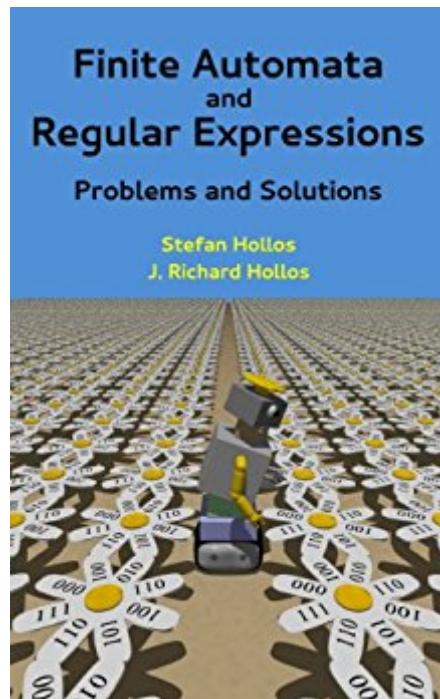


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# Finite Automata And Regular Expressions: Problems And Solutions



## Synopsis

This is a book about solving problems related to automata and regular expressions. It helps you learn the subject in the most effective way possible, through problem solving. There are 84 problems with solutions. The introduction provides some background information on automata, regular expressions, and generating functions. The inclusion of generating functions is one of the unique features of this book. Few computer science books cover the topic of generating functions for automata and there are only a handful of combinatorics books that mention it. This is unfortunate since we believe the connection between computer science and combinatorics, that is opened up by these generating functions, can enrich both subjects and lead to new methods and applications. We cover a few interesting classes of problems for finite state automata and then show some examples of infinite state automata and recursive regular expressions. The final problem in the book involves constructing a recursive regular expression for matching regular expressions. This book explains:  
\* Why automata are important.  
\* The relationship of automata to regular expressions.  
\* The difference between deterministic and nondeterministic automata.  
\* How to get the regular expression from an automaton.  
\* Why two seemingly different regular expressions can belong to the same automaton.  
\* How the regular expression for an infinite automaton is different than one for a finite one.  
\* The relationship of a regular expression to a regular language.  
\* What a generating function for a language tells you about the language.  
\* How to get a generating function from a regular expression.  
\* How the generating function of a recursive regular expression is different from that of an ordinary regular expression.  
\* How to test divisibility properties of integers (binary and decimal based) using automata.  
\* How to construct an automaton to search for a given pattern, or for a given pattern not occurring.  
\* How to construct an automaton for arbitrary patterns and alphabets.  
\* How the recursive regular expression for nested parentheses leads to the Catalan numbers. Included in this book:  
\* Divisibility problems in binary and decimal.  
\* Pattern search problems in binary, ternary, and quaternary alphabets.  
\* Pattern search problems for circular strings that contain or do not contain a given pattern.  
\* Automata, regular expressions, and generating functions for gambling games.  
\* Automata and generating functions for finite and infinite correctly nested parentheses.  
\* The recursive regular expression for matching regular expressions over a binary alphabet.  
\* A further reading list.

## Book Information

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