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# LENGTH SYNCHRONIZATION CONTEXT-FREE GRAMMARS

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ABSTRACT

We propose a new type of regulation on the derivation of a context-free grammar: the productions used for passing from a level of a derivation tree to the next level should have the right-hand members of the same length. We prove that such length synchronized context-free grammars characterize the family of ET0L languages, and therefore are equivalent with the synchronization context-free grammars of H. Jürgensen and K. Salomaa. In this way, a conjecture of H. Jürgensen and K. Salomaa is disproved, about a language which was conjectured not to be generated by a synchronization context-free grammar.

*Keywords:* Context-free grammars, synchronization context-free grammars, length synchronization context-free grammars, extended tabled interactionless L systems

## 1. Introduction

The context-free (CF) grammars are among the most investigated classes of generative mechanisms. On the one hand, they are attractive for linguistics and programming languages because of their simplicity and the possibility to describe derivations by trees, on the other hand their generative power is rather limited. For instance, they cannot describe multiple agreements or identifiers declaration restrictions, described by languages of the form $\{a^n b^n c^n \mid n \geq 1\}$ or $\{ww \mid w \in \{a,b\}^*\}$. However, using instead context-sensitive (CS) grammars is not a solution, because of the difficulty of describing the derivations and of the many undecidability questions in this area. That is why many restrictions in the derivation of context-free grammars were considered – see [1] for details.