regular language) is very simple and efficient, however, the increase of the generative power is considerable (from context-free languages to recursively enumerable languages). Since on the one hand practical requirements do not ask for arbitrary regular languages and on the other hand theoretical studies – for instance proofs – show that only special regular languages are used, it is very natural to study the devices with subregular languages for the control. Investigations on the change of the generative power are done in [5] and [2] for conditional grammars, where the subregular restrictions are defined by combinatorial and algebraic properties.