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NECESSARY CONDITIONS FOR SUBCLASSES OF RANDOM CONTEXT GALLERIES

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ABSTRACT

Random context picture grammars are used to generate pictures through successive refinement. There exist several natural subclasses of these grammars, e. g., context-free picture grammars, random permitting context picture grammars, random forbidding context picture grammars, and table-driven context-free picture grammars. These classes generate context-free galleries (cfpls), random permitting context galleries (rPcpls), random forbidding context galleries (rFcpls), and table-driven context-free galleries (Tcfpls), respectively. For all these classes of galleries, necessary conditions have been proven. In particular, for cfpls there exists a pumping-shrinking lemma, for rPcpls a pumping lemma, and for rFcpls a shrinking lemma. For Tcfpls, two necessary conditions have been proven. We now present a new necessary condition for each of the abovementioned classes of galleries, except for the cfpls, and illustrate it with an example in each case.

Keywords: formal language, regulated rewriting, random context grammar, picture grammar, necessary condition

1. Introduction

Syntactic methods of picture generation have become established during the last decades. An early work [14] provides a comprehensive survey of picture languages in 1993. A tree-based approach to grammatical picture generation is presented in [4]. A more recent development is the model of cooperating context-free array grammar systems with permitting features [15]. An interesting area of application for syntactic picture generation is introduced with visual password schemes [13].

Random context picture grammars (rcpgs) [11, 7] generate pictures through successive refinement. They are context-free grammars with regulated rewriting; the motivation for their development was the fact that context-free grammars are often too weak to describe a given picture set, e. g., the Sierpiński carpets, while context-sensitive grammars are too complex to use or prove theorems for.

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