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EFFICIENT SIMULATION OF NONDETERMINISTIC WEIGHTED FINITE AUTOMATA [1] [2]

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ABSTRACT

Simulation of nondeterministic automata is often required in algorithms for string matching and image compression. We give three algorithms for NWFA simulation and compare them with known methods. When we consider the problem of computing the acceptance weight of all words of a given finite length, we find that the best of the three algorithms is comparable with a recursive version of a known sparse matrix based algorithm with respect to time, but offers an implementation with simpler data structures.

Keywords: Weighted automata, simulation, nondeterministic, implementation

1. Introduction

We are motivated to find efficient ways to simulate nondeterministic weighted finite automata (NWFA) by the need to decompress greyscale images that have been compressed as large NWFA [9]. This requires the computation of the weight with which all finite words of a given finite length n are accepted by a weighted finite automaton. We refer to this as the *all-words of length n problem*, or more simply, the *all words* problem.

Nondeterministic automata are also commonly used in algorithms solving such problems as string matching [7, 12] and modeling physical particles [3]. Naturally, nondeterminism makes implementation of such algorithms difficult. One must either determinize the automaton to be simulated and use an algorithm for deterministic automata, or use an algorithm that directly simulates nondeterministic automata.

Some well known software packages that provide libraries for common operations on nondeterministic finite automata have largely chosen the latter method (if they have addressed the implementation of nondeterministic automata at all). The AMORE

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