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# OpenGL Development Cookbook



## Synopsis

OpenGL brings an added dimension to your graphics by utilizing the remarkable power of modern GPUs. This straight-talking cookbook is perfect for intermediate C++ programmers who want to exploit the full potential of OpenGL. Overview Explores current graphics programming techniques including GPU-based methods from the outlook of modern OpenGL 3.3 Includes GPU-based volume rendering algorithms Discover how to employ GPU-based path and ray tracing Create 3D mesh formats and skeletal animation with GPU skinning Explore graphics elements including lights and shadows in an easy to understand manner In Detail OpenGL is the leading cross-language, multi-platform API used by masses of modern games and applications in a vast array of different sectors. Developing graphics with OpenGL lets you harness the increasing power of GPUs and really take your visuals to the next level. OpenGL Development Cookbook is your guide to graphical programming techniques to implement 3D mesh formats and skeletal animation to learn and understand OpenGL. OpenGL Development Cookbook introduces you to the modern OpenGL. Beginning with vertex-based deformations, common mesh formats, and skeletal animation with GPU skinning, and going on to demonstrate different shader stages in the graphics pipeline. OpenGL Development Cookbook focuses on providing you with practical examples on complex topics, such as variance shadow mapping, GPU-based paths, and ray tracing. By the end you will be familiar with the latest advanced GPU-based volume rendering techniques. What you will learn from this book Create an OpenGL 3.3 rendering context Get to grips with camera-based viewing and object picking techniques Learn off-screen rendering and environment mapping techniques to render mirrors Discover shadow mapping techniques, including variance shadow mapping Implement a particle system using shaders Learn about GPU-based methods for global illumination using spherical harmonics and SSAO Understand translucent geometry and order independent transparency using dual depth peeling Explore GPU-based volumetric lighting using half angle slicing and physically based simulation on the GPU using transform feedback Approach This hands-on Cookbook cuts through the preamble and gets straight to the point. OpenGL Development Cookbook is perfect for intermediate C++ programmers. Full of practical techniques for implementing amazing computer graphics and visualizations, using OpenGL. Crammed full of useful recipes, OpenGL Development Cookbook will help you exploit OpenGL to its full potential. Who this book is written for OpenGL Development Cookbook is geared toward intermediate OpenGL programmers to take you to the next level and create amazing OpenGL graphics in your applications.

## Book Information

Paperback: 326 pages

Publisher: Packt Publishing (June 25, 2013)

Language: English

ISBN-10: 1849695040

ISBN-13: 978-1849695046

Product Dimensions: 7.5 x 0.7 x 9.2 inches

Shipping Weight: 1.6 pounds (View shipping rates and policies)

Average Customer Review: 4.1 out of 5 stars [See all reviews](#) (10 customer reviews)

Best Sellers Rank: #1,268,380 in Books (See Top 100 in Books) #45 in [Books > Computers & Technology > Programming > Graphics & Multimedia > OpenGL](#) #566 in [Books > Computers & Technology > Databases & Big Data > Data Modeling & Design](#) #5358 in [Books > Computers & Technology > Graphics & Design](#)

## Customer Reviews

I had great expectations when I first opened this book. In fact, I feel there is a big void right in the middle of published books about OpenGL. At one side of the void there are either technical references or introductory texts, which explain the reader how to properly use the library but don't show practical applications: at the end of those books people know how to texture lookup from a vertex shader, not how to render realistic terrain from a height map. At the other side there are collections of articles about very advanced rendering techniques, intended for people already well versed in graphics programming and hardly of any use for the everyday developer (think about the ShaderX or the GPU Pro series). The premise of this book is to be the gap filler, which tells you about all the cool things you can do with OpenGL (in addition to rendering teapots) in a wide range of topics, while remaining practical enough for the average OpenGL developer. While it's a good shot in that direction, it doesn't live up to this ambitious premise. Let's start with what's good: recipes cover a vast range of applications, including mirrors, object picking, particle systems, GPU physics simulations, ray tracing, volume rendering and more. OpenGL version of choice is 3.3 core profile, so all the recipes are implemented using modern OpenGL while still being compatible with most GPU hardware out there. Every recipe comes with a self-contained and working code example that you can run and tweak. All examples share coding style and conventions, which is great added value. The toolchain of choice is Visual Studio for Windows, but the examples also build unmodified on Linux installations. Despite Mac OS X only supporting up to OpenGL 3.

This book magically appeared about the time I began contemplating if and how I will update my older OpenGL 2.x code to the modern OpenGL "Core" API, introduced with OpenGL 3.0. The Core API removes all support for the older fixed-function pipeline that I have been using for 20+ years, and replaces it with an entirely shader-based model with basic support for buffer-based geometry descriptions in lieu of immediate mode. I was hoping for an introductory chapter on techniques for migrating legacy immediate-mode code to the Core API, but the book assumes you'll be starting with at least OpenGL 3.3 and dives head-first into the first recipes within a few pages. The author is clearly writing for people with previous experience with OpenGL; don't consider this an introduction to OpenGL 3.x. In fact, the book's subtitle, "Over 40 recipes to help you learn, understand, and implement modern OpenGL in your applications", is about as perfect a description of the book as one could get. The book gets off the ground quickly with a brief section on getting the development environment up and running with the demo programs. They are built for Visual Studio 2010 on Windows but can easily be built to run on other platforms, as they use the excellent and ubiquitous freeglut and GLEW libraries. Then a C++ shader class is introduced. It will be used throughout the rest of the book to streamline access to the various shaders required by all OpenGL 3.x programs. The recipes start simply, with a filled triangle using trivial vertex and fragment shaders, followed by more complex recipes that build on previous concepts such as vertex manipulations with the vertex shader and geometry generation using the geometry shader.

If you want to learn OpenGL v3.3+ by doing, rather than by studying, this is the book for you, because it's ultra concise and driven by simple, practical examples. This book does *\*not\** however, explain 3d mathematics or 3d rasterization. If you don't understand those concepts, I would pair this book with 3D Math Primer for Graphics and Game Development (Wordware Game Math Library), which I find to be the most approachable coverage of 3d math and the 3d rendering process. Why do I like this book? Compared to other OpenGL books (including the "official" orange-book), OpenGL Development Cookbook doesn't deluge you with mountains of functions all at once, it doesn't include unwieldy 3-5 page code fragments, and it doesn't bury you in every detail of every function. This is an excellent choice, because too many of those details can get in the way of understanding the key parts of getting results. Nitty gritty function definitions are all available freely on the Internet, so this book doesn't bother with them. Instead it shows practical, concise examples of how to use available OpenGL features and functions to achieve actual results. After you get your bearings and can get basic stuff on screen, if the examples and the Internet have made you comfortable with the OpenGL API itself, you can move onto advanced rendering techniques presented in books such as

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