

LIMITED SIMPLE ECO-GRAMMAR SYSTEMS WITH PRESCRIBED TEAMS

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ABSTRACT

In each derivation step of a simple eco-grammar system with prescribed teams of *ter Beek* [2], at most one production of every agent of a team is used. In this paper, we soften this restriction imposed upon the agents. Each agent may use a greater, but limited number of productions in every step. We consider two different kinds of such limited eco-grammar systems with prescribed teams where the corresponding actions of the agents are motivated by the limitations of k -limited [9] or uniformly k -limited [10, 14] 0L systems, respectively. By this mean, the generative power of the systems is changed. The corresponding language families are compared with each other according to the different types of the underlying L systems (0L, T0L, etc.), according to the different limitations of the underlying (uniformly) k -limited 0L systems, and they are also compared with the language families given by 0L or (uniformly) k -limited 0L systems.

Keywords: Formal languages, (limited) Lindenmayer systems, eco-grammar systems, prescribed teams

1. Introduction

Eco-grammar systems have been introduced in [3] to model the interaction between the environment of an eco-system and the organisms living in it. An eco-system can be seen as a special multi-agent system where the agents not only interact with each other but also with their common shared environment. In the approach given in [3] and [4], an eco-grammar system consists of a Lindenmayer system (L system) which acts in parallel on the environment and of several agents which change the environment only at one position. In the original model, the choice of an acting rule of an agent usually depends on the actual state of the environment.

In the case of simple eco-grammar systems the agents, independently of the actual state, can execute all possible actions on the environment. Furthermore, teams of agents in simple eco-grammar systems have been considered in [1, 2, 5, 6, 13], and [12]. In [2] and [12], prescribed teams are investigated. This means that a system possesses a fixed set of teams which may have different sizes.

It has been shown in [2], that prescribed teams really increase the generative power of the underlying L systems. Indeed, if the underlying system is an ETOL one, and