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.

Reference

- Hagenah, C. and A. Muscholl [1998]. “Computing epsilon-free NFA from regular
- Thompson, K. [1968]. “Regular expression search algorithms”. Communications of the ACM. vol. 11, no. 6, pp. 419-422.
Construction of a Minimal Deterministic Finite Automaton from a Regular Expression

Index Terms

Computer Science
Algorithms

Key words

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Automaton Construction
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Concatenation
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