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CONJUNCTIVE GRAMMARS [1]

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ABSTRACT

This paper introduces a class of formal grammars made up by augmenting the formalism of context-free grammars with an explicit set-theoretic intersection operation.

It is shown that conjunctive grammars can generate some important non-context-free language constructs, including those not in the intersection closure of context-free languages, and that they can provide very succinct descriptions of some context-free languages and finite intersections of context-free languages.

On the other hand, it is proved that conjunctive grammars can still be parsed in cubic time and that the notion of the derivation tree is retained, which gives reasonable hope for their practical applicability.

Keywords: conjunctive grammar, context-free grammar, intersection, descriptional complexity, parsing.

1. Introduction

It is a classical result that the family of context-free languages is not closed under intersection, and that most decision problems concerning intersection of context-free languages are undecidable.

However, intersection, as well as other set-theoretic operations, is an essential part of any kind of formalized reasoning, since it actually denotes an object that satisfies several conditions simultaneously.

The family of finite intersections of context-free languages (intersection closure of the context-free languages, intersective context-free languages) was introduced in [8], where it was proved that they form an infinite hierarchy. Its proper inclusion in the family of deterministic context-sensitive languages was shown in [3]. Intersection and general Boolean closures of deterministic and nondeterministic context-free languages were studied in [10, 11].

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