

Game Programming Gems 7

Edited by
Scott Jacobs

Charles River Media

A part of Course Technology, Cengage Learning

* > COURSE TECHNOLOGY
8% CENGAGE Learning"

Australia • Brazil • Japan • Korea • Mexico • Singapore • Spain • United Kingdom • United States

Contents

Prefaceix
About the Cover Imagexiii
Acknowledgmentsxv
Contributor Biosxvii
SECTION 1 GENERAL PROGRAMMING1
Introduction3
<i>Adam Lake, Graphics Software Architect</i>	
1.1 Efficient Cache Replacement Using the Age and Cost Metrics	5
<i>Colt "MainRoach" McAnlis, Microsoft Ensemble Studios</i>	
1.2 High Performance Heap Allocator15
<i>Dimitar Lazarov, Luxoflux</i>	
1.3 Optical Flow for Video Games Played with Webcams25
<i>Arnau Ramisa, Institut d'Investigacio, en Intel·ligencia Artificial</i>	
<i>Enric Vergara, GeoVirtual</i>	
<i>Enric Marti, Universitat Autònoma de Barcelona</i>	
1.4 Design and Implementation of a Multi-Platform Threading Engine	35
<i>Michael Ramsey</i>	
1.5 For Bees and Gamers: How to Handle Hexagonal Tiles47
<i>Thomas Jahn, King Art</i>	
<i>Jorn Loviscach, Hochschule Bremen</i>	
1.6 A Sketch-Based Interface to Real-Time Strategy Games Based on a Cellular Automaton59
<i>Carlos A. Dietrich, Luciana P. Nedel, Jodo L. D. Comba</i>	
1.7 Foot Navigation Technique for First-Person Shooting Games69
<i>Marcus Aurelius C. Farias, Daniela G. Trevisan, Luciana P. Nedel</i>	
1.8 Deferred Function Call Invocation System81
<i>Mark Jawad, Nintendo of America Inc.</i>	
1.9 Multithread Job and Dependency System87
<i>Julien Hamaide</i>	

1.10	Advanced Debugging Techniques.	97
	<i>Martin Fleisz</i>	
SECTION 2 MATH AND PHYSICS.		107
	Introduction.	109
	<i>Graham Rhodes, Applied Research Associates, Inc.</i>	
2.1	Random Number Generation.	113
	<i>Chris Lomont</i>	
2.2	Fast Generic Ray Queries for Games.	127
	<i>Jacco Bikker, IGADINHTV University of Applied Sciences—Breda, The Netherlands</i>	
2.3	Fast Rigid-Body Collision Detection Using Farthest Feature Maps..	143
	<i>Rahul Sathe, Advanced Visual Computing, SSG, Intel Corp.</i> <i>Dillon Sharlet, University of Colorado at Boulder</i>	
2.4	Using Projective Space to Improve Precision of Geometric Computations.	153
	<i>Krzysztof Kluczek, Gda 'nsk University of Technology</i>	
2.5	XenoCollide: Complex Collision Made Simple.	165
	<i>Gary Snethen, Crystal Dynamics</i>	
2.6	Efficient Collision Detection Using Transformation Semantics.	179
	<i>Jose Gilvan Rodrigues Maia, UFC</i> <i>Creto Augusto Vidal, UFC</i> <i>Joaquim Bento Cavalcante-Neto, UFC</i>	
2.7	Trigonometric Splines.	191
	<i>Tony Barrera, Barrera Kristiansen AB</i> <i>Anders Hast, Creative Media Lab, University ofGdvle</i> <i>Ewert Bengtsson, Centre For Image Analysis, Uppsala University</i>	
2.8	Using Gaussian Randomness to Realistically Vary Projectile Paths .	199
	<i>Steve Rabin, Nintendo of America Inc.</i>	
SECTION 3 AI.		205
	Introduction.	207
	<i>Brian Schwab</i>	
3.1	Creating Interesting Agents with Behavior Cloning.	209
	<i>John Harger</i> <i>Nathan Fabian</i>	

Contents

3.2	Designing a Realistic and Unified Agent-Sensing Model	217
	<i>Steve Rabin, Nintendo of America Inc.</i> <i>Michael Delp, WXP Inc.</i>	
3.3	Managing AI Algorithmic Complexity: Generic Programming Approach.	229
	<i>Iskander Umarov</i> <i>Anatoli Beliaev</i>	
3.4	All About Attitude: Building Blocks for Opinion, Reputation, and NPC Personalities.	249
	<i>Michael F. Lynch, Ph.D., Rensselaer Polytechnic Institute, Troy, NY</i>	
3.5	Understanding Intelligence in Games Using Player Traces and Interactive Player Graphs.	265
	<i>G. Michael Youngblood, UNC Charlotte</i> <i>Priyesh N. Dixit, UNC Charlotte</i>	
3.6	Goal-Oriented Plan Merging.	281
	<i>Michael Dawe</i>	
3.7	Beyond A*: IDA* and Fringe Search.	289
	<i>Robert Kirk DeLisle</i>	
	SECTION 4 AUDIO.	295
	Introduction.	297
	<i>Alexander Brandon</i>	
4.1	Audio Signal Processing Using Programmable Graphics Hardware .	299
	<i>Mark France</i>	
4.2	MultiStream—The Art of Writing a Next-Gen Audio Engine.	305
	<i>Jason Page, Sony Computer Entertainment, Europe</i>	
4.3	Listen Carefully, You Probably Won't Hear This Again.	321
	<i>Stephan Schutze</i>	
4.4	Real-Time Audio Effects Applied.	331
	<i>Ken Noland</i>	
4.5	Context-Driven, Layered Mixing.	341
	<i>Robert Sparks</i>	

SECTION 5 GRAPHICS	349
Introduction	351
<i>Timothy E. Roden, Angelo State University</i>	
5.1 Advanced Particle Deposition	353
<i>Jeremy Hayes, Intel Corporation</i>	
5.2 Reducing Cumulative Errors in Skeletal Animations	365
<i>Bill Budge, Sony Entertainment of America</i>	
5.3 An Alternative Model for Shading of Diffuse Light for Rough Materials.	373
<i>Tony Barrera, Barrera Kristiansen AB</i>	
<i>Anders Hast, Creative Media Lab, University of Gdvl</i>	
<i>Ewert Bengtsson, Centre For Image Analysis, Uppsala University</i>	
5.4 High-Performance Subdivision Surfaces	381
<i>Chris Lomont</i>	
5.5 Animating Relief Impostors Using Radial Basis Functions Textures .	401
<i>Vitor Fernando Pamplona, Instituto de Informatica: UFRGS</i>	
<i>Manuel M. Oliveira, Instituto de Informatica: UFRGS</i>	
<i>Luciana Porcher Nedel, Instituto de Informatica: UFRGS</i>	
5.6 Clipmapping on SM1.1 and Higher.	413
<i>Ben Garney</i>	
5.7 An Advanced Decal System.	423
<i>Joris Mans</i>	
<i>Dmitry Andreev</i>	
5.8 Mapping Large Textures for Outdoor Terrain Rendering.	435
<i>Antonio Seoane, Javier Taibo, Luis Hernandez, and</i>	
<i>Alberto Jasp e, VidealAB, University of La Coruna</i>	
5.9 Art-Based Rendering with Graftal Imposters.	447
<i>Joshua A. Doss, Advanced Visual Computing, Intel Corporation</i>	
5.10 Cheap Talk: Dynamic Real-Time Lipsync.	455
<i>Timothy E. Roden, Angelo State University</i>	
SECTION 6 NETWORKING AND MULTIPLAYER	463
Introduction	465
<i>Diana Stelmack</i>	

6.1	High-Level Abstraction of Game World Synchronization.	467
	<i>Hyun-jik Baeb</i>	
6.2	Authentication for Online Games.	481
	<i>Jon Watte</i>	
6.3	Game Network Debugging with Smart Packet Sniffers.	491
	<i>David L. Koenig, The Whole Experience, Inc.</i>	
SECTION 7 SCRIPTING AND DATA-DRIVEN SYSTEMS.		499
	Introduction.	501
	<i>Scott Jacobs</i>	
7.1	Automatic Lua Binding System.	503
	<i>Julien Hamaide</i>	
7.2	Serializing C++ Objects Into a Database Using Introspection.	517
	<i>Joris Mans</i>	
7.3	Dataports.	535
	<i>Martin Linklater</i>	
7.4	Support Your Local Artist: Adding Shaders to Your Engine.	541
	<i>Curtiss Murphy, Alion Science and Technology</i>	
7.5	Dance with Python's AST.	555
	<i>Zou Guangxian</i>	
	About the CD-ROM.	561
	Index.	563