UNIQUELY PARSABLE ACCEPTING GRAMMAR SYSTEMS

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Extended Abstract

Cooperating distributed grammar systems (CDGS, for short) have been introduced independently in [3] as a grammatical approach of the so-called "blackboard model" in the problem solving theory [8] and [2], with motivations coming from regulated rewriting area. Most of the results known in this field until the middle of 1992 can be found in [4], while more recent results are surveyed in [5]. Constructing parsers in the grammar systems set-up is a topic, which is not only of theoretical interest, but it will make grammar systems more appealing to researchers in applied computer science. This will clearly bring to the user all the advantages of having a model which can cope with such phenomena as cooperation and distribution of the work carried out by several processors.

In [6], Mihalache and Mitrana study the effect on CD grammar systems of some syntactical constraints similar to those considered for strict deterministic context-free grammars. They obtained a promising result in this respect, namely the *unambiguity* of the derivations holds for some classes of grammar systems as well.

We belive that a more involved study of the derivations in a CD grammar system would be very useful to a possible parser constructor for the languages generated by grammar systems. This is the aim of the present paper: a new class of accepting devices called uniquely parsable accepting grammars systems (UPAGS, for short) is introduced. These mechanisms have a restricted type of accepting rules such that parsing can be done without backtracking. Each component of a UPAGS is a so-called RC-uniquely parsable grammar [7] viewed as an accepting grammar. In [7] one provided a hierarchy of uniquely parsable grammars that gave a simple grammatical characterization of the deterministic counterpart of the classical Chomsky hierarchy.

When extending the restrictions for unique parsability to accepting grammar systems, two variants should be taken into consideration, depending on the level, *local/global*, to which the restrictions address. In the global level case, where the restrictions apply to all rules of the system consiered alto-

gether as a single set, the accepting capacity of the systems equals the accepting power of deterministic pushdown automata. In other words, the systems collapse to RC-uniquely parsable grammars. When local level is considered, where conditions apply to all rules of each component independently, for some more restrictive classes, one gets more computational power keeping the parsability without backtracking. We give a simple recognition algorithm for these systems.

Our algorithm has two distinct phases: one in which we find the unique component which is to become active and the other one in which a t-leftmost reduction is performed by this component. The former phase is based on the algorithm proposed in [1] for solving the multiple pattern matching problem. The only difference is that the searching process is stopped as soon as a matching pattern has been found in the text. The text is the sentential form while the dictionary of matching patterns is formed by the words in the lefthand side of all rules of the given uniquely parsable grammar system.

For the latter phase we define a procedure which provides the word obtained by a t-leftmost reduction of the current sentential form in the component found in the first phase. Then, this process is resumed. A criterion to detect infinite loops in the derivation process is also presented. When no reduction is possible anymore, we check the sentential form and decide whether or not the input word is accepted.

The exact complexity of this algorithm is briefly discussed.

Acknowledgements

The work done by the second author has been supported by the Dirección General de Enseñanza Superior e Investigación Cientifica, SB 97–00110508.

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