MR2362183 (2008k:68046) 68Q42

Biegler, Franziska (3-WON-C); **McQuillan, Ian** (3-SK-C); **Salomaa, Kai** (3-QEN-SC)

An infinite hierarchy induced by depth synchronization. (English summary)

Theoret. Comput. Sci. **387** (2007), *no. 2,* 113–124.

To gain additional generating power context-free grammars have been extended in numerous ways; in synchronized context-free (SCF) grammars "situation symbols" are attached to the nonterminal symbols in order to allow independent subderivations to communicate. A candidate derivation contributes to the language of the grammar only if the sequences of these situation symbols along any two paths synchronize, i.e., they are in a certain prefix or equality relation.

The authors measure the amount of depth synchronization in an SCF grammar by mapping an integer onto the number of symbols in the longest situation sequence needed to derive a word of this length; next this definition is extended to languages. When not bounded by a constant this measure is at least logarithmic and at most linear with respect to the word length and it gives rise to a strict infinite hierarchy of languages within the family of SCF (and ET0L) languages.

Reviewed by *Peter R. J. Asveld*

References

1. J. Dassow, G. Păun, Regulated Rewriting in Formal Language Theory, in: EATCS Monographs in Theoretical Computer Science, vol. 18, Springer-Verlag, Berlin, 1989. MR1067543 (91i:68078)
2. E. Csuhaj-Varjú, J. Dassow, J. Kelemen, G. Păun, Grammar Systems: A Grammatical Approach to Distribution and Cooperation, in: Topics in Computer Mathematics, vol. 5, Gordon and Breach Science Publishers, Yverdon, 1994. MR1475215 (2000b:68113)
3. A. Aho, Indexed grammars—An extension of context-free grammars, Journal of the ACM 15 (1968) 647–671. MR0258547 (41 #3194)
4. H. Jürgensen, K. Salomaa, Block-synchronization context-free grammars, in: Z. Du, I. Ko (Eds.), Advances in Algorithms, Languages, and Complexity, Kluwer Academic Publishers, The Netherlands, 1997, pp. 111–137. MR1447447 (98b:68107)
5. H. Bordihn, M. Holzer, On the computational complexity of synchronized context-free languages, Journal of Universal Computer Science 8 (2) (2002) 119–140. MR1895793 (2003b:68089)
6. I. McQuillan, The generative capacity of block-synchronized context-free grammars, Theoretical Computer Science 337 (2005) 119–133. MR2141217 (2006d:68116)
7. I. McQuillan, Descriptional complexity of block-synchronized context-free grammars, Journal of Automata, Languages and Combinatorics 9 (2004) 317–332. MR2168349 (2006f:68059)
8. J. Hromkovič, J. Karhumäki, B. Rovan, A. Slobodová, On the power of synchronization in parallel computations, Discrete and Applied Mathematics 32 (1991) 155–182. MR1120667 (92m:68025)

9. F. Biegler, Synchronization functions of synchronized context-free grammars and languages, in: C. Mereghetti, B. Palano, G. Pighizzini, D. Wotschke (Eds.), 7th International Workshop on Descriptional Complexity of Formal Systems, Como, Italy, 2005, pp. 236–244.

10. J. Hopcroft, J. Ullman, Introduction to Automata Theory, Languages, and Computation, Addison-Wesley, Reading, MA, 1979. MR0645539 (83j:68002)

11. A. Salomaa, Formal Languages, Academic Press, New York, 1973. MR0438755 (55 #11661)

12. G. Rozenberg, A. Salomaa, The Mathematical Theory of L Systems, Academic Press, Inc., New York, 1980. MR0561711 (82g:68053)

13. T. Cormen, C. Leiserson, R. Rivest, Introduction to Algorithms, MIT Press, Cambridge, Mass., 1989. MR1066870 (91i:68001)

14. M. Madhu, K. Krithivasan, Length synchronization context-free grammars, Journal of Automata Languages and Combinatorics 9 (2004) 457–464. MR2198709 (2006j:68057)

Note: This list reflects references listed in the original paper as accurately as possible with no attempt to correct errors.