

ON THE DETERMINIZATION OF WEIGHTED AUTOMATA ¹

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ABSTRACT

In the paper, we generalize an algorithm and some related results by Mohri [25] for determinization of weighted finite automata (WFA) over the tropical semiring. We present the underlying mathematical concepts of his algorithm in a precise way for arbitrary semirings. We define a class of semirings in which we can show that the twins property is sufficient for the termination of the algorithm. We also introduce single-valued WFA and give a partial correction of a claim by Mohri [25] by showing several characterizations of single-valued WFA, e.g., the formal power series computed by a single-valued WFA is subsequential iff it has bounded variation. Also, it is decidable in polynomial time whether a given WFA over the tropical semiring is single-valued.

Keywords: Weighted finite automata, formal power series, semirings, determinization

1. Introduction

Weighted finite automata are of great theoretical and practical interest in computer science. They play a crucial role in the structure theory of recognizable languages in free monoids and trace monoids. However, weighted finite automata also have practical applications in speech recognition and image compression [6, 9, 14, 17, 18, 25]. The behaviour of a weighted finite automaton, for short WFA, can be described as a formal power series, i.e., a mapping from a free monoid into some semiring.

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