

# OpenGL<sup>®</sup>

## Programming Guide

### Seventh Edition

# OpenGL Programming Guide Seventh Edition

**Tony Mullen**



## **OpenGL Programming Guide Seventh Edition:**

**OpenGL Programming Guide** Dave Shreiner, The Khronos OpenGL ARB Working, 2009-07-21 Please note that this title's color insert referred to as Plates within the text is not available for this digital product OpenGL is a powerful software interface used to produce high quality computer generated images and interactive applications using 2D and 3D objects bitmaps and color images The OpenGL Programming Guide Seventh Edition provides definitive and comprehensive information on OpenGL and the OpenGL Utility Library The previous edition covered OpenGL through Version 2.1 This seventh edition of the best selling red book describes the latest features of OpenGL Versions 3.0 and 3.1 You will find clear explanations of OpenGL functionality and many basic computer graphics techniques such as building and rendering 3D models interactively viewing objects from different perspective points and using shading lighting and texturing effects for greater realism In addition this book provides in depth coverage of advanced techniques including texture mapping antialiasing fog and atmospheric effects NURBS image processing and more The text also explores other key topics such as enhancing performance OpenGL extensions and cross platform techniques This seventh edition has been updated to include the newest features of OpenGL Versions 3.0 and 3.1 including Using framebuffer objects for off screen rendering and texture updates Examples of the various new buffer object types including uniform buffer objects transform feedback buffers and vertex array objects Using texture arrays to increase performance when using numerous textures Efficient rendering using primitive restart and conditional rendering Discussion of OpenGL's deprecation mechanism and how to verify your programs for future versions of OpenGL This edition continues the discussion of the OpenGL Shading Language GLSL and explains the mechanics of using this language to create complex graphics effects and boost the computational power of OpenGL The OpenGL Technical Library provides tutorial and reference books for OpenGL The Library enables programmers to gain a practical understanding of OpenGL and shows them how to unlock its full potential Originally developed by SGI the Library continues to evolve under the auspices of the Khronos OpenGL ARB Working Group an industry consortium responsible for guiding the evolution of OpenGL and related technologies

*OpenGL Programming Guide* Dave Shreiner, 2010 OpenGL is a powerful software interface used to produce high quality computer generated images and interactive applications using 2D and 3D objects bitmaps and color images The OpenGL Programming Guide Seventh Edition provides definitive and comprehensive information on OpenGL and the OpenGL Utility Library The previous edition covered OpenGL through Version 2.1 This seventh edition of the best selling red book describes the latest features of OpenGL Versions 3.0 and 3.1 You will find clear explanations of OpenGL functionality and many basic computer graphics techniques such as building and rendering 3D models interactively viewing objects from different perspective points and using shading lighting and texturing effects for greater realism In addition this book provides in depth coverage of advanced techniques including texture mapping antialiasing fog and atmospheric effects NURBS image processing and more The text also explores other key topics

such as enhancing performance OpenGL extensions and cross platform techniques This seventh edition has been updated to include the newest features of OpenGL Versions 3 0 and 3 1 including Using framebuffer objects for off screen rendering and texture updates Examples of the various new buffer object types including uniform buffer objects transform feedback buffers and vertex array objects Using texture arrays to increase performance when using numerous textures Efficient rendering using primitive restart and conditional rendering Discussion of OpenGL s deprecation mechanism and how to verify your programs for future versions of OpenGL This edition continues the discussion of the OpenGL Shading Language GLSL and explains the mechanics of using this language to create complex graphics effects and boost the computational power of OpenGL The OpenGL Technical Library provides tutorial and reference books for OpenGL The Library enables programmers to gain a practical understanding of OpenGL and shows them how to unlock its full potential Originally developed by SGI the Library continues to evolve under the auspices of the Khronos OpenGL ARB Working Group an industry consortium responsible for guiding the evolution of OpenGL and related technologies

**OpenGL Programming Guide** John Kessenich, Graham Sellers, Dave Shreiner, 2016-07-25 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 write 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 nongraphical 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 Deeper 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 appendixes covering the latest OpenGL libraries related APIs functions variables formats and debugging and profiling techniques

**Processing, second edition** Casey Reas, Ben Fry, 2014-12-19 The new edition of an introduction to computer programming within the context of the visual arts using the open source programming language Processing thoroughly updated throughout The visual arts are rapidly changing as media moves into the web mobile devices and architecture When designers and artists learn the basics of writing software they develop a new

form of literacy that enables them to create new media for the present and to imagine future media that are beyond the capacities of current software tools This book introduces this new literacy by teaching computer programming within the context of the visual arts It offers a comprehensive reference and text for Processing [www.processing.org](http://www.processing.org) an open source programming language that can be used by students artists designers architects researchers and anyone who wants to program images animation and interactivity Written by Processing's cofounders the book offers a definitive reference for students and professionals Tutorial chapters make up the bulk of the book advanced professional projects from such domains as animation performance and installation are discussed in interviews with their creators This second edition has been thoroughly updated It is the first book to offer in depth coverage of Processing 2.0 and 3.0 and all examples have been updated for the new syntax Every chapter has been revised and new chapters introduce new ways to work with data and geometry New synthesis chapters offer discussion and worked examples of such topics as sketching with code modularity and algorithms New interviews have been added that cover a wider range of projects Extension chapters are now offered online so they can be updated to keep pace with technological developments in such fields as computer vision and electronics Interviews SUE C Larry Cuba Mark Hansen Lynn Hershman Leeson J rg Lehnert Golan Levin and Zachary Lieberman Benjamin Maus Manfred Mohr Ash Nehru Josh On Bob Sabiston Jennifer Steinkamp Jared Tarbell Steph Thirion Robert Winter

**The iOS Game Programming Collection (Collection)** Michael Daley, Rod Strougo, Ray Wenderlich, 2011-12-30 The iOS Game Programming Collection consists of two bestselling eBooks Learning iOS Game Programming A Hands On Guide to Building Your First iPhone Game Learning Cocos2D A Hands on Guide to Building iOS Games with Cocos2D Box2D and Chipmunk Since the launch of the App Store games have been the hottest category of apps for the iPhone iPod touch and iPad That means your best chance of tapping into the iPhone iPad Gold Rush is to put out a killer game that everyone wants to play and talk about While many people think games are hard to build they actually can be quite easy and this collection is your perfect beginner's guide Learning iOS Game Programming walks you through every step as you build a 2D tile map game Sir Lamorak's Quest The Spell of Release which is free in the App Store You can download and play the game you're going to build while you learn about the code You learn the key characteristics of a successful iPhone game and important terminology and tools you will use Learning Cocos2D walks you through the process of building Space Viking which is free on the App Store a 2D scrolling game that leverages Cocos2D Box2D and Chipmunk As you build Space Viking you'll learn everything you need to know about Cocos2D so you can create the next killer iOS game This collection helps you Plan high level game design components and difficulty levels Use game loops to make sure the right events happen at the right time Render images create sprite sheets and build animations Use tile maps to build large game worlds from small reusable images Create fire explosions smoke sparks and other organic effects Deliver great sound via OpenAL and the iPhone's media player Provide game control via iPhone's touch and accelerometer features Craft an effective intuitive game interface

Build game objects and entities and making them work properly Detect collisions and ensuring the right response to them Polish test debug and performance tune your game Install and configure Cocos2D so it works with Xcode 4 Build a complete 2D action adventure game with Cocos2D Build your game s main menu screen for accessing levels Use Cocos2D s Scheduler to make sure the right events happen at the right times Use tile maps to build scrolling game levels from reusable images Add audio and sound effects with CocosDenshion Cocos2D s sound engine Add gravity realistic collisions and ragdoll effects with Box2D and Chipmunk physics engines Add amazing effects to your games with particle systems Leverage Game Center in your game for achievements and leader boards Squeeze the most performance from your games      **OpenGL Library**

Dave Shreiner,Randi J. Rost,Bill Licea-Kane,2009-07 This boxed set includes The best selling OpenGL Programming Guide Seventh Edition which covers the latest releases of OpenGL Versions 3 0 and 3 1 and includes a 16 page color insert This is the definitive guide to graphics programming with OpenGL the platform independent standard for professional quality 3D graphics The popular OpenGL Shading Language Third Edition which addresses the more integrated nature of the shading language in OpenGL 3 0 and 3 1 with key coverage of special shading techniques light and shading techniques light and shadow shaders and multipass shaders Plus A bonus schematic poster of the OpenGL Machine for both the 3 0 and 3 1 versions of OpenGL 032163764X 9780321637642 OpenGL Library 7 e Package consists of 0321552628 9780321552624 OpenGL Programming Guide The Official Guide to Learning OpenGL Versions 3 0 and 3 1 7 e 0321637631 9780321637635 OpenGL Shading Language 3 e 0321660609 9780321660602 OpenGL Library Poster 2 e 0321670124 9780321670120 OpenGL Library Fifth Edition slipcase 5 e      **OpenGL Programming Guide** Mason Woo,Jackie Neider,Tom Davis,OpenGL Architecture Review Board,1997 Explaining how graphics programs using Release 1 1 the latest release of OpenGL this book presents the overall structure of OpenGL and discusses in detail every OpenGL feature including the new features introduced in Release 1 1 Numerous programming examples in C show how to use OpenGL functions Also includes 16 pages of full color examples      3D Engine Design for Virtual Globes Patrick Cozzi,Kevin Ring,2011-06-24 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      *OpenGL Shading Language* Randi J. Rost,Bill Licea-Kane,Dan Ginsburg,John Kessenich,Barthold

Lichtenbelt,Hugh Malan,Mike Weiblen,2009-07-13 OpenGL Shading Language Third Edition extensively updated for OpenGL 3 1 is the experienced application programmer s guide to writing shaders Part reference part tutorial this book thoroughly explains the shift from fixed functionality graphics hardware to the new era of programmable graphics hardware and the

additions to the OpenGL API that support this programmability With OpenGL and shaders written in the OpenGL Shading Language applications can perform better achieving stunning graphics effects by using the capabilities of both the visual processing unit and the central processing unit In this book you will find a detailed introduction to the OpenGL Shading Language GLSL and the new OpenGL function calls that support it The text begins by describing the syntax and semantics of this high level programming language Once this foundation has been established the book explores the creation and manipulation of shaders using new OpenGL function calls OpenGL Shading Language Third Edition includes updated descriptions for the language and all the GLSL entry points added though OpenGL 3.1 as well as updated chapters that discuss transformations lighting shadows and surface characteristics The third edition also features shaders that have been updated to OpenGL Shading Language Version 1.40 and their underlying algorithms including Traditional OpenGL fixed functionality Stored textures and procedural textures Image based lighting Lighting with spherical harmonics Ambient occlusion and shadow mapping Volume shadows using deferred lighting Ward's BRDF model The color plate section illustrates the power and sophistication of the OpenGL Shading Language The API Function Reference at the end of the book is an excellent guide to the API entry points that support the OpenGL Shading Language

**Game Engine Gems 2** Eric Lengyel, 2011-02-14 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](http://www.gameenginegems.net)

**OpenGL Programming Guide**, 2007 **OpenGL Insights** Patrick Cozzi, Christophe Riccio, 2012-07-23 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

**High Performance Visualization** E. Wes Bethel, Hank Childs, Charles Hansen, 2012-10-25 Visualization and analysis tools techniques and algorithms have undergone a rapid evolution in recent decades to accommodate explosive growth in data size and complexity and to exploit emerging multi and many core computational platforms High Performance Visualization Enabling Extreme Scale Scientific Insight focuses on the subset of scientific visualization concerned with algorithm design implementation and optimization for use on today's largest computational platforms The book collects some of the most seminal work in the field including algorithms and implementations running at the highest levels of concurrency and used by scientific researchers worldwide After introducing the fundamental concepts of parallel visualization the book explores

approaches to accelerate visualization and analysis operations on high performance computing platforms Looking to the future and anticipating changes to computational platforms in the transition from the petascale to exascale regime it presents the main research challenges and describes several contemporary high performance visualization implementations Reflecting major concepts in high performance visualization this book unifies a large and diverse body of computer science research development and practical applications It describes the state of the art at the intersection of scientific visualization large data and high performance computing trends giving readers the foundation to apply the concepts and carry out future research in this area      **OpenGL Programming Guide : the Official Guide to Learning OpenGL, Version 4.3** ,2013

**Learning iOS Game Programming** Michael Daley,2010-09-03 Since the launch of the App Store games have been the hottest category of apps for the iPhone iPod touch and iPad That means your best chance of tapping into the iPhone iPad Gold Rush is to put out a killer game that everyone wants to play and talk about While many people think games are hard to build they can actually be quite easy and Learning iOS Game Programming is your perfect beginner s guide Michael Daley walks you through every step as you build a killer 2D game for the iPhone In Learning iOS Game Programming you ll learn how to build a 2D tile map game Sir Lamorak s Quest The Spell of Release which is free in the App Store You can download and play the game you re going to build while you learn about the code and everything behind the scenes Daley identifies the key characteristics of a successful iPhone game and introduces the technologies terminology and tools you will use Then he carefully guides you through the whole development process from planning storylines and game play all the way through testing and tuning Download the free version of Sir Lamorak s Quest from the App Store today while you learn how to build the game in this book Coverage includes Planning high level game design components and difficulty levels Using game loops to make sure the right events happen at the right time Rendering images creating sprite sheets and building basic animations Using tile maps to build large game worlds from small reusable images Creating fire explosions smoke sparks and other organic effects Delivering great sound via OpenAL and the iPhone s media player Providing game control via iPhone s touch and accelerometer features Crafting an effective intuitive game interface Building game objects and entities and making them work properly Detecting collisions and ensuring the right response to them Polishing testing debugging and performance tuning your game Learning iOS Game Programming focuses on the features concepts and techniques you ll use most often and helps you master them in a real world context This book is 100% useful and 100% practical there s never been an iPhone game development book like it      **CUDA for Engineers** Duane Storti,Mete Yurtoglu,2015-11-02 CUDA for Engineers gives you direct hands on engagement with personal high performance parallel computing enabling you to do computations on a gaming level PC that would have required a supercomputer just a few years ago The authors introduce the essentials of CUDA C programming clearly and concisely quickly guiding you from running sample programs to building your own code Throughout you ll learn from complete examples you can build run and modify complemented by additional



projects that deepen your understanding All projects are fully developed with detailed building instructions for all major platforms Ideal for any scientist engineer or student with at least introductory programming experience this guide assumes no specialized background in GPU based or parallel computing In an appendix the authors also present a refresher on C programming for those who need it Coverage includes Preparing your computer to run CUDA programs Understanding CUDA s parallelism model and C extensions Transferring data between CPU and GPU Managing timing profiling error handling and debugging Creating 2D grids Interoperating with OpenGL to provide real time user interactivity Performing basic simulations with differential equations Using stencils to manage related computations across threads Exploiting CUDA s shared memory capability to enhance performance Interacting with 3D data slicing volume rendering and ray casting Using CUDA libraries Finding more CUDA resources and code Realistic example applications include Visualizing functions in 2D and 3D Solving differential equations while changing initial or boundary conditions Viewing processing images or image stacks Computing inner products and centroids Solving systems of linear algebraic equations Monte Carlo computations

**Seventh International Conference on Parallel and Distributed Systems** Yoshitaka Shibata,2000 Presents 66 contributions from the July 2000 conference The technical areas covered are multimedia systems group communications checkpointing and commitment Web based computing distributed shared memory multicast object oriented programming routing fault tolerant systems high performance databases parallel systems mobile systems distributed algorithms multi agent systems and parallel and distributed query processing Annotation copyrighted by Book News Inc Portland OR **3D for iPhone Apps with Blender and SIO2** Tony Mullen,2010-04-01 Create exciting interactive 3D apps for the iPhone and iPod Touch What a combination using free open source Blender software and the SIO2 game engine to create very cool 3D characters and games for the very hot devices of the moment the iPhone and iPod Touch Whether you re coming to this as an iPhone developer or as a Blender artist this book is for you Learn how to create 3D content using Blender s WYSIWYG approach find helpful information on Xcode and other iPhone SDK topics master physical collisions and acquire the skills you need to bridge both worlds with fun compelling content Shows you what you need to know to use Blender software the SIO2 game engine and iPhone SDK to create interactive 3D content for the iPhone and iPod Touch Walks you through a series of tutorials that you can use as starting points for your own creations Provides enough information on the iPhone software developer kit SDK to get you started quickly Covers Blender s physics simulation library Bullet and Blender s robust collision functionality Bridge the exciting worlds of Blender and iPhone app development in an easy to follow pipeline with this one of a kind guide **Creación de Videojuegos en Español** Carlos Gonzalez,Javier Albusac,Sergio

Perez,EspaCursos,2019-11-06 Este libro forma parte de una colecci n de cuatro vol menes dedicados al Desarrollo de Videojuegos Con un perfil principalmente t cnico estos cuatro libros cubren los aspectos esenciales en programaci n de videojuegos Programaci n Gr fica El segundo libro de la colecci n se centra en los algoritmos y t cnicas de representaci n gr

fica y optimizaciones en sistemas de despliegue interactivo

**OpenGL Programming Guide** Dave Shreiner, OpenGL

Architecture Review Board, 2008 OpenGL Programming Guide Sixth Edition OpenGL is a powerful software interface used to produce high quality computer generated images and interactive applications using 2D and 3D objects, bitmaps and color images. The OpenGL Programming Guide Sixth Edition provides definitive and comprehensive information on OpenGL and the OpenGL Utility Library. The previous edition covered OpenGL through Version 2.0. This sixth edition of the best selling red book describes the latest features of OpenGL Version 2.1. You will find clear explanations of OpenGL functionality and many basic computer graphics techniques such as building and rendering 3D models interactively, viewing objects from different perspective points and using shading, lighting and texturing effects for greater realism. In addition, this book provides in depth coverage of advanced techniques including texture mapping, antialiasing, fog and atmospheric effects, NURBS image processing and more. The text also explores other key topics such as enhancing performance, OpenGL extensions and cross platform techniques. This sixth edition has been updated to include the newest features of OpenGL Version 2.1 including Using server side pixel buffer objects for fast pixel rectangle download and retrieval, Discussion of the sRGB texture format, Expanded discussion of the OpenGL Shading Language. This edition continues the discussion of the OpenGL Shading Language GLSL and explains the mechanics of using this language to create complex graphics effects and boost the computational power of OpenGL. The OpenGL Technical Library provides tutorial and reference books for OpenGL. The Library enables programmers to gain a practical understanding of OpenGL and shows them how to unlock its full potential. Originally developed by SGI, the Library continues to evolve under the auspices of the OpenGL Architecture Review Board ARB Steering Group, now part of the Khronos Group, an industry consortium responsible for guiding the evolution of OpenGL and related technologies.

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