Abstract

This paper describes a method for constructing a minimal deterministic finite automaton (DFA) from a regular expression. It is based on a set of graph grammar rules for combining many graphs (DFA) to obtain another desired graph (DFA). The graph grammar rules are presented in the form of a parsing algorithm that converts a regular expression R into a minimal
deterministic finite automaton M such that the language accepted by DFA M is same as the
language described by regular expression R. The proposed algorithm removes the dependency
over the necessity of lengthy chain of conversion, that is, regular expression --> NFA with
ε-transitions --> NFA without ε-transitions --> DFA --> minimal DFA. Therefore the main
advantage of our minimal DFA construction algorithm is its minimal intermediate memory
requirements and hence, the reduced time complexity. The proposed algorithm converts a
regular expression of size n in to its minimal equivalent DFA in O(n.log2n) time. In addition to
the above, the time complexity is further shortened to O(n.logen) for n ≥ 75.

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Construction of a Minimal Deterministic Finite Automaton from a Regular Expression

Index Terms

Computer Science

Algorithms

Key words

Alphabet

Automaton Construction

Combined State Union

Concatenation

Kleene Closure

Minimization

Transition