

MULTI-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 [15], we have softened this restriction imposed upon the agents. Each agent may use a greater, but limited number of productions in every step. We have considered 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 [11] or uniformly k -limited [12, 17] OL systems, respectively. All agents of a fixed system use the same limitation. In this paper, we broaden the definitions of the systems in such a manner that the agents of a system may use different limitations. By this means, the generative power of the systems is enlarged. The corresponding language families are compared with each other according to the different types of the underlying L systems (OL, TOL, etc.), according to the different limitations and different sets of agents of the underlying (uniformly) k -limited OL systems, and they are also compared with the language families given by OL or (uniformly) k -limited OL 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, 14], and [13]. In [2] and [13], prescribed teams are investigated. This means that a system possesses a fixed set of teams which may have different sizes.