WEIGHTED TREE TRANSDUCERS [1]

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ABSTRACT

In recent investigations, tree transducers were generalized to tree series transducers [21, 8, 12] by allowing tree series as output rather than trees, where a tree series is a mapping from output trees to some semiring. The semantics of tree series transducers was defined in an algebraic framework, more precisely, as an initial algebra semantics. In this paper we suggest an alternative approach by introducing weighted tree transducers, of which the semantics is defined in an operational style. A weighted tree transducer is a tree transducer each (term rewriting) rule of which is associated with a weight taken from a semiring. Along a successful derivation the weights of the involved rules are multiplied and, for every pair of input tree and output tree, the weights of its successful derivations are summed up. We show in a constructive way that the two approaches, i.e., tree series transducers and weighted tree transducers, are semantically equivalent for both, the top-down and the bottom-up case.

Keywords: Automata theory, tree automata, rewrite semantics, initial algebra semantics

1. Introduction

In this paper we introduce weighted tree transducers in order to describe the semantics of tree series transducers in an operational style. The top-down tree series transducer was first studied in [21] as a generalization of a restricted version of a top-down tree transducer [25, 23, 10]. This was investigated in a more systematic way in [8, 14] where the full classes of bottom-up and top-down tree transducers were generalized and the concept of tree series transducers was introduced.