

TABLE-DRIVEN AND CONTEXT-SENSITIVE COLLAGE LANGUAGES¹

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ABSTRACT

In this paper, we introduce the notions of context-sensitive and ETOL collage grammars as generalizations of context-free collage grammars. Both kinds of picture-generating devices are more powerful than the context-free case. Nevertheless, the size of collages in an ETOL collage language can be shown to grow at most exponentially. In contrast to this, there are no such bounds for context-sensitive collage languages because suitable pictorial representations of recursively enumerable sets of strings can be generated. On the other hand, it is still a conjecture that ETOL collage languages exist that are not context-sensitive.

Keywords: Collage grammars, collage languages, Lindenmayer systems, context-sensitivity, picture generation

1. Introduction

Collage grammars are studied in [3, 4, 8, 9, 10, 11, 12] as picture-generating devices with a context-free mode of rewriting based on hyperedge replacement. A collage consists of a set of geometrical parts, a sequence of pin points, and a set of hyperedges each coming with a nonterminal label and a sequence of attachment points. A hyperedge can be replaced by a collage if its pin points meet the attachment points. This defines a direct derivation in a context-free collage grammar provided that the label of the replaced hyperedge and an affine transformation of the replacing collage form a rule of the grammar. The generated language comprises all collages without hyperedges that are derived in this way from the start collage of the grammar.

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