Journal of Automata, Languages and Combinatorics 1 (1996) 3, 181–197

ON THE REGULARITY OF LANGUAGES GENERATED BY PARALLEL COMMUNICATING GRAMMAR SYSTEMS

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ABSTRACT
A sufficient condition for a returning Parallel Communicating Grammar System (*PCGS*), with regular components, over one-letter alphabet, to generate a regular language is given. It is proved that this condition is an extension of PARDUBSKÁ's condition from [4].

Keywords: Parallel communicating grammar systems, ET0L systems, generative capacity.

1. Introduction

The parallel communicating grammar systems (*PCGS* for short) have been introduced in [7] and this seems to be an area both 'practically' motivated (see [1, 9]) and rich in theoretical problems (see the bibliography). A *PCGS* of degree n consists of n usual Chomsky grammars, working simultaneously, each of them having its own vocabularies, axioms and rewriting rules, and communicating to each other by sending, or requesting, the current sentential form. Thus, the derivation of a *PCGS* is a sequence of parallel derivation steps and communication steps. The language generated by the system is the language obtained by a 'master' component.

In [4] it is proved that if Π is a regular *PCGS* over one-letter alphabet such that i) $G(\Pi)$, the communication graph of Π, contains at most one cycle and ii) if $G(\Pi)$ contains a cycle, this cycle involves the grammar G_1, then $L(\Pi)$ is a regular language. The proof uses a nondeterministic Turing-machine simulating a derivation of Π in a constant memory. Also in [4] there are two examples of *PCGS* generating non-regular languages over one-letter alphabet, with $G(\Pi)$ containing two cycles, respectively one cycle that does not contain G_1. We give here an example (Example 1) of *PCGS* Π whose communication graph $G(\Pi)$ contains a cycle which does not involve G_1 and which generates a regular language over one-letter alphabet.

In this paper we give a new sufficient condition for a given *PCGS* to generate a regular language over one-letter alphabet. With this new condition we can prove that the language from Example 1 is regular. Also we prove that for every *PCGS* which has the properties i) and ii) this condition is true.