Weighted automata and weighted logics*

Manfred Droste[1] and Paul Gastin[2]

[1] Institut für Informatik, Universität Leipzig
Augustusplatz 10-11, D-04109 Leipzig, Germany,
droste@informatik.uni-leipzig.de
[2] LSV, CNRS UMR 8643 & ENS de Cachan
61, Av. du Président Wilson, F-94235 Cachan Cedex, France,
Paul.Gastin@lsv.ens-cachan.fr

Weighted automata are used to describe quantitative properties in various areas such as probabilistic systems, image compression, speech-to-text processing. The behaviour of such an automaton is a mapping, called a formal power series, assigning to each word a weight in some semiring. We generalize Büchi's and Elgot's fundamental theorems to this quantitative setting. We introduce a weighted version of MSO logic and prove that, for commutative semirings, the behaviours of weighted automata are precisely the formal power series definable with our weighted logic. We also consider weighted first-order logic and show that aperiodic series coincide with the first-order definable ones, if the semiring is locally finite, commutative and has some aperiodicity property.

References

1. M. Droste and P. Gastin. *Weighted automata and weighted logics.* Automata, Languages and Programming (32nd ICALP, Lissabon), Lecture Notes in Comp. Science vol. 3580, Springer, 2005, pp. 513-525

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