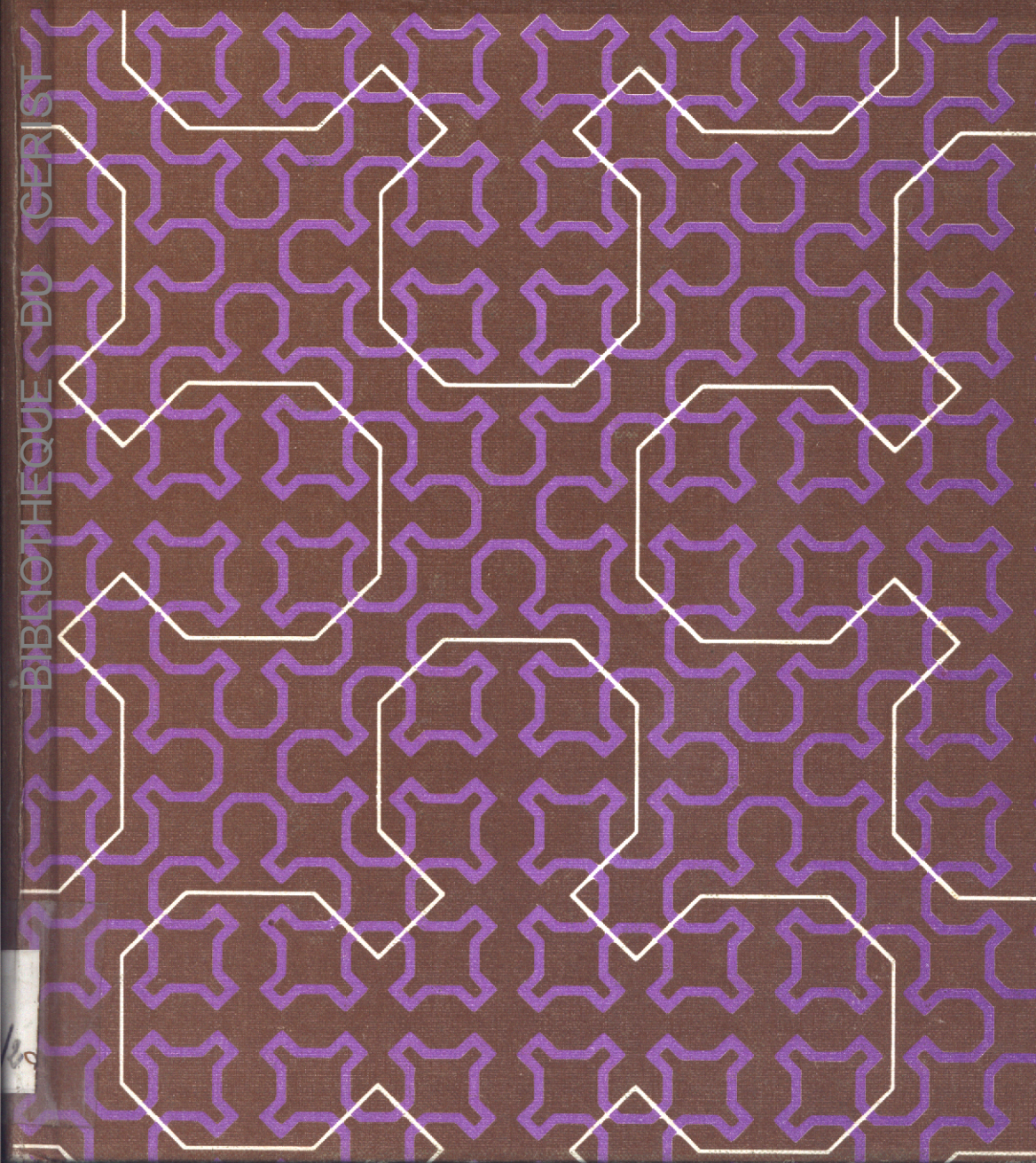
Cambridge Computer Science Texts · 15

Information Representation and Manipulation using Pascal

E.S. PAGE and L.B. WILSON



Information representation and manipulation using Pascal

Also in this series

1 **An Introduction to Logical Design of Digital Circuits**
C. M. Reeves 1972

2 **Information Representation and Manipulation in a Computer**
E. S. Page and L. B. Wilson, Second Edition 1978

3 **Computer Simulation of Continuous Systems**
R. J. Ord-Smith and J. Stephenson 1975

4 **Macro Processors**
A. J. Cole, Second Edition 1981

5 **An Introduction to the Uses of Computers**
Murray Laver 1976

6 **Computing Systems Hardware**
M. Wells 1976

7 **An Introduction to the Study of Programming Languages**
D. W. Barron 1977

8 **ALGOL 68 - A first and second course**
A. D. McGettrick 1978

9 **An Introduction to Computational Combinatorics**
E. S. Page and L. B. Wilson 1979

10 **Computers and Social Change**
Murray Laver 1980

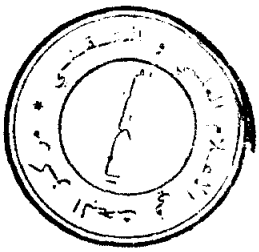
11 **The Definition of Programming Languages**
A. D. McGettrick 1980

12 **Programming via Pascal**
J. S. Rohl and H. J. Barrett 1980

13 **Program Verification using Ada**
Andrew D. McGettrick

14 **Simulation Techniques for Discrete Event Systems**
I. Mitrani

Cambridge Computer Science Texts · 15



Information Representation and Manipulation using Pascal

E.S. PAGE

Vice-Chancellor
University of Reading

L.B. WILSON

Professor of Computing Science
University of Stirling

CAMBRIDGE UNIVERSITY PRESS

Cambridge

London New York New Rochelle

Melbourne Sydney

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
296 Beaconsfield Parade, Middle Park, Melbourne 3206, Australia

First published 1983

Printed in Great Britain at the University Press, Cambridge

Library of Congress catalogue card number: 82-4505

ISBN 0 521 24954 6 hard covers
ISBN 0 521 27096 0 paperback

British Library cataloguing in publication data

Page, E. S.
Information representation and manipulation using Pascal. -
(Cambridge computer science texts; 15)
1. Electronic data processing
I. Title II. Wilson, L. B.
001.64'42 QA76

ISBN 0 521 24954 6
ISBN 0 521 27096 0 Pbk

Contents

		Page
Preface		ix
Chapter 1	**Symbols on Paper**	
1.1	Introduction	1
1.2	Computer Operations	2
1.3	Single Symbols	3
1.4	Descriptions of Sounds and Positions	5
1.5	Other Representations by Symbols	6
Examples 1		7
Chapter 2	**Symbols and Codes**	
2.1	Binary Elements	8
2.2	External Representation	9
2.3	Paper Tape	9
2.4	Error Correction and Detection	12
2.5	Coding Theory	16
2.6	Construction of Optimal Codes	20
2.7	Weighted Codes	22
2.8	Punched Card Codes	24
2.9	Bibliography	25
Examples 2		25
Chapter 3	**Internal Representation**	
3.1	Units of Storage	32
3.2	Conversion between Scales	33
3.3	Integers: Packed Decimal	36
3.4	Integers: Binary Representation	37
3.5	Fractions: Fixed Binary	38
3.6	Floating Point Numbers	39
3.7	Bibliography	42
Examples 3		43

Chapter 4 Information Structures 1: Arrays

4.1 Introduction 50
4.2 Storage of Arrays 53
4.3 Applications of Access Tables 59
4.4 Sparse Arrays 61
4.5 Bibliography 65
Examples 4 66

Chapter 5 Information Structures 2: Linear Lists

5.1 Introduction 74
5.2 Stacks, Queues and Deques 74
5.3 Sequential Allocation of Storage 78
5.4 Linked Allocation of Storage 85
5.5 Comparison of Sequential and linked Allocation of Storage 97
5.6 Bibliography 99
Examples 5 100

Chapter 6 Information Structures 3: Trees

6.1 Introduction and Basic Definitions 109
6.2 Traversing a Tree 115
6.3 The Transformation of Trees into Binary Trees 120
6.4 Tree Representation 127
6.5 Path Length 143
6.6 Bibliography 147
Examples 6 149

Chapter 7 Searching

7.1 Introduction 162
7.2 Scanning 163
7.3 Key Transformation (Scatter Storage) Techniques 173
7.4 Bibliography 183
Examples 7 185

Chapter 8 Sorting

8.1 Introduction 193
8.2 Internal Methods 196
8.3 Merging Methods 214

8.4 A Comparison of Sorting Methods 221
8.5 Bibliography 223
Examples 8 226

Notes on the solutions to Examples 235

Index 265