

Contents

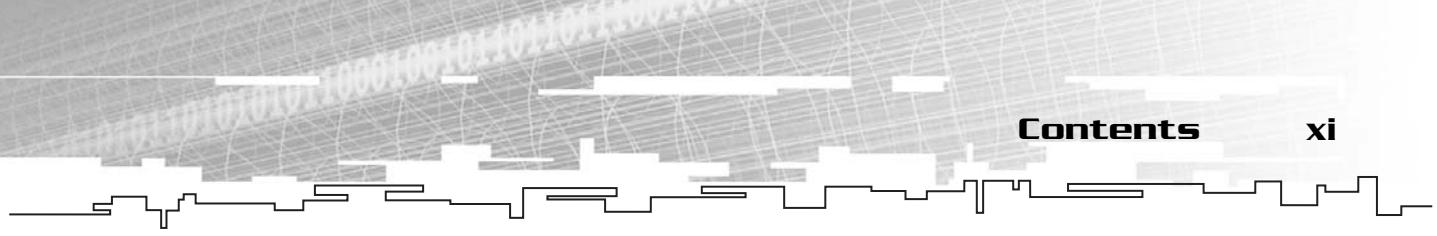
Letter from the Series Editor	xix
Introduction	xx

Part One

DirectX Graphics: Don't Hurt Me 1

Chapter 1	
The History of Direct3D/DirectX Graphics..... 3	
DirectX 2.0	4
DirectX 6/7	5
DirectX 8.....	5
Point Sprites	6
3D Textures.....	6
Direct3DX Utility Library	6
Vertex and Pixel Shaders	6
DirectX 9.....	7
Summary.....	8

Chapter 2	
Overview of HAL and COM 9	
Hardware Abstraction Layer	10
Pluggable Software Devices.....	13
Reference Rasterizer	14
Controlling Devices	14
COM	15
Summary.....	17



Chapter 3 Programming Conventions 19

Accessing COM Objects	20
Naming Conventions	22
Debugging DirectX.....	24
Return Codes	25
Summary.....	26

Chapter 4 3D Fundamentals, Gouraud Shading, and Texture-Mapping Basics 27

3D Fundamentals	28
Understanding Vertices	30
Working with Orientation.....	31
Understanding Faces	31
Understanding Polygons	33
Understanding Normals.....	33
Understanding Normals and Gouraud Shading	33
Texture-Mapping Basics	34
Summary.....	36

Chapter 5 The Basics 37

Compiling the Examples	38
The DirectX Graphics Common Architecture	40
The Basic Example.....	41
The ConfirmDevice(), OneTimeScenelInit(), and InitDeviceObjects() Functions ..	44
The RestoreDeviceObjects() Method	45
The FrameMove() Function	53
The Render() Function	53

The InvalidateDeviceObjects() Function	57
The DeleteDeviceObjects() Function	58
The FinalCleanup() Function	58
The Basic2 Example.....	58
The InitDeviceObjects() Function	62
The RestoreDeviceObjects() Function	62
The Render() Function.....	64
The InvalidateDeviceObjects() Function	66
The DeleteDeviceObjects() Function	67
The FinalCleanup() Function	67
The Basic3 Example.....	67
The Basic4 Example.....	69
The Basic5 Example.....	75
Summary.....	76

Chapter 6 **First Steps to Animation** **77**

Understanding Transformations and Viewports.....	78
The World Transformation	79
The View Transformation	103
The Projection Transformation.....	110
Working with the Viewport	112
Depth Buffering.....	116
Additional Resources	119
Summary.....	119
Part One Quiz.....	120

Part Two **Knee-Deep in DirectX** **Graphics Programming** **123**

Chapter 7 **Texture-Mapping Fundamentals** **125**

What Is the Point of Textures?	126
Working with Texture Coordinates	129
Using Texture-Addressing Modes	131
Wrap Texture-Addressing Mode	132
Mirror Texture-Addressing Mode	133
Clamp Texture-Addressing Mode	134
Border Color Texture-Addressing Mode	135
Mirrornoce Texture-Addressing Mode	136
Texture Wrapping	136
Texture Filtering and Anti-Aliasing	138
Mipmaps	139
Nearest-Point Sampling	140
Linear Texture Filteringing	141
Anisotropic Filtering	142
Anti-Aliasing	143
Alpha Blending	145
Summary	147

Chapter 8 **Using Multiple Textures** **149**

Multipass Rendering	150
Color Operations	153
Dark Mapping	154
Animating the Dark Map	157
Blending a Texture with Material Diffuse Color	158
A Dark Map Blended with Material Diffuse Color	160

Glow Mapping.....	161
Detail Mapping	163
Alpha Modulation	167
Alpha Operations	166
Multitexturing Support	168
Texture Management.....	169
Additional Resources	169
Summary.....	170
Part Two Quiz	170
Part Three	
Hard-Core DirectX	
Graphics Programming	175
Chapter 9	
Shader Programming with the High-Level Shader	
Language	177
What You Need to Jump into HLSL.....	179
Vertex and Pixel Shader Tasks.....	180
Common Lighting Formulas Implemented with HLSL	181
Ambient Lighting.....	181
Diffuse Lighting	183
Specular Lighting.....	186
Self-Shadowing Term	191
Bump Mapping.....	192
Point Lights	194
Summary.....	196
Chapter 10	
More Advanced Shader Effects	197
Working with Cube Maps	198
Generating Cube Maps.....	198
Accessing Cube Maps.....	199

Implementation	200
Refractive and Reflective Environment Mapping.....	202
Dynamic Refractive and Reflective Environment Mapping	204
Bumped Dynamic Refractive and Reflective Environment Mapping	208
Working with Shadows	211
Shadow Volumes	212
Things to Consider When Using Shadow Volumes	226
Summary.....	226

Chapter 11 **Working with Files** **227**

3D File Formats	228
The X File Format.....	229
Header.....	230
Mesh	231
MeshMaterialList.....	232
Normals.....	235
Textures.....	236
Transformation Matrices.....	242
Animation	246
Using X Files.....	249
Extending X Files	251
Additional Resources	252
X File Format	252
Skinned Meshes.....	252
Summary.....	252

Chapter 12 **Using *.md3 Files** **253**

Files of the Trade	254
Animation.cfg.....	258
The .skin File.....	260
Textures and the Shader File	261

Custom Sounds.....	267
The .md3 Format	267
Md3.h.....	269
The CharacterEngine Example Program.....	271
Loading and Animating an .md3 Model	273
Further Improvements	298
Additional Resources	298
Summary.....	298
Part Four Appendixes	299
Appendix A Windows Game Programming Foundation.....	301
How to Look through a Window.....	302
How Windows 95/98/ME/NT/2000/XP Interacts with Your Game	302
The Components of a Window.....	303
A Window Skeleton	303
Step 1: Define a Window Class	307
Step 2: Register the Window Class	311
Step 3: Create a Window of That Class.....	311
Step 4: Display the Window	314
Step 5: Create the Message Loop.....	315
The Window Procedure.....	318
A Window Skeleton Optimized for Games	318
Windows Resources	322
Appendix B C++ Primer	327
What Is Object-Oriented Programming?	328
Abstraction	329
Classes.....	331

Encapsulation	332
Declaring a Class	333
The Constructor	337
The Destructor	337
Class Hierarchies and Inheritance	339
Virtual Functions	343
Polymorphism	345
Inline Functions	345
C++ Enhancements to C	347
Additional Resources	352

Appendix C Mathematics Primer 353

Points in 3D	354
Vectors	356
Bound Vector	356
Free Vector	357
Unit Vector	364
Matrices	364
Multiplication of a Matrix by a Vector	366
Matrix Addition and Subtraction	366
Matrix Multiplication	366
Translation Matrix	367
Scaling Matrix	367
Rotation Matrices	367
Summary	369

Appendix D Creating a Texture with D3DXCreateTextureFromFileEx() 371

Appendix E	
Game Programming Resources	375
General	376
DirectX Graphics	376
Appendix F	
What's on the CD.	377
DirectX 9.0 SDK.....	378
ATI RenderMonkey.....	378
NVIDIA Cg Toolkit	379
Flash Movies	379
Index	381