

# Greibach Normal Form and Simple Automata for Weighted $\omega$ -Context-Free Languages

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In weighted automata theory, many classical results on formal languages have been extended into a quantitative setting. Here, we investigate weighted context-free languages of infinite words, a generalization of  $\omega$ -context-free languages (Cohen, Gold 1977) and an extension of weighted context-free languages of finite words (Chomsky, Schützenberger 1963). As in the theory of formal grammars, these weighted context-free languages, or  $\omega$ -algebraic series, can be represented as solutions of (mixed)  $\omega$ -algebraic systems of equations and by weighted  $\omega$ -pushdown automata.

In our first main result, we show that (mixed)  $\omega$ -algebraic systems can be transformed into *Greibach normal form*. We use the Greibach normal form in our second main result to prove that *simple  $\omega$ -reset pushdown automata* recognize all  $\omega$ -algebraic series. Simple  $\omega$ -reset automata do not use  $\epsilon$ -transitions and can change the stack only by at most one symbol. These results generalize fundamental properties of context-free languages to weighted context-free languages.

This talk is based on [1] and its corresponding short version [2].

- [1] M. Droste, S. Dziadek, W. Kuich. Greibach normal form for  $\omega$ -algebraic systems and weighted simple  $\omega$ -pushdown automata, 2020. Submitted, arXiv:2007.08866.
- [2] M. Droste, S. Dziadek, W. Kuich. Greibach normal form for  $\omega$ -algebraic systems and weighted simple  $\omega$ -pushdown automata. In: *Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2019)*, LIPIcs, vol. 150, pp. 38:1–38:14, 2019. doi:10.4230/LIPIcs.FSTTCS.2019.38.