

ON ACTIVE SYMBOLS IN CD GRAMMAR SYSTEMS ¹

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ABSTRACT

We consider the number of active symbols for cooperating distributed grammar systems having context-free or meta-linear components, both admitting and not admitting erasing productions. We show that the number of active symbols can be restricted to be constant for all modes of derivation under consideration, in most cases even to 1 or 2.

Keywords: Descriptive complexity, active symbols, cooperating distributed grammar systems, context-free and meta-linear productions

1. Introduction

The notion of active symbols has first been considered and thoroughly investigated for extended tabled Lindenmayer systems without interaction (ETOL systems). Lindenmayer systems have been introduced for modeling the development of biological organisms. In essence, an ETOL system consists of a finite set of finite substitutions, called tables, over a joint alphabet. For a comprehensive study of Lindenmayer systems see, e. g., [16]. A symbol a is defined to be *active* in a table if and only if there is a production replacing it non-identically, that is, the finite substitution does *not* map the symbol a to $\{a\}$. Therefore, the number of active symbols in a tabled Lindenmayer system equals the maximum number of letter types which can be replaced truly in parallel or, in biological terms, the number of cell types which are able to contribute to the development of the organism simultaneously. Therefore, the number of active symbols in ETOL systems induces, in a certain sense, a hierarchy of different degrees

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