



Logik Kolloquium

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Weighted automata and quantitative logics

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Abstract:

Quantitative models and quantitative analysis in Computer Science are receiving increased attention. The goal of this talk is to investigate quantitative automata and quantitative logics. Weighted automata on finite words have already been investigated in seminal work of Schützenberger (1961). They consist of classical finite automata in which the transitions carry weights. These weights may model, e.g., the cost, the consumption of resources, or the reliability or probability of the successful execution of the transitions. This concept soon developed a flourishing theory. We investigate weighted automata and their relationship to weighted logics. For this, we present syntax and semantics of a quantitative logic; the semantics counts ‘how often’ a formula is true in a given word. Our main result, extending the classical result of Büchi, shows that if the weights are taken from an arbitrary semiring, then weighted automata and a syntactically defined fragment of our weighted logic are expressively equivalent. A corresponding result holds for infinite words. Moreover, this extends to quantitative automata investigated by Henzinger et al. with (non-semiring) average-type behaviors, or with discounting or limit average objectives for infinite words.

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