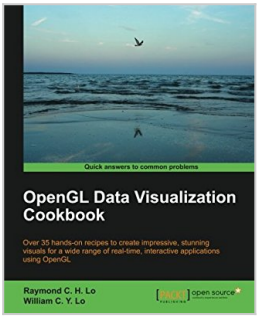

OpenGL Data Visualization Cookbook

By Raymond C. H. Lo, William C. Y. Lo

OpenGL Data Visualization Cookbook By Raymond C. H. Lo, William C. Y. Lo

Over 35 hands-on recipes to create impressive, stunning visuals for a wide range of real-time, interactive applications using OpenGL

About This Book

- Get acquainted with a set of fundamental OpenGL primitives and concepts that enable users to create stunning visuals of arbitrarily complex 2D and 3D datasets for many common applications
- Explore interactive, real-time visualization of large 2D and 3D datasets or models, including the use of more advanced techniques such as stereoscopic 3D rendering.
- Create stunning visuals on the latest platforms including mobile phones and state-of-the-art wearable computing devices

Who This Book Is For

This book is aimed at anyone interested in creating impressive data visualization tools using modern graphics hardware. Whether you are a developer, engineer, or scientist, if you are interested in exploring the power of OpenGL for data visualization, this book is for you. While familiarity with C/C++ is recommended, no previous experience with OpenGL is assumed.

What You Will Learn

- Install, compile, and integrate the OpenGL pipeline into your own project
- Create interactive applications using GLFW to handle user inputs and the Android Sensor framework to detect gestures and motions on mobile devices
- Use OpenGL primitives to plot 2-D datasets such as time series dynamically
- Render complex 3D volumetric datasets with techniques such as data slicers and multiple viewpoint projection
- Render images, videos, and point cloud data from 3D range-sensing cameras using the OpenGL Shading Language (GLSL)
- Develop video see-through augmented reality applications on mobile devices

with OpenGL ES 3.0 and OpenCV
- Visualize 3D models with meshes and surfaces using stereoscopic 3D technology

In Detail

OpenGL is a great multi-platform, cross-language, and hardware-accelerated graphics interface for visualizing large 2D and 3D datasets. Data visualization has become increasingly challenging using conventional approaches as datasets become larger and larger, especially with the Big Data evolution. From a mobile device to a sophisticated high-performance computing cluster, OpenGL libraries provide developers with an easy-to-use interface to create stunning visuals in 3D in real time for a wide range of interactive applications.

This book provides a series of easy-to-follow, hands-on tutorials to create appealing OpenGL-based visualization tools with minimal development time. We will first illustrate how to quickly set up the development environment in Windows, Mac OS X, and Linux. Next, we will demonstrate how to visualize data for a wide range of applications using OpenGL, starting from simple 2D datasets to increasingly complex 3D datasets with more advanced techniques. Each chapter addresses different visualization problems encountered in real life and introduces the relevant OpenGL features and libraries in a modular fashion.

By the end of this book, you will be equipped with the essential skills to develop a wide range of impressive OpenGL-based applications for your unique data visualization needs, on platforms ranging from conventional computers to the latest mobile/wearable devices.

Style and approach

This is an easy-to-follow, comprehensive Cookbook showing readers how to create a variety of real-time, interactive data visualization tools. Each topic is explained in a step-by-step format. A range of hot topics is included, including stereoscopic 3D rendering and data visualization on mobile/wearable platforms.

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Editorial Review

About the Author

Raymond C. H. Lo

Raymond C. H. Lo is currently the CTO and cofounder of Meta (http://www.getameta.com), a company in Silicon Valley that is creating the world's first augmented reality eyeglasses with 3D gesture input and 3D stereoscopic display. This next-generation wearable computing technology, which is the result of his PhD research, has been featured extensively in news media, including CNN, MIT News, CNET, and Forbes magazine. During his PhD, Raymond worked with Professor Steve Mann, who is widely recognized as the father of wearable computing. Together, they published and presented papers at leading conferences, including the SIGGRAPH and IEEE conferences, on real-time high-dynamic-range (HDR) imaging, augmented reality, and digital eyeglasses, which involve high-performance computation using CUDA and visualization using OpenGL.

William C. Y. Lo

William C. Y. Lo is currently an MD-PhD candidate at Harvard Medical School. He is pursuing his PhD degree in the joint Harvard-MIT Medical Engineering and Medical Physics program under the guidance of Professor Brett Bouma (and co-advisor Professor Benjamin Vakoc) at Massachusetts General Hospital, who founded the NIH-funded Center for Biomedical OCT Research and Translation. He obtained his bachelor of applied science degree in computer engineering and his MSc degree in medical biophysics from the University of Toronto, where he worked with Professor Lothar Lilge and Professor Jonathan Rose on high-performance computing for photodynamic therapy planning using custom FPGA hardware and graphics processors with CUDA. He, along with J. Rose and L. Lilge, worked on Computational Acceleration for Medical Treatment Planning: Monte Carlo Simulation of Light Therapies Accelerated using GPUs and FPGAs, VDM Verlag, 2010.

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