CONTENTS

Foreword ix

Preface xi

1 Sorting and Searching 1

Sorting 1

Searching 25

2 Queues, Stacks, Linked Lists, and Binary Trees 29

Queues 30

Stacks 38

Linked Lists 43

Binary Trees 59

3 Dynamic Allocation 67

The Turbo C Dynamic Allocation System 68

Sparse Array Processing 71

The Linked-List Sparse Array 72
The Binary Tree Approach to Sparse Arrays 75
The Pointer Array Approach to Sparse Arrays 78
Hashing 82
Choosing an Approach 87
Reusable Buffers 88
The "Unknown Memory Dilemma" 90
Fragmentation 97

4 Using System Resources 99

The 8086 Family of Processors 100
The 8086 Interrupts and PC-DOS 100
Accessing System Resources in the ROM-BIOS 103
Using DOS to Access System Functions 115
Final Thoughts on Using System Resources 119

5 Interfacing to Assembly Language Routines 121

Calling Conventions 123
Creating an Assembly Code Function 124
Using **asm** 132
When to Code in Assembler 134

6 Graphics 137

Modes and Palettes 138
Writing Pixels 139
Drawing Lines 143
Drawing and Filling Boxes 148
Drawing Circles 150
Putting It All Together 152

7 Statistics 165

Samples, Populations, Distributions, and Variables 166
The Basic Statistics 168
Simple Plotting on the Screen 175
Projections and the Regression Equation 180
Making a Complete Statistics Program 186
Using the Statistics Program 197
Final Thoughts 200

8 Codes and Data Compression 201

A Short History of Cryptography 202
Substitution Ciphers 204
Transposition Ciphers 212
Bit-Manipulation Ciphers 217
Data Compression 222
The 16-Character Language 226
Code-Breaking 230

9 Random Number Generators and Simulations 235

Random Number Generators 236
Determining the Quality of a Generator 239
Using Multiple Generators 248
Simulations 253
Random-Walk Portfolio Management 264

10 Expression Parsing and Evaluation 269

Expressions 270
Dissecting an Expression 272
Expression Parsing 274
A Simple Expression Parser 276
Adding Variables to the Parser 281
Syntax Checking in a Recursive Descent Parser 288

11 Converting Turbo Pascal to Turbo C 291

Structured, but Different 292
An Identifier Comparison Between Turbo Pascal and Turbo C 294
Converting Turbo Pascal Loops into C Loops 297
The case and if Statements 298
Records Versus Structures 299
A Sample Translation 300
Using the Computer to Help Convert Turbo Pascal to C 302
Final Thoughts on Translating 310

12 Efficiency, Porting, and Debugging 311

Efficiency 311
Porting Programs 320
Debugging 323
General Debugging Theory 332
The Art of Program Maintenance 334

A Turbo C Memory Models 337

The 8086 Family of Processors 338
16-Bit Versus 32-Bit Pointers 340
Memory Models 341
Overriding a Memory Model 343

B A Review of Turbo C 347

The Origins of C 347
C as a Structured Language 348
A Review of Turbo C 350
Variables—Types and Declaration 350
Operators 356
Functions 365
Statement Summary 370
The Turbo C Preprocessor 382
The Turbo C Standard Library 385

Index 389