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# STATE COMPLEXITY OF REGULAR LANGUAGES [1]

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ABSTRACT

State complexity is a descriptional complexity measure for regular languages based on the deterministic finite automaton model. We investigate and review the problems related to the state complexity of regular languages, as well as finite languages, and their operations. In particular, we compare various state complexity results for general regular languages to those for finite languages.

*Keywords:* regular languages, finite languages, deterministic finite automata, state complexity, descriptional complexity.

## 1. Introduction

Regular languages and their implementations have been attracting more and more attention in recent years [21, 28] due to the increased applications of regular languages and finite automata in software engineering, programming languages, and other practical areas of computer science. Evidences of the increased applications include the popularity of the Regex ("regular expressions"), which appeared as a programming-language construct in many programming languages such as PERL and PYTHON, and the adoption of the statecharts as part of the object-oriented modeling and design tools such as OMT and UML [22, 2].

In recent years, quite a few software systems for manipulating formal language objects, with the emphasis on regular-language objects, have been developed. Examples include AGL, AMoRE, Automate, FADELA, FinITE, FireLite, FLAP, FSM, Grail, INR, MONA, and Turing's World [21, 28, 5].

The applications as well as the implementations of regular languages require and also motivate the study of the complexity issues of regular languages. There are two kinds of complexity issues which are of interest: (1) time and space complexity issues and (2) descriptional complexity issues. In this article, the focus is on the *state complexity* issues. State complexity is a type of descriptional complexity for

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