

## REMARKS ON SIMPLE ECO-GRAMMAR SYSTEMS WITH PRESCRIBED TEAMS

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### ABSTRACT

In this paper, the simple eco-grammar systems with prescribed teams of *ter Beek* [2] are reconsidered. We show that limited L systems can be simulated by such systems. Furthermore, we introduce the concept of programmed prescribed teams in simple eco-grammar systems. Depending on the success of the application of a team to the actual state of the system, it is specified which teams are allowed to be applied in the next step. By this mean, the generative power of the systems, at least for the non-extended case, can be enlarged. The corresponding language families are compared with each other according to the different underlying L systems (0L, T0L, etc.) of the systems and also with the language families given by the simple eco-grammar systems with prescribed teams. We prove that some inclusions whose properness was left open in [2], are strict.

*Keywords:* Formal languages, Lindenmayer systems, eco-grammar systems, prescribed teams, programmed 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 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 this paper we consider simple eco-grammar systems that is systems where the agents, independently of the actual state, can execute all possible actions on the environment. Furthermore, we assume that there exist teams of agents. Teams of agents in simple eco-grammar systems have already been considered in [1, 2, 5, 6], and [12]. In such a case, the behaviour of an eco-grammar system depends on the total number of agents and on the number of agents in an active team. In a certain sense we can say that simple eco-grammar systems are Lindenmayer systems with