

Preface

This book deals with the general theory of finite automata and sequential machines, a subject of great current theoretical and practical importance and one likely to have an even greater impact in the future.

In writing this text, we had in mind a wide audience. We naturally hoped it would be useful to specialists in switching or digital computer theory and design. Such persons are already familiar with the necessary mathematical techniques, that is, propositional calculus, general concepts of predicate calculus, and the fundamentals of the theory of algorithms (theory of recursive functions). For them, the book may serve as a reference on fundamentals. But our primary audience is the beginner whose mathematical training is confined to fundamentals of calculus, differential equations, and mathematical physics. Aside from engineering students, such readers may include specialists in automation, remote control and communications, that is, those branches of engineering where lack of fundamentals of mathematical logic and the theory of algorithms may preclude the solution of a variety of problems.

In addition, we would like to think that the potential beneficiaries may include the mathematician who is not a logician, as well as the physicist, physiologist and biologist interested in the applications of the theory of finite automata and sequential machines to idealized models, such as those of nets of nerves. Basically, however, the book is intended for engineers, which is why, in discussing some problems of logic and algorithmic theory, we preferred to forego mathematical rigor and concentrate on the clarity of exposition.

Thus, the objective of this book is to introduce the reader to this new field and familiarize him with the basic concepts and the ways in which particular problems are stated, as well as those solutions which have been obtained so far. In the presentation, our own results are intertwined with those obtained from the relevant literature.

Since this text is designed for a diversified audience, we could not organize it in a manner that would suit any special group. The

disposition of subject matter is thus a compromise between contending interests. In general, the material is arranged in order of increasing difficulty, and each reader should thus proceed according to his own needs and background. We would, however, like to offer several suggestions:

1. The reader who is completely unfamiliar with the subject but seeks detailed information should follow the sequence presented in the book.
2. The reader interested only in a general acquaintance with the subject should read the first seven chapters consecutively, followed by Chapter 12; after this he may glance through Chapter 13, and finish by reading Chapters 8, 9, 10, and 11.
3. The reader familiar with the fundamentals of mathematical logic and its technical applications is advised to begin with Chapter 3.
4. Finally, the mathematician interested in engineering applications may safely omit Chapters 1, 12, and 13.

Sections 2.5 and 8.4 deal with the special problems of minimizations of Boolean functions and the realization of finite automata, defined in the language of regular expressions; these sections (which go beyond the basic principles of the general theory of finite automata and sequential machines) were written, at the author's request, by V.D. Kazakov and O.P. Kuznetsov, respectively.

The authors would welcome all comments and suggestions.

TRANSLATOR'S NOTE

This translation of the original Russian edition contains problems, additions, and revisions prepared by the author for the English edition.