PREFIX REWRITING AND DESCRIPTIONAL COMPLEXITY [1]

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ABSTRACT

We investigate rewriting-systems that rewrite a prefix of a given string. BÜCHI has shown that these systems and some of their generalizations generate the regular sets from finite sets of axioms, which justifies the name regular canonical systems. Here we consider the descriptional power of these systems in comparison to finite automata, answering questions left open by FRAZIER and PAGE.

Keywords: Descriptional complexity, prefix rewriting, regular canonical systems.

1. Introduction

In his investigation of formal systems, POST [9] showed that canonical systems of normal productions $u \to v$ which transform strings of the form ux into xv are as powerful as the most general formal systems. A natural question related to these systems is, whether rewriting at *one* end of a string is equally powerful. POST remarked that several classes of systems that access only one end of a given string or set of strings are strictly less powerful than normal systems. In particular they generate only recursive sets. This observation was considerably strengthened by BÜCHI, who could establish that for a variety of definitions the sets generated by these restricted systems are in fact regular [1, 4], see also [10, 3]. He called these systems *regular canonical systems*.

BÜCHI already briefly discussed the efficiency of regular canonical systems in comparison to finite automata, predating the seminal work of MEYER and FISCHER on economy of description [8], who did however not consider regular canonical systems. The problem of comparing these systems and finite automata was posed again by FRAZIER and PAGE in [6], where relations to logic programs and computational learning theory were mentioned. Here we will present results answering the questions left open in [6] and some additional remarks concerning the descriptional power of regular canonical systems.

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