APPLICATIONS PROGRAMMING

IN

VISUAL BASIC

5

SECOND EDITION

MARK G. SIMKIN

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Applications Programming in Visual Basic 5, Second Edition

Mark G. Simkin

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PREFACE

Visual Basic traces its roots to the 1960s, where its predecessor, BASIC, was developed at Dartmouth College as an easy-to-learn programming language for entry-level students. In fact, the term BASIC is an acronym for "Beginners All-Purpose Symbolic Instruction Code." Since its development, Basic has continued to evolve as a programming language with such versions as GW Basic, MS Basic, Quick Basic, and older versions of Visual Basic. Each of these used the same fundamental commands such as "Print" or "Dim," but each successive version also added new commands and controls that enhanced the language, improved the programming tools available with it, and helped users create computer applications more easily and effectively.

It is difficult to overstate the importance of Visual Basic today. Now in its fifth version, Visual Basic provides a remarkably rich set of programming tools for creating Windows, and Windows-like, computer applications. Many beginning students love Visual Basic because it is so graphic and because they can create simple applications in just a few hours. But even Unix and C++ programmers are grudgingly learning Visual Basic programming because the language is so powerful, and also because its applications are so widespread.

SPECIAL FEATURES OF THIS BOOK

Unlike many of the other VB books now available, this one is written for the beginner—i.e., the person who has no previous programming background, or a very limited one. What this means is that the book starts at "square one," and only assumes that the reader knows how to work with Windows, load a program, and use a mouse. The book continues from this point forward.

Also unlike other VB books, this book is a textbook rather than a trade book. What this means is that it has been designed for classroom use. Among its many features are:

A LAY-FLAT BINDING that allows students to use it conveniently in a computer laboratory.

SHORT CHAPTER INTRODUCTIONS that allows students to get to the learning material as quickly as possible.

DOZENS OF VISUAL AIDS in each chapter including figures, tables, and program listings that illustrate chapter concepts, help the reader follow the discussions, or document the required output for problems; these are often labeled for easy reference during lectures.

YOURSELF A large number of TRY IT YOURSELF exercises embedded within the chapters that encourage students to experiment with the many examples in the text.



TIPs and FYIs that describe coding short cuts, explain special programming techniques, or expand on chapter material.

WARNINGS! that warn the reader about potential programming pitfalls.



A **BULLETPROOFING!** feature that describes common mistakes and input errors that cause programs to fail and provides pointers on how to avoid them.

CHAPTER SUMMARIES that recap in capsule format how to accomplish specific programming tasks.

A set of **KEY TERMS YOU SHOULD KNOW** that were introduced in the chapter, complete with definitions.

A **TEST YOURSELF** section at the end of each chapter that asks specific true/ false, multiple-choice, and fill-in-the-blank questions about the material covered in the text.

A separate set of **SKILL BUILDER** exercises that tests understanding with open ended questions such as short answer, what-does-this-program-print, and what-is-the-difference type questions.

End-of-chapter demonstration **ASSIGNMENTS** with detailed, annotated instructions that demonstrate chapter topics and discussions in complete programs.

Additional **Programming Assignments** that instructors can use as class demonstration or homework projects.

An **APPENDIX** with answers to selected true/false, multiple-choice, and fill-in-the-blank questions.

A special APPENDIX listing Visual Basic's reserved words;

A special APPENDIX containing two lists of Visual Basic's error codes;

A complete GLOSSARY of key terms, and;

A complete **INDEX** at the end of the book to help the reader find any particular topic of interest.

ENRICHMENT MODULES This edition of Visual Basic includes three additional Enrichment Modules not likely to be found in other VB textbooks. Enrichment Module A appears at the end of Part II and describes Visual Basic for Applications (VBA), Microsoft's macro programming language. This module focuses on VBA for Excel, Microsoft's spreadsheet program. Enrichment Module B appears at the end of Part III and discusses Visual

Basic's built-in functions. Enrichment Module C appears at the end of Part IV and outlines the features of the Crystal Reports add-in used to produce printed reports from databases. All of these modules are similar to chapters, and can help you learn and apply Visual Basic programming techniques in many practical applications and settings.

APPLICATIONS Finally, this book is *applications oriented*. Unlike other programming textbooks that introduce programming concepts by providing formal definitions and then a few, relatively-abstract examples, this book was written by a former programmer who knows the real world and wishes to keep his book firmly rooted in it. For example, this book does not illustrate If tests with the example "If Alpha <> 100," but rather "If HoursWorked > 40." A complete list of exercises, categorized by major application area, may be found inside the front cover of this book.

NOTES TO STUDENTS

This book is conveniently divided into four major sections.

Part I: Getting Started—provides an overview of the Visual Basic programming language, explains some of its features, and summarizes some of the ways that users can get help when and if they need it. This section also describes the fundamental techniques for creating, modifying, saving, reloading, and printing Visual Basic programs. Thus, Part I is fundamental to the beginner, and should also be read by anyone needing an overview of Visual Basic 5. However, more experienced students and the instructors of faster-paced courses may wish to minimize coverage here because of its elementary nature.

Part II: Visual Basic's Features—describes the characteristics, behavior, and properties of such form controls as Labels, TextBoxes, CommandButtons, CheckBoxes, Frames, Shapes, OptionButtons, ScrollBars, InputBoxes, MessageBoxes, and Form windows themselves. This part of the text describes many of the most important and useful programming tools in Visual Basic, and identifies the properties that programmers need to understand in order to use them effectively. This part of the book is fundamental to the beginner, but is also recommended reading for more experienced programmers who have never used Visual Basic. Enrichment Module A in Part II covers ActiveX controls. Many of these controls are new to Visual Basic. They provide a wide and wonderful array of tools that programmers can use to visually and functionally enhance VB applications, including internet applications.

Part III: Programming—concentrates on the procedural language part of Visual Basic. For example, Chapter 7 describes the Code window and provides formal guidelines for writing and documenting effective programs. Similarly, Chapter 8 introduces the various types of variables supported by Visual Basic and emphasizes the scope and persistence of variables in actual code examples. Other chapters review the fundamental programming concepts of branching (Chapter 9), looping (Chapter 10), data arrays (Chapter 11), and control arrays

This book uses Visual Basic screen names for the form controls—for example, "CommandButton" instead of "command button"—because this is what beginners will see onscreen.

(Chapter 12). Chapter 13 discusses ListBoxes and ComboBoxes—fundamental form controls in one sense, but form controls whose properties are better understood and appreciated after the concepts of arrays and looping have been mastered.

Part IV: Database Applications—Finally, Part IV of this textbook focuses on database applications. Chapter 14 is new to this edition, and discusses basic database concepts as well as Visual Basic's Data control, Data Form Wizard, and Data Manager. Because these are automated controls, this chapter does not require the programming techniques discussed in Part III, and thus may be covered earlier in a course if so desired. This part of the book also discusses sequential files (Chapter 15), direct access files (Chapter 16), and binary files (Chapter 16).

To the Beginning Student

If you have never programmed a computer before, you are in for a treat. Writing simple programs in a procedural, event-driven programming language such as Visual Basic is neither difficult nor complicated. Rather, it is "empowering," meaning that most people experience a rush of excitement and accomplishment when their programs execute correctly. In this sense, writing a computer program is no different than using a word processor effectively or creating a spreadsheet that runs properly.

Beginning students should also be aware that programming is not a spectator sport! To get the most from this book, you are encouraged to read the chapters carefully, and to perform as many of the "Try It Yourself" exercises as possible. In a nutshell, "the best way to learn how to program a computer is to program a computer." There is no substitute for trying things for yourself!

Beginners should also be aware that computers are remarkably literal animals. This means that computers are unable to extrapolate, interpret, or otherwise translate inaccurate commands or instructions into things that make sense. Do not be discouraged if you make mistakes. You should make mistakes—it is a natural part of the learning process. Just try not to make the *same* mistakes—which of course indicates that you are *not* learning! (During the course of a quarter or semester, it is unlikely you will make nearly as many mistakes as the author did writing this book!)

Finally, you are likely to find writing Visual Basic programs fun, but also challenging. If so, you may find it helpful to think of a Visual Basic programming assignment as a term paper that is usually best completed over time—not finished in one day. For this reason, it is useful to start working on your assigned projects well before the deadline at which they are due, and realize that you may run into a roadblock or two before you're done. The earlier you start your project, the sooner you'll know what roadblocks these are, and the more time you'll have to find the answers. Chapter 1, which discusses the many sources of help available to beginners, may be especially useful for this.

To More Experienced Programmers

If you are someone who knows another programming language, you already know something about computer programming—although perhaps not very much. In this case, you are also encouraged to read Chapters 1 and 2 even if your first programming assignment is in Chapter 3. These first two chapters provide the background you will need to understand Chapter 3, and also ex-

plain some of the many ways you can get help if your program does not run properly.

More experienced programmers are also encouraged to read the chapters in Part II of this text. As explained above, these chapters describe some of the properties and characteristics of Visual Basic form controls, many of which are unique to this programming language. These controls are remarkably powerful programming tools, and knowing about them can keep even the most proficient programmer from "reinventing the wheel."

Finally, more experienced programmers are especially encouraged to exercise care when creating applications in Visual Basic 5. For example, it is easy to assume that "an If test is an If test in any language," and that you do not need to review the rules for these instructions before using them. Unfortunately, this is only partially true: the resemblance between the form controls and language constructs of Visual Basic 5 are often superficial, and may differ appreciably even from earlier versions of the language.

TO THE INSTRUCTOR

It has been the author's experience that, no matter how one structures a programming course, some students "get it" while others flounder. The most fundamental goal of this book is to minimize the amount of floundering while avoiding the rote learning endemic to keystroking lab manuals.

This book attempts to achieve this goal by creating very concise and structured learning objectives for each chapter, and by using a measured, step-by-step approach that pyramids student knowledge in small, easy to understand doses. Concepts are therefore presented on a need-to-know basis, and extraneous or nice-but-not-essential points are relegated to the **FYI** features.

It has also been the author's experience that students best learn programming by experimenting themselves. For this reason, this book includes many **Try It Yourself** exercises in every chapter. Earlier users and reviewers of this text uniformly agree on the desirability and advantages of this approach, and instructors are therefore encouraged to require their students to do the exercises as they read. This text therefore especially lends itself to hands-on learning in a laboratory setting.

Levels of Exercises and Programming Assignments

Teachers will also find several levels of exercises and programming assignments at the end of each chapter. Roughly speaking, these levels of assignments fall into the following categories:

Understanding the Vocabulary and Ideas of Visual Basic. Tasks that help students gain familiarity with and recognition of Visual Basic nomenclature and terminology. Many of the True/False, Multiple-Choice, and Fill-inthe-Blank exercises in the **Test Yourself** portion of each chapter have this as their objective.

Drills. Rote keystroking exercises that demonstrate Visual Basic applications. One or two of the assignments at the end of each chapter falls into this category.

Skills. Skill-building exercises test student understanding of language syntax, grammar, construction, and Visual Basic controls. Most of the **Skill Builder**

exercises are geared towards this type of learning. Assignments designated as **Fast Track to Programming** help students see the power of programming skills early in the book, even before all the language elements have been fully explored.

Transfer of Knowledge. More difficult assignments that require students to apply what they have learned to new settings. These exercises require them to use two or more programming skills, and/or to recognize from the context of the problem what must be done to accomplish specific processing objectives. Many of the assignments at the end of the chapters fall into this category.

Challege Exercises. Still more complex assignments that force students to transfer their skills from previous chapters to new settings. Complex, almost "real-world" coding problems also appear among the assignments. In these, the student is challenged to achieve the tasks defined, and only hints are provided as to how such tasks might be accomplished.

This wide range of problems is intended to provide instructors with programming assignments suited to a wide range of student backgrounds and experience, as well as meet the skill-level objectives and programming proficiency targets of the class.

Organizing a Course

This book addresses the needs of those instructors wishing to teach Visual Basic to entry-level or novice students. For such classes, it is an easy matter to proceed linearly chapter by chapter—perhaps skipping a chapter or two as time and course objectives dictate. But it is also possible to mix and match chapters as needs dictate. The following discussions provide guidelines for both approaches.

Linear Coverage. Although the focus of the first six chapters of this book is on Visual Basic features, the chapters of this book are perhaps best covered in sequential fashion even by those instructors wishing to focus on procedural-language skills. For example, instructors will still want students to know the fundamental characteristics of Visual Basic, as covered in Chapters 3, 4, and 5.

The meat of the course for procedural-language instructors will be in Part III—Chapters 7 through 13. These chapters contain more detailed programming material, and contain more demanding programming assignments. The first assignment in many of these chapters is also a capstone demonstration project, that illustrates many of the concepts discussed in the chapter. The following tables provide guidelines for covering the chapters in their current sequence for both 10-week and 15-week course formats.

Ten-Week Course	Introductory Course (chapters)	More Advanced Course (chapters)
1	1,2	1, 2
2	3	3, 4
3	4	5, 6
4	5	7, 8
5	6	9
6	7	10

1		
7	8	11, 12
8	9	13, 14
9	10	15, 16
10	exams	exams
1800 9000		CAUTIS
FIFTEEN-WEEK COURSE	INTRODUCTORY COURSE (CHAPTERS)	More Advanced Course (chapters)
1	1, 2	1, 2
2	√ 3	3, 4
3	4	5, 6
4	5	7
5	6	8
6	7	
7	exam) musech	exam
8	8	10
9	9	11
10	9 (contd.)	12
11	10	13
12	10 (contd.)	14
13	11	15,16
14	12	EMA, EMB,
		EMC
15	exam	exam

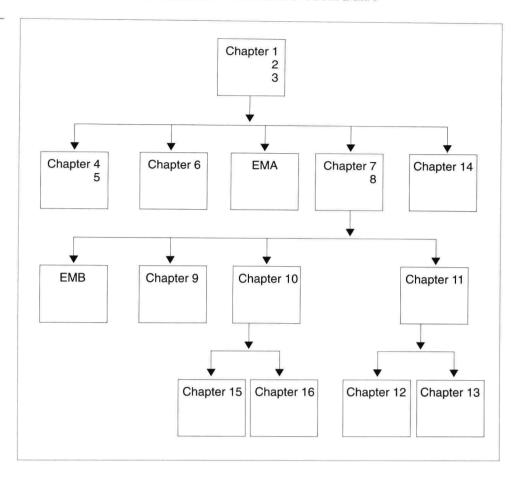
Non-Linear Coverage. The author also recognizes that Visual Basic courses differ widely in their time frames, student audiences, and objectives. For this reason, this book was designed with as much flexibility as possible, thus allowing instructors to cover chapters out of sequence as needs and interests dictate. The flowchart in Figure P.1 illustrates chapter sequencing requirements, and illustrates the wide latitude that instructors have for covering chapters within the overall course framework.

Read the chart from top to bottom. Thus, the chart suggests that all students read Chapters 1, 2, and 3 first, as these provide a basic foundation in Visual Basic's user interfaces (Chapter 1), techniques for creating, saving, and printing a small project (Chapter 2), and most important form controls (Chapter 3). After this, instructors are free to select from a wide number of options. The flowcharts in Figure P.2 provide some examples of three different options.

About the Enclosed Disk. The disk that accompanies this book contains all the page-format test-yourself questions in WordPerfect and Microsoft Word formats, so that students can hand in answers to these questions without having to retype very much. This should help those instructors who formally assign them to students.

Test Items. Test items are available in hard copy and diskette for professors who adopt this text.

Figure P.1 Chapter sequencing requirements



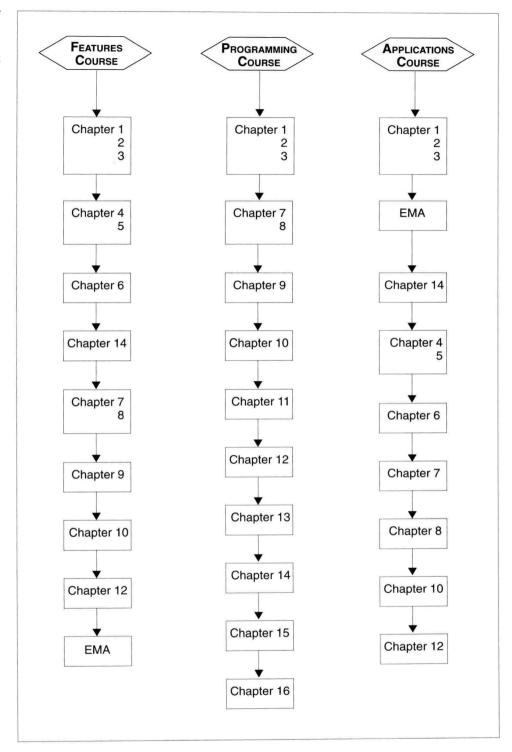
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Professor Simkin is the author or coauthor of ten other books, including Accounting Information Systems (John Wiley and Sons, Publishers), Discovering Computers (William C. Brown, Publishers), Microcomputer Principles and Applications (William C. Brown, Publishers), Introduction to Computer Information Systems for Business (William C. Brown, Publishers), and Core Concepts of Accounting Information Systems (John Wiley and Sons, Publishers).

The author appreciates comments, suggestions for improvement, or corrections of errors found in this book. He can be contacted at the above mailing address, or by email at Simkin@equinox.unr.edu.

Figure P.2 Examples of selected chapter coverage from Figure P.1



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A special acknowledgment is due Ms. Mary Beth O'Donnell. Mary Beth assisted me throughout the long months spent writing, revising, editing, and completing the many components of this text. Mary Beth read chapters for accuracy and clarity, found errors in the manuscript and corrections for them, wrote many of the Test Yourself and Skill Builder questions and exercises, created the answer key for the appendix, developed many of the new assignments, and performed most of the screen captures for the book's figures. The credit is hers, the remaining errors are mine.

I am also indebted to Professor Forest Lin of Tulsa Junior College. Professor Lin's earlier work *The Visual Basic Coursebook* (also published by Scott/Jones Publishers) was the inspiration for the present text. In similar fashion, I also want to express my appreciation to Professor Carol Peterson of South Plains College, Texas. Professor Peterson developed some of the advanced exercises and applications at the end of the chapters, and worked diligently to meet the tight publication deadlines of this work. Thus, she made a significant contribution to the final quality of this book.

Finally, I am indebted to the reviewers listed below for their many helpful, insightful, and timely comments and suggestions. I owe them a great deal. I have listed the reviewers of each edition separately.

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Of these reviewers, I owe Frank Meyers, Dotty Smally, and Ed Wittke a special acknowledgment. Their tireless efforts and attention to detail in making this a better text was superb and I cannot thank them enough.

Mark G. Simkin, December, 1997

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