Table of Contents

Preface 1

Chapter 1: Introduction to Custom Controls 5

What Are Controls? 5
Introducing Custom Controls 7
Categories of User Controls 9
Preparing Your Environment 9
What Are Custom Controls Made Of? 9
Private Fields 10
Properties 11
Indexers 13
Events and Delegates 14
Handling Events 16
Collections 17
Enums 19
Building TinyNoiseMaker 20
Time for Action—Creating the TinyNoiseMaker Custom Control 20
Extending TinyNoiseMaker 27
Time for Action—Adding Public Functionality 27
Time for Action—Using the Control's Public Interface 31
Summary 33

Chapter 2: Introduction to GDI+ 35

Understanding Control Drawing 35
Understanding GDI+ 36
The Graphics Object 36
The Control.Paint Event 37
Invalidation 37
Simple Drawing on a Form 38
Time for Action—Creating the Application 38
Drawing Inside a Panel Object 41
Time for Action—Creating the Application 41

Drawing Inside a Control **42**
Time for Action—Creating the Application 43
Summary **45**
Chapter 3: Basic Drawing **47**
The GDI+ Coordinate System **47**
Drawing with GDI+ **49**
Using the Color Object 49
Drawing Using the Pen Object 50
Filling Surfaces Using the Brush Object 51
Drawing Text Using the Font Object 52
Improving Drawing Quality 53
Building the GradientLabel Control **54**
Time for Action—Creating the GradientLabel Custom Control 54
Summary **56**
Chapter 4: Drawing Complex Shapes and Using Transformations **57**
Drawing Complex Shapes **57**
The GraphicsPath Object 58
The Region Object 62
Clipping Drawing Using Region Objects **65**
Keeping Drawing Inside a Region 65
Keeping Drawing Outside a Region 66
Graphics Transformations **67**
Translation 68
Rotation 69
Scaling 70
Creating the Clock Control **71**
Time for Action—Creating the Clock Control 71
Time for Action—Updating the Clock to Use Transformations 77
Summary **78**
Chapter 5: Drawing Control Parts, Borders, and Adornments **79**
Rendering Common Control Parts **79**
Drawing Buttons 80
Drawing Caption Buttons 81
Drawing Checkboxes 82

Drawing Drop-Down Buttons 83
Drawing Radio Buttons 83
Drawing Scroll Buttons 84
Rendering Borders and Frames 85
Rendering Button Borders 85
Rendering 3D Borders 86
Rendering Control Adornments 87
Creating Multiple Controls that Reuse the Same Functionality 88
Creating a Base Class for Two or More Controls 89
Time for Action—Creating the ControlPart Base Class 89
Creating Derived Controls 91
Time for Action—Creating the ScrollArrowButton Control 91
Time for Action—Creating the CheckButton Control 93
Extending Existing Controls 94
Time for Action—Creating the BorderGradientPanel Control 94
Time for Action—Implementing the GradientButton Control 96
Summary 98

Chapter 6: Working with Images 99

Drawing Images 100
Using the Image Class 100
Using the Bitmap Class 101
Displaying Images 103
Time for Action—Displaying Images 103
Image Effects 105
Skewing, Rotation, and Scaling 107
Building the ImageWarper Class 108
Time for Action—Creating the ImageWarper Class 109
The ImageWarperControl 113
Time for Action—Creating the ImageWarperApp and the Image WarperControl 113
Summary 120

Chapter 7: Printing 121

.NET Printing Explained 121
Using the PrintDocument Class 122
Your First Print Job 123
Time for Action—Creating the "Hello Printer!" Application 123

The SimpleReportPrinter **126**
Building the SimpleReportPrinter and TextDispenser Classes 126
Time for Action—Building the TextDispenser Class 128
Time for Action—Building the SimpleReportPrinter Class 130
User Involvement 134
Our Responsibilities as Programmers 137
Printing Custom Controls **137**
Time for Action—Creating the PrintableRichTextBox 138
Summary **141**

Chapter 8: Collections **143**

Collections in the .NET Framework **144**
ArrayList 144
Queue 145
Stack 146
SortedList 148
Generics **150**
Building the Font Picker **152**
Time for Action—Building Font Picker 152
Summary **163**

Chapter 9: Double Buffering **165**

Introduction to Double Buffering **165**
The Scroll Bar **166**
Scroll that Text! 168
Time for Action—Building FlickerFree Control 169
Summary **175**

Chapter 10: Handling Mouse Events **177**

Handling Mouse Events **178**
Working with Coordinates 179
Dragging and Dropping **179**
Dragging 180
Time for Action—Dragging 181
Dragging and Dropping 188
Time for Action—Dragging and Dropping 188
Summary **193**

Chapter 11: Implementing Design-Time Support 195

Building Designer-Friendly Controls 196
Attributes 196
Designers 197
Type Converters 197
UI Type Editors 198
Property Editors 199
Creating Property Editors 200
Time for Action—Adding Design-Time Support 200
Summary 203

Chapter 12: Designing Intuitive Interfaces 205

The Relationship between User and Computer 205
Communicating with Users 206
Requests, Input Parsing, Fault Tolerance, and Feedback 206
Examining the Sketcher Control 208
Looking Further Into Input Parsing 212
How Can We Use Regex to Our Advantage? 212
Time for Action—Creating the Regex Application 213
Our Regex Pattern in Detail 215
Optimization and Coding Conventions 215
Summary 216

Chapter 13: The PieChart Control 217

Creating the PieChart Control 218
Time for Action—Creating the PieChart Control 218
Adding Slice Names and Delimiters 224
Time for Action—Improving the PieChart Control 225
PieChart Legend 229
Time for Action—Creating the PieChart Legend 229
Printing the PieChart 232
Time for Action—The Printable PieChart 233
Adding and Removing Slices 238
Time for Action—Add Application Support for PieChart Slice Add/Remove Operations 238
Summary 243

Appendix A: Distributing Custom Controls **245**

Creating a Control Library Using Visual Studio 2005 **246**
Creating a Control Library Using Visual C# Express 2005 **248**
Using a Custom Control Library **250**

Index **255**