Gpu Pro 5 Advanced Rendering Techniques

Computer Graphics Programming in OpenGL with C++

Important elements of games, movies, and other computer-generated content, shadows are crucial for enhancing realism and providing important visual cues. In recent years, there have been notable improvements in visual quality and speed, making high-quality realistic real-time shadows a reachable goal. Real-Time Shadows is a comprehensive guide to the theory and practice of real-time shadow techniques. It covers a large variety of different effects, including hard, soft, volumetric, and semi-transparent shadows. The book explains the basics as well as many advanced aspects related to the domain of shadow computation. It presents interactive solutions and practical details on shadow computation. The authors compare various algorithms for creating real-time shadows and illustrate how they are used in different situations. They explore the limitations and failure cases, advantages and disadvantages, and suitability of the algorithms in several applications. Source code, videos, tutorials, and more are available on the book’s website www.realtimeshadows.com.

3D Engine Design for Virtual Globes

The book is written in a Cookbook format with practical recipes aimed at helping you exploit OpenGL to its full potential. This book is targeted towards intermediate OpenGL programmers. However, those who are new to OpenGL and know an alternate API like DirectX might also find these recipes useful to create OpenGL animations.

Real-Time Rendering

The latest edition of this bestselling game development reference offers proven tips and techniques for the real-time rendering of special effects and visualization data that are useful for beginners and seasoned game and graphics programmers alike. Exploring recent developments in the rapidly evolving field of real-time rendering, GPU Pro 7: Advanced Rendering Techniques text, dynamic user interfaces, custom attributes--plus, you’ll also find reliable security and authentication methods.

Physically Based Rendering

This advanced resource is ideal for experienced programmers seeking practical solutions to real problems. Discover valuable coding techniques and best practices while learning to master Microsoft’s newest cross-platform programming language. This definitive guide will show you how to expertly apply and integrate C# into your business applications. Create user controls, special effects, text, dynamic user interfaces, custom attributes--plus, you’ll also find reliable security and authentication methods.

Gpu Pro 7

Thoroughly updated, this fourth edition focuses on modern techniques used to generate synthetic three-dimensional images in a fraction of a second. With the advent of programmable shaders, a wide variety of new algorithms have arisen and evolved over the past few years. This edition discusses current, practical rendering methods used in games and other applications. It also presents a solid theoretical framework and relevant mathematics for the field of interactive computer graphics, all in an approachable style. The authors have made the figures used in the book available for download for fair use.

Graphics Shaders

Thoroughly revised, this third edition focuses on modern techniques used to generate synthetic three-dimensional images in a fraction of a second. With the advent of programmable shaders, a wide variety of new algorithms have arisen and evolved over the past few years. This edition discusses current, practical rendering methods used in games and other applications. It also presents a solid theoretical framework and relevant mathematics for the field of interactive computer graphics, all in an approachable style. The authors have made the figures used in the book available for download for fair use.

Game Engine Architecture

This book takes the practicality of other “Gems” series such as “Graphics Gems” and “Game Programming Gems” and provide a quick reference for novice and expert programmers alike to swiftly track down a solution to a task needed for their VR project. Reading the book from cover to cover is not the expected use case, but being familiar with the territory from the Introduction and then jumping to the needed explanations is how the book will mostly be used. Each chapter (other than Introduction) will contain between 5 to 10 “tips”, each of which is a self-contained explanation with implementation detail generally demonstrated as pseudo code, or in cases where it makes sense, actual code.
researchers and developers Usable code snippets that readers can put to immediate use in their own projects. Tips of value both to readers entering the field as well as those looking for solutions that expand their repertoire.

OpenCL Programming Guide

Wolfgang Engel’s GPU Pro 360 Guide to Rendering gathers all the cutting-edge information from his previous seven GPU Pro volumes into a convenient single source anthology that covers rendering. This volume is complete with 32 articles by leading programmers that focus on the ability of graphics processing units to process and generate rendering in exciting ways. GPU Pro 360 Guide to Rendering is comprised of ready-to-use ideas and efficient procedures that can help solve many rendering programming challenges that may arise.

GPU Pro 360 Guide to Rendering

Over 70 recipes that cover advanced techniques for 3D programming such as lighting, shading, textures, particle systems, and image processing, along with OpenGL 4.6 basics, and CUDA 5.0 and SM 3.5. The streaming multiprocessors, including descriptions of all features through SM 3.5. Comprehensive reference and a practical cookbook, the text is divided into the following three parts: Part I, Overview, gives high-available at www.cudahandbook.com–is specifically intended to be reused and repurposed by developers. Designed to be both a

CPU/GPU data interchange and synchronization. The accompanying open source code–more than 25,000 lines of it, freely expert coverage of topics such as the driver API and context migration, as well as the guidance on how best to structure hardware processes commands and how the driver checks progress; more experienced CUDA developers will appreciate the

sophisticated, will find something here of interest and immediate usefulness. Newer CUDA developers will see how the software in greater detail and covering both CUDA 5.0 and Kepler. Every CUDA developer, from the casual to the most

day graphics programming challenges. Focusing on interactive media and games, the book covers up-to-date methods for

modern, realistic visual effects Book Description OpenGL 4 Shading Language Cookbook, Third Edition provides easy-to-follow recipes that first walk you through the theory and background behind each technique, and then proceed to showcase and explain the GLSL and OpenGL code needed to implement them. The book begins by familiarizing you with beginner-level topics such as compiling and linking shader programs, saving and loading shader binaries (including SPIR-V), and using an OpenGL function loader library. We then proceed to cover basic lighting and shading effects. After that, you’ll learn to use textures, produce shadows, and use geometry and tessellation shaders. Topics such as particle systems, screen-space ambient occlusion, deferred rendering, depth-based tessellation, and physically based rendering will help you tackle advanced topics. OpenGL 4 Shading Language Cookbook, Third Edition also covers advanced techniques such as shadow techniques (including the two of the most common techniques: shadow maps and shadow volumes). You will learn how to use noise in shaders and how to use computer shaders. The book provides examples of modern shading techniques that can be used as a starting point for programmers to expand upon to produce modern, interactive, 3D computer-graphics applications. What you will learn Compile, debug, and communicate with shader programs Use compute shaders for physics, animation, and general computing Learn about features such as shader storage classes, shared memory, and the “GPUCache” feature. Use and utilize image objects for image processing. Write shaders that are both efficient and scalable. Use the SPUC compiler to generate optimized code. Use the SPIR-V Shader binary Learn how to create shadows using shadow maps or shadow volumes Create particle systems that simulate smoke, fire, and other effects Who this book is for If you are a graphics programmer looking to learn OpenGL shading language, this book is for you. A basic understanding of 3D graphics and programming experience with C++ are required.

ShaderX4

This book is a must-have for anyone serious about rendering in real time. With the announcement of new ray tracing APIs and hardware to support them, developers can easily create real-time applications with ray tracing as a core component. As ray tracing on the GPU becomes faster, it will play a more central role in real-time rendering. Ray Tracing Gems provides key building blocks for developers of games, architectural applications, visualizations, and more. Experts in rendering share their knowledge by explaining everything from nitty-gritty techniques that will improve any ray tracer to mastery of the new capabilities of current and future hardware. What you’ll learn: The latest ray tracing techniques for developing real-time applications such as simulating light transport, real-time procedural geometry, and physically based effects. Advanced techniques for rendering applications with Microsoft DirectX 12. For developers who are looking to leverage the latest APIs and GPU technology for real-time rendering and ray tracing Students who want to learn about shader programming techniques to expand GPU applications and games. A complete guide to shader programming techniques with detailed examples and practical advice. This book is a must-have for anyone serious about rendering in real time. With the announcement of new ray tracing APIs and hardware to support them, developers can easily create real-time applications with ray tracing as a core component. As ray tracing on the GPU becomes faster, it will play a more central role in real-time rendering. Ray Tracing Gems provides key building blocks for developers of games, architectural applications, visualizations, and more. Experts in rendering share their knowledge by explaining everything from nitty-gritty techniques that will improve any ray tracer to mastery of the new capabilities of current and future hardware. What you’ll learn: The latest ray tracing techniques for developing real-time applications such as simulating light transport, real-time procedural geometry, and physically based effects. Advan


teed techniques for rendering applications with Microsoft DirectX 12. For developers who are looking to leverage the latest APIs and GPU technology for real-time rendering and ray tracing.

GPU Pro 4

Advanced Rendering Techniques presents ready-to-use ideas and procedures that can help solve many of your day-to-day graphics programming challenges. Focusing on interactive media and games, the book covers up-to-date methods for

physically based rendering and explains how image space algorithms are becoming a key way to achieve a more realistic and higher quality final image. Moving on to the difficult task of rendering shadows, the book describes the state of the art in real-time shadow maps. It then covers game engine design, including quality, optimization, and high-level architecture. The final section explores approaches that go beyond the normal pixel and triangle scope of GPUs as well as techniques that take advantage of the parallelism of modern graphic processors in a variety of applications. Useful to beginners and seasoned game and graphics programmers alike, this color book offers practical tips and techniques for creating real-time graphics. Example programs and source code are available for download on the book’s CRC Press web page. The directory structure of the online material closely follows the book structure by using the chapter numbers as the name of the subdirectory. The CUDA Handbook begins where CUDA by Example (Addison-Wesley, 2011) leaves off, discussing CUDA hardware and software in greater detail and covering both CUDA 5.0 and Kepler. Every CUDA developer, from the casual to the most sophisticated, will find something here of interest and immediate usefulness. Newer CUDA developers will see how the hardware processes commands and how the driver checks progress; more experienced CUDA developers will appreciate the expert coverage of topics such as the driver API and context migration, as well as the guidance on how best to structure CPU/GPU data interchange and synchronization. The accompanying open source code—more than 25,000 lines of it, freely available at www.cudahandbook.com—is specifically intended to be reused and repurposed by developers. Designed to be both a comprehensive reference and a practical cookbook, the text is divided into the following three parts: Part I, Overview, gives high-level descriptions of the hardware and software that make CUDA possible. Part II, Details, provides thorough descriptions of every aspect of CUDA, including Memory Streams and events Models of execution, including the dynamic parallelism feature, new with CUDA 5.0 and SM 3.5. The streaming multiprocessors, including descriptions of all features through SM 3.5.
Programming multiple GPUs Texturing The source code accompanying Part II is presented as reusable microbenchmarks and microdemos, designed to expose specific hardware characteristics or highlight specific use cases. Part III, Select Applications, details specific families of CUDA applications and key parallel algorithms, including Streaming workloads Reduction Parallel prefix sum (Scan) N-body Image Processing. These algorithms cover the full range of potential CUDA applications.

**Real-Time 3D Rendering with DirectX and HLSL**

Welcome to ShaderX6, the latest volume in the cutting-edge, indispensable series for game and graphics programmers. This all-new volume is packed with a collection of insightful techniques, innovative approaches to common problems, and practical tools and tricks that provide you with a complete shader programming toolbox. Every article was developed from the research and experiences of industry pros and edited by shader experts, resulting in unbiased coverage of all hardware and developer tools.

**GPU Zen 2**

This new edition provides step-by-step instruction on modern 3D graphics shader programming in OpenGL with C++, along with its theoretical foundations. It is appropriate both for computer science graphics courses and for professionals interested in mastering 3D graphics skills. It has been designed in a 4-color, "teach-yourself" format with numerous examples that the reader can run just as presented. Every shader stage is explored, from the basics of modeling, textures, lighting, shadows, etc., through advanced techniques such as tessellation, normal mapping, noise maps, as well as new chapters on simulating water, stereoscopy, and ray tracing. FEATURES: Covers modern OpenGL 4.0+ shader programming in C++, with instructions for both PC/Windows and Macintosh. Adds new chapters on simulating water, stereoscopy, and ray tracing. Includes companion files with code, object models, figures, and more (also available for downloading by writing to the publisher) illustrates every technique with running code examples. Everything needed to install the libraries, and complete source code for each example. Includes step-by-step instruction for using each GLSL programmable pipeline stage (vertex, tessellation, geometry, and fragment) Every practical example for modeling, lighting, and shadows (including soft shadows), terrain, water, and 3D materials such as wood and marble. Explains how to optimize code for tools such as Nvidia’s Nsight debugger.

**ShaderX7**

The latest edition of this bestselling game development reference offers proven tips and techniques for the real-time rendering of special effects and visualization data that are useful for beginners and seasoned game and graphics programmers alike. Exploring recent developments in the rapidly evolving field of real-time rendering, GPU Pro 7: Advanced Rendering Techniques assembles a high-quality collection of cutting-edge techniques for advanced graphics processing unit (GPU) programming. It incorporates contributions from more than 30 experts who cover the latest developments in graphics programming for games and movies. The book covers shader programming for games and movies, the DirectX and OpenGL runtimes, as well as on any other runtime with any language available. It details the specific challenges involved in creating games across the most common consumer software platforms such as PCs, video consoles, and mobile devices. The book includes coverage of geometry manipulation; rendering techniques, handheld devices; programming, effects in image space, lighting, 3D engine design, graphics-related tools, and environmental effects. It also includes a dedicated section on general purpose GPU programming that covers CUDA and DirectCompute examples. In color throughout, GPU Pro 7 presents ready-to-use ideas and procedures that can help solve many of your daily graphics programming challenges. Example programs with downloadable source code are also provided on the book's CRC Press web page.

**GPU Pro 360 Guide to Image Space**

This thesis presents methods for photorealistic rendering of virtual objects so that they can be seamlessly composited into images of the real world. To generate predictable and consistent results, we study physically based methods, which simulate how light propagates in a mathematical model of the augmented scene. This computationally challenging problem demands both efficient and accurate simulation of the light transport in the scene, as well as detailed modeling of the geometries, illumination conditions, and material properties. In this thesis, we discuss and formulate the challenges inherent in these steps and present several methods to make the process more efficient. In particular, the material contained in this thesis addresses four closely related areas: HDR imaging, IBL, reflectance modeling, and efficient rendering. The thesis presents a new, statistically motivated algorithm for HDR reconstruction from raw camera data combining denoising, denoising, and HDR fusion in a single processing operation. The thesis also presents practical and robust methods for rendering with spatially and temporally varying illumination conditions captured using omnidirectional HDR video. Furthermore, two new parametric BRDF models are proposed for surfaces exhibiting wide angle gloss. Finally, the thesis also presents a physically based light transport algorithm based on Markov Chain Monte Carlo methods that allows approximations to be used in place of exact quantities, while still converging to the exact result. As illustrated in the thesis, the proposed algorithm enables efficient rendering of scenes with glossy transfer and heterogeneous participating media.

**ShaderX6**

2006 FrontLine Award Winner. The ShaderX series provides a complete toolbox of cutting-edge advanced graphics hardware and software techniques for all levels of graphics programmers, from novices to graphics gurus. With the increasing pixel shader power of current graphics cards, techniques that were once done on the GPU or simply avoided due to their expense are now possible, and this latest volume of the ShaderX series is filled with articles that provide methods for performing these techniques. The collection covers state-of-the-art shader rendering techniques that will bring your graphics to a new level of realism. Throughout the book you'll find a plethora of all new, ready-to-use solutions and tools for the many graphics programming challenges you face everyday. These solutions will save valuable programming time, helping to make you more efficient and productive. Throughout the collection you'll find: How to simulate cloth on the GPU; How to use ambient occlusion efficiently in a game environment; Several global illumination approaches suitable for current hardware platforms; How to do real-time caustics on the GPU; Several ways for how to make your shadow penumbra software for shadow volumes and shadow maps; Tips for using the D3DXEffects framework efficiently and how to integrate post processing; Real-time damage system that uses a damage map to store damage data; Snow rendering; Procedural generation of textures; Tricks, tips, and techniques for super shader, a light map precompilation tool that stores radiosity light maps, and a system for debugging and optimizing...
applications, and much more! This is an indispensable series that should be on every graphics programmer’s bookshelf!

**GPU Gems 2**

In GPU Pro 5: Advanced Rendering Techniques, section editors Wolfgang Engel, Christopher Oat, Carsten Dachsbander, Michal Valient, Wessam Bahnassi, and Marius Bjorge have once again assembled a high-quality collection of cutting-edge techniques for advanced graphics processing unit (GPU) programming. Divided into six sections, the book covers rendering, lighting, effects in image space, mobile devices, 3D engine design, and compute. It explores rasterization of liquids, ray tracing of art assets that would otherwise be used in a rasterized engine, physically based area lights, volumetric light effects, screen-space grass, the usage of quaternions, and a quadtree implementation on the GPU. It also addresses the latest developments in deferred lighting on mobile devices, OpenCL optimizations for mobile devices, morph targets, and tiled deferred blending methods. In color throughout, GPU Pro 5 is the only book that incorporates contributions from more than 50 experts who cover the latest developments in graphics programming for games and movies. It presents ready-to-use ideas and procedures that can help solve many of your daily graphics programming challenges. Example programs with source code are provided on the book’s CRC Press web page.

**OpenGL Development Cookbook**


**VR Developer Gems**

Get Started Quickly with DirectX 3D Programming: No 3D Experience Needed This step-by-step text demystifies modern graphics programming so you can quickly start writing professional code with DirectX and HLSL. Expert graphics instructor Paul Varcholik starts with the basics: a tour of the DirectX 3D graphics pipeline, a 3D math primer, and an introduction to the best tools and support libraries. Next, you’ll discover shader authoring with HLSL. You’ll implement basic lighting models, including ambient lighting, diffuse lighting, and specular highlighting. You’ll write shaders to support point lights, spotlights, environment mapping, fog, color blending, normal mapping, and more. Then you’ll employ C++ and the Direct3D API to develop a robust, extensible rendering engine. You’ll learn about virtual cameras, loading and rendering 3D models, mouse and keyboard input, and you’ll create a flexible effect and material system to integrate your shaders. Finally, you’ll extend your graphics knowledge with more advanced material, including post-processing techniques for color filtering, Gaussian blurring, bloom, and distortion mapping. You’ll develop shaders for casting shadows, work with geometry and tessellation shaders, and implement a complete skeletal animation system for importing and rendering animated models. You don’t need any experience with 3D graphics or the associated math: Everything’s taught hands-on, and all graphics-specific code is fully explained. Coverage includes • The Direct3D API and graphics pipeline • A 3D math primer: vectors, matrices, coordinate systems, transformations, and the DirectX Math library • Free and low-cost tools for authoring, debugging, and profiling shaders • Extensive treatment of HLSL shader authoring • Development of a C++ rendering engine • Cameras, 3D models, materials, and lighting • Post-processing effects • Device input, component-based architecture, and software services • Shadow mapping, depth maps, and projective texture mapping • Skeletal animation • Geometry and tessellation shaders • Survey of rendering optimization, global illumination, compute shaders, deferred shading, and data-driven engine architecture

**GPU Pro 7**

Programmable graphics shaders, programs that can be downloaded to a graphics processor (GPU) to carry out operations outside the fixed-function pipeline of earlier standards, have become a key feature of computer graphics. This book is designed to open computer graphics shader programming to the student, whether in a traditional class or on their own. It is intended to complement texts based on fixed-function graphics APIs, specifically OpenGL. It introduces shader programming in general, and specifically the GLSL shader language. It also introduces a flexible, easy-to-use tool, glman, that helps you develop, test, and tune shaders outside an application that would use them.

**Ray Tracing Gems**

Supported with code examples and the authors' real-world experience, this book offers the first guide to engine design and rendering algorithms for virtual globe applications like Google Earth and NASA World Wind. The content is also useful for general graphics and games, especially planet and massive-world engines. With pragmatic advice throughout, it is essential reading for practitioners, researchers, and hobbyists in these areas, and can be used as a text for a special topics course in computer graphics. Topics covered include: Rendering globes, planet-sized terrain, and vector data Multithread resource management Out-of-core algorithms Shader-based renderer design

**GPU Gems 3**

In GPU Gems 3: Advanced Rendering Techniques, section editors Wolfgang Engel, Christopher Oat, Carsten Dachsbander, Michal Valient, Wessam Bahnassi, and Marius Bjorge have once again assembled a high-quality collection of cutting-edge techniques for advanced graphics processing unit (GPU) programming. Divided into six sections, the book covers rendering, lighting, effects in image space, mobile devices, 3D engine design, and compute. It explores rasterization of liquids, ray tracing of art assets that would otherwise be used in a rasterized engine, physically based area lights, volumetric light effects, screen-space grass, the usage of quaternions, and a quadtree implementation on the GPU. It also addresses the latest developments in deferred lighting on mobile devices, OpenCL optimizations for mobile devices, morph targets, and tiled deferred blending methods. In color throughout, GPU Gems 3 is the only book that incorporates contributions from more than 50 experts who cover the latest developments in graphics programming for games and movies. It presents ready-to-use ideas and procedures that can help solve many of your daily graphics programming challenges. Example programs with source code are provided on the book’s CRC Press web page.
Get Real-World Insight from Experienced Professionals in the OpenGL Community With OpenGL, OpenGL ES, and WebGL, real-time rendering is becoming available everywhere, from AAA games to mobile phones to web pages. Assembling contributions from experienced developers, vendors, researchers, and educators, OpenGL Insights presents real-world techniques for intermediate and advanced OpenGL, OpenGL ES, and WebGL developers. Go Beyond the Basics The book thoroughly covers a range of topics, including OpenGL 4.2 and recent extensions. It explains how to optimize for mobile devices, explores the design of WebGL libraries, and discusses OpenGL in the classroom. The contributors also examine asynchronous buffer and texture transfers, performance state tracking, and programmable vertex/pixel shading. These state-of-the-art, ready-to-use solutions will help you meet your daily programming challenges and bring your graphics to a new level of realism. This collection offers time-saving solutions to help you become more efficient and productive, and is a must-have reference for all shader programmers.

**GPU Pro 5**

Welcome to ShaderX7: Advanced Rendering Techniques, the latest volume in the cutting-edge, indispensable series for game and graphics programmers. This all-new volume is packed with a collection of insightful techniques, innovative solutions to common problems, and practical tools and tricks that provide you with a complete shader programming toolbox. Every article was developed from the research and experiences of industry pros and edited by shader experts, resulting in unbiased coverage of all hardware and developer tools. ShaderX7 provides coverage of the vertex and pixel shader methods used in high-end graphics and game development. These state-of-the-art, ready-to-use solutions will help you meet your daily programming challenges and bring your graphics to a new level of realism. This collection offers time-saving solutions to help you become more efficient and productive, and is a must-have reference for all shader programmers.

**GPU Pro 6**

Build your own low-level game engine in Metal! This book introduces you to graphics programming in Metal - Apple's framework for programming on the GPU. You'll build your own game engine in Metal where you can create 3D scenes and build your own 3D games. Who Is This Book For This book is for intermediate Swift developers interested in learning 3D graphics or gaining a deeper understanding of how games engines work. Topics Covered in Metal by Tutorials The Rendering Pipeline: Take a deep dive through the graphics pipeline. 3D Models: Import 3D models with Model I/O and discover what makes up a 3D model. Graphics Shaders: Learn the math behind 3D rendering. Lighting: Make your models look more realistic with simple lighting techniques. Textures & Materials: Design textures and surfaces for micro detail. Character Animation: Bring your 3D models to life with joints and animation. Tessellation: Discover how to tessellate to add a greater level of detail using fewer resources. Environment: Add a sky to your scenes and use the sky image for lighting. Instancing & Procedural Generation: Save resources with instancing, and generate scenes algorithmically. Multi Pass & Deferred Rendering: Add shadows with advanced lighting effects. and more! After reading this book, you'll be prepared to take full advantage of graphics rendering with the Metal framework.

**Game Engine Gems 2**

Hailed as a “must-have textbook” (CHOICE, January 2010), the first edition of Game Engine Architecture provided readers with a complete guide to the theory and practice of game engine software development. Updating the content to match today's landscape of game engine architecture, this second edition continues to thoroughly cover the major components that make up a typical commercial game engine. New to the Second Edition Information on new topics, including the latest variant of the C++ programming language, C++11, and the architecture of the eighth generation of gaming consoles, the Xbox One and PlayStation 4 New chapter on audio technology covering the fundamentals of the physics, mathematics, and technology that go into creating an AAA game audio engine Updated sections on multicore programming, pipelined CPU architecture and optimization, localization, pseudovectors and Grassman algebra, dual quaternions, SIMD vector math, memory alignment, and anti-aliasing. Insight into the making of Naughty Dog's latest hit, The Last of Us The book presents the theory underlying various subsystems that comprise a commercial game engine as well as the data structures, algorithms, and software interfaces that are typically used to implement them. It primarily focuses on the engine itself, including a host of low-level foundation systems, the rendering engine, the collision system, the physics simulation, character animation, and audio. An in-depth discussion on the “gameplay foundation layer” delves into the game's object model, world editor, event system, and scripting system. The text also touches on some aspects of gameplay programming, including player mechanics, camera, and AI. An awareness-building tool and a jumping-off point for further reading. Game Engine Architecture, Second Edition gives readers a solid understanding of both the theory and common practices employed within each of the engineering disciplines covered. The book will help readers on their journey through this fascinating and multifaceted field.
Techniques

Read Book Gpu Pro 5 Advanced Rendering. More useful techniques, tips, and tricks for harnessing the power of the new generation of powerful GPUs.

- Complete simulation that incorporates everything you've learned
- Implementing special effects ranging from skyboxes to particles and billboards
- Systematically optimizing graphics
- Partitioning data to draw expansive outdoor scenes with rolling terrain
- Detecting and handling user interaction with 3D render 3D geometric objects from any point of view
- Animating scenes by controlling time through application logic
- Simulating ambient, diffuse, and specular light
- Using transformations to simulate the presence of single-precision floating-point arithmetic
- Integrating Cocoa Touch with OpenGL ES to leverage the power of Apple's platform

In this sequel to his new book is his well-known collision detection system, the Software Library for Interference Detection (SOLID). Along the way, he covers the topics of vector algebra and geometry, the various geometric primitives of interest in a collision system, the powerful method of separating axes for the purposes of intersection testing, and the equally powerful Gilbert-Johnson-Keerthi (GJK) algorithm for computing the distances between convex objects data that book provide more than a good compendium of the ideas that go into building a collision system. The curse of practical computational geometry is floating-point arithmetic. Algorithms with straightforward implementations when using exact arithmetic can have catastrophic failures in a floating-point system. Specifically, intersection and distance algorithms implemented in a floating-point system tend to fail exactly in the most important case in a collision system—when two objects are just touching. Great care must be taken to properly handle floating-point round off errors. Gino's ultimate accomplishment in this book is his presentation on how to correctly implement the GJK distance algorithm in the presence of single-precision floating-point arithmetic. And what better way to illustrate this than with a case study, the final chapter on the design and implementation of SOLID. About the CD-ROM The companion CD-ROM includes the full C++ source code of SOLID 3.5 as well as API documentation in HTML and PDF formats. Both single (32bit) and double (64bit) precision versions of the SOLID SDK plus example programs can be compiled for Linux platforms using GNU g++ version 2.95 to 3.3 and for Win32 platforms using Microsoft Visual C++ version 6.0 to 7.1. Use of the SOLID source code is governed by the terms of either the GNU GPL or the Trolltech QPL (see CD-ROM documentation for details). About the Author Gino van den Berg is a game developer living and working in The Netherlands. He is the creator of SOLID and holds a Ph.D. in computing science from Eindhoven University of Technology. Gino implemented collision detection and physics in NaN Technologies' Blender, a creation suite for interactive 3D content.

The CUDA Handbook

The latest edition of this bestselling game development reference offers proven tips and techniques for the real-time rendering of special effects and visualizations. Whether you're a beginner or seasoned games programmer. Exploring recent developments in the rapidly evolving field of real-time rendering, GPU Pro6: Advanced Rendering Techniques assembles a high-quality collection of cutting-edge techniques for advanced graphics processing unit (GPU) programming. It incorporates contributions from more than 45 experts who cover the latest developments in graphics programming for games and movies. The book covers advanced rendering techniques that run on the DirectX or OpenGL runtimes, as well as on any other runtime with any language available. It details the specific challenges involved in targeting graphics across the most common consumer software platforms such as PCs, video consoles, and mobile devices. The book includes coverage of geometry manipulation; rendering techniques, handheld devices programming, effects in image space, shadows, 3D engine design, graphics-related tools, and environmental effects. It also includes a dedicated section on general purpose GPU programming that covers CUDA, DirectXCompute, and OpenGL examples. In color throughout, GPU Pro presents ready-to-use ideas and procedures that can help solve many of your daily graphics programming challenges. Example programs with downloadable source code are also provided on the book's CRC Press web page.

GPU Pro 360 Guide to 3D Engine Design

Complete Coverage of OpenGL® 4.5—the Latest Version (Includes 4.5, 4.4, SPIR-V, and Extensions) The latest version of today's leading worldwide standard for computer graphics, OpenGL 4.5 delivers significant improvements in application efficiency, flexibility, and performance. OpenGL 4.5 is an exceptionally mature and robust platform for programming high-quality computer-generated images and interactive applications using 2D and 3D objects, color images, and shaders. OpenGL® Programming Guide, Ninth Edition, presents definitive, comprehensive information on OpenGL 4.5, 4.4, SPIR-V, OpenGL extensions, and the OpenGL Shading Language. It will serve you for as long as you live or maintain OpenGL code. This edition of the best-selling "Red Book" fully integrates shader techniques alongside classic, function-centric approaches, and contains extensive code examples that demonstrate modern techniques. Starting with the fundamentals, its wide-ranging coverage includes drawing, color, pixels, fragments, transformations, textures, framebuffers, light and shadow, and memory techniques for advanced rendering and non-graphical applications. It also offers discussions of all shader stages, including thorough explorations of tessellation, geometric, and compute shaders. New coverage in this edition includes Thorough coverage of OpenGL 4.5 Direct State Access (DSA), which overhauls the OpenGL programming model and how applications access objects Deep discussions and more examples of shader functionality and GPU processing, reflecting industry trends to move functionality onto graphics processors Demonstrations and examples of key features based on community feedback and suggestions Updated appendices covering the latest OpenGL libraries, related APIs, functions, variables, formats, and debugging and profiling techniques.

OpenGL Insights

Get Started Fast with Modern OpenGL ES Graphics Programming for iPhone, iPod touch, and iPad. OpenGL ES technology underpins the user interface and graphical capabilities of Apple's iPhone, iPod touch, and iPad—plus devices ranging from video-game consoles and aircraft-cockpit displays to non-Apple smartphones. In this friendly, thorough introduction, Erik M. Buck shows how to make the most of OpenGL ES in Apple's iOS environment. This highly anticipated title focuses on modern, efficient approaches that use the latest versions of OpenGL ES, helping you avoid the irrelevant, obsolete, and misleading techniques that litter the Internet. Buck embraces Objective-C and Cocoa Touch, showing how to leverage Apple's powerful, elegant GLKit framework to maximize your productivity, achieve tight platform integration, and deliver exceptionally polished apps. If you've written C or C++ code and know object-oriented programming basics, this title brings together everything you need to fully master OpenGL ES graphics for iOS—including downloadable examples specifically designed to jumpstart your own projects. Coverage includes • Understanding core OpenGL ES computer graphics concepts and iOS graphics architecture • OpenGL ES with Cocoa Touch on Apple's platform • Creating textures from start to finish: opacity, blending, multi-texturing, and compression • Simulating ambient , diffuse, and specular light • Using transformations to render 3D geometric objects from any point of view • Animating scenes by controlling time through application logic • Partitioning data to draw expansive outdoor scenes with rolling terrain • Detecting and handling user interaction with 3D geometry • Implementing special effects ranging from skyboxes to particles and billboards • Systematically optimizing graphics performance • Understanding the essential linear algebra concepts used in computer graphics • Designing and constructing a complete simulation that incorporates everything you've learned.

Collision Detection in Interactive 3D Environments

More useful techniques, tips, and tricks for harnessing the power of the new generation of powerful GPUs.
GPU gems

Every other day we hear about new ways to put deep learning to good use: improved medical imaging, accurate credit card fraud detection, long range weather forecasting, and more. PyTorch puts these superpowers in your hands, providing a comfortable Python experience that gets you started quickly and then grows with you as you—and your deep learning skills—become more sophisticated. Deep Learning with PyTorch will make that journey engaging and fun. Summary Every other day we hear about new ways to put deep learning to good use: improved medical imaging, accurate credit card fraud detection, long range weather forecasting, and more. PyTorch puts these superpowers in your hands, providing a comfortable Python experience that gets you started quickly and then grows with you as you—and your deep learning skills—become more sophisticated. Deep Learning with PyTorch will make that journey engaging and fun. Foreword by Soumith Chintala, Cocreator of PyTorch. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Although many deep learning tools use Python, the PyTorch library is truly Pythonic. Instantly familiar to anyone who knows PyData tools like NumPy and scikit-learn, PyTorch simplifies deep learning without sacrificing advanced features. It’s excellent for building quick models, and it scales smoothly from laptop to enterprise. Because companies like Apple, Facebook, and JPMorgan Chase rely on PyTorch, it’s a great skill to have as you expand your career options. It’s easy to get started with PyTorch. It minimizes cognitive overhead without sacrificing the access to advanced features, meaning you can focus on what matters the most: building and training the latest and greatest deep learning models and contribute to making a dent in the world. PyTorch is also a snap to scale and extend, and it partners well with other Python tooling. PyTorch has been adopted by hundreds of deep learning practitioners and several first-class players like FAIR, OpenAI, FastAI and Purdue. About the book Deep Learning with PyTorch teaches you to create neural networks and deep learning systems with PyTorch. This practical book quickly gets you to work building a real-world example from scratch: a tumor image classifier. Along the way, it covers best practices for the entire DL pipeline, including the PyTorch Tensor API, loading data in Python, monitoring training, and visualizing results. After covering the basics, the book will take you on a journey through larger projects. The centerpiece of the book is a neural network designed for cancer detection. You'll discover ways for training networks with limited inputs and start processing data to get some results. You'll sift through the unreliable initial results and focus on how to diagnose and fix the problems in your neural network. Finally, you'll look at ways to improve your results by training with augmented data, make improvements to the model architecture, and perform other fine tuning. What's inside Training deep neural networks Implementing modules and loss functions Utilizing pretrained models from PyTorch Hub Exploring code samples in Jupyter Notebooks About the reader For Python programmers with an interest in machine learning. About the author Eli Stevens had roles from software engineer to CTO, and is currently working on machine learning in the self-driving-car industry. Luca Antiga is cofounder of an AI engineering company and an AI tech startup, as well as a former PyTorch contributor. Thomas Viehmann is a PyTorch core developer and machine learning trainer and consultant. consultant based in Munich, Germany and a PyTorch core developer. Table of Contents PART 1 - CORE PYTORCH 1 Introducing deep learning and the PyTorch Library 2 Pretrained networks 3 It starts with a tensor 4 Real-world data representation using tensors 5 The mechanics of learning 6 Using a neural network to fit the data 7 Telling birds from airplanes: Learning from images 8 Using convolutions to generalize PART 2 - COMPUTER GRAPHICS 9 Parallelizing your GPU 10 Combining data sources into a unified dataset 11 Training a classification model to detect suspected tumors 12 Improving training with metrics and augmentation 13 Using segmentation to find suspected nodules 14 End-to-end nodule analysis, and where to go next PART 3 - DEPLOYMENT 15 Deploying to production

OpenGL 4 Shading Language Cookbook

Based on course notes of SIGGRAPH course teaching techniques for real-time rendering of volumetric data and effects; covers both applications in scientific visualization and real-time rendering. Starts with the basics (texture-based ray casting) and then improves and expands the algorithms incrementally. Book includes source code, algorithms, diagrams

Metal by Tutorials (Second Edition): Beginning Game Engine Development with Metal

Wolfgang Engel’s GPU Pro 360 Guide to Image Space gathers all the cutting-edge information from his previous seven GPU Pro volumes into a convenient single source anthology that covers various algorithms that operate primarily in image space. This volume is complete with 15 articles by leading programmers speaks to the power and convenience of working in screen space. GPU Pro 360 Guide to Image Space is comprised of ready-to-use ideas and efficient procedures that can help solve many computer graphics programming challenges that may arise. Key Features: Presents tips & tricks on real-time rendering of special effects and visualization data on common consumer software platforms such as PCs, video consoles, mobile devices Covers specific challenges involved in creating games on various platforms Explores the latest developments in rapidly evolving field of real-time rendering Takes practical approach that helps graphics programmers solve their daily challenges

Real-Time Rendering, Fourth Edition

This book, the second volume in the popular Game Engine Gems series, contains short articles that focus on a particular technique, describe a clever trick, or offer practical advice within the subject of game engine development. The 31 chapters cover three broad categories—graphics and rendering, game engine design, and systems programming. Professional game developers, students of game development and computer science, and anyone interested in learning how the pros tackle specific problems that arise during game engine development will find useful gems in this collection. Supplementary materials, including demos, source code, examples, specifications, and more can be found at www.gameenginegems.net.

Real-Time Shadows

This updated edition describes both the mathematical theory behind a modern photorealistic rendering system as well as its practical implementation. Through the ideas and software in this book, designers will learn to design and employ a full-featured rendering system for creating stunning imagery. Includes a companion site complete with source code for the rendering system described in the book, with support for Windows, OS X, and Linux.

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