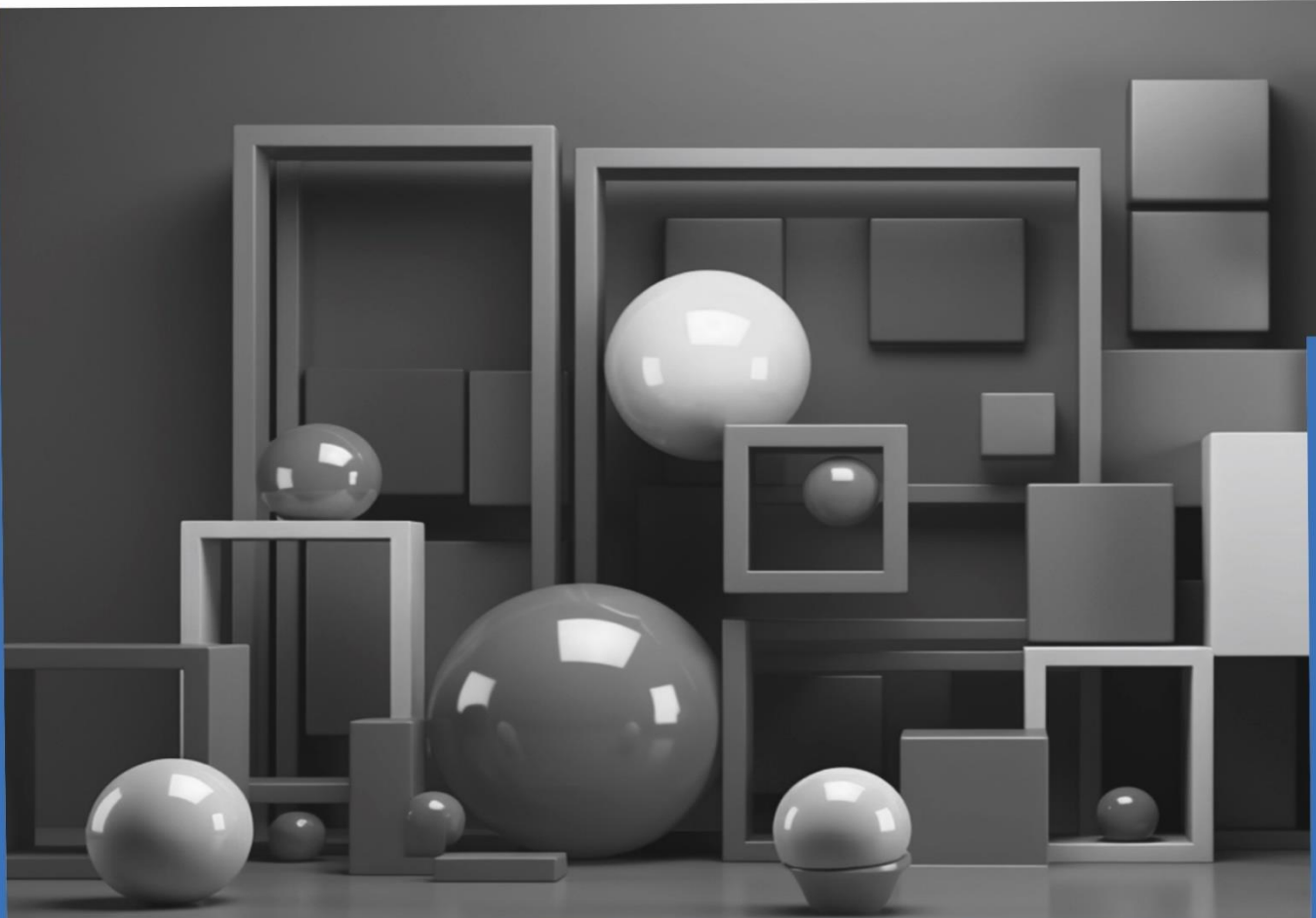


Interactive Computer Graphics: Programming Approach using OpenGL

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INTERACTIVE COMPUTER GRAPHICS: PROGRAMMING APPROACH USING OPENGL

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PREFACE

Computer Graphics is a transformative paradigm that enables scalable, convenient, on-demand access to a shared pool of configurable computing resources for efficiently delivering applications. This book is written as a text book on Computer Graphics using OpenGL for educational programmes at colleges, universities. The typical reader is expected to have completed a couple of courses in programming using traditional high level language at the college-level and is either a senior or a beginning graduate student in the field of science, technology, engineering or mathematics.

We have tried to write a comprehensive book that transfers knowledge through an immersive “hands-on” approach, where the reader is provided the necessary guidance and knowledge to develop working code for real-world Computer Graphics applications. Concurrent development of practical applications that accompanies traditional instructional material within the book further enhances the learning process.

The book is organized into 9 chapters these include topics like: Graphics Primitive Representation, OpenGL, Input-Output Interaction, Geometric Objects and Transformations, 3D Object Viewing, Lighting and Shading, Vertices to Fragments, 3D Object Surface Representation.

Chapter 1: Introduction

Provides overview of Applications of Computer Graphics, Raster Scan Display and Random Scan Display, Objects and Viewers, Imaging Systems, Synthetic Camera Model and Graphics Architecture

Chapter 2: Graphics Primitive Representation

Describes Scan Converting Lines, Midpoint Line Drawing Algorithm, Scan Converting Circle

Chapter 3: OpenGL

Provides an introduction to the use of OpenGL Interface, Graphics Functions, Control Functions, viewing, Primitives and Attributes, Text, Attributes, color, polygons and Recursion, plotting implicit functions.

Chapter 4: Input-Output Interaction

Describe the development of Graphics applications using Input Devices, Logical Devices, Input Modes, Programming Event Driven Input, Animating Interactive Programs, Picking, Building Interactive Models

Chapter 5: Geometric Objects and Transformations

Provides description of Scalars, Points and Vectors, Coordinate Systems and Frames, Frames in OpenGL, Modeling Colored Cube, 2D Transformations, Transformations in Homogeneous Coordinates (3D Transformations), Concatenation of Transformations, OpenGL Transformation Matrices (3D Transformations), Interfaces to Three Dimensional Applications, Quaternion's

Chapter 6: 3D Object Viewing

Provides principles and methodologies of Classical and Computer viewing, Viewing with a Computer, Simple Projections, Projections in OpenGL, Hidden-Surface removal

Chapter 7: Lighting and Shading

Provides description of Light and Matter, Light Sources, The Phong Lighting Model, Computation of Vectors, Polygon shading, Light Sources in OpenGL, Specification of Materials in OpenGL

Chapter 8: Vertices to Fragments

Provides principles and methodologies of Clipping, Line-Segment Clipping, Polygon Clipping, Clipping of Other Primitives, Polygon Rasterization, Hidden Surface removal

Chapter 9: 3D Object Surface Representation

Provides description of 3D object Representation, Quadric Surfaces, Bezier Curves and Surfaces, B-Spline Curve

Abbreviations

Cathode Ray Tube (CRT)

GIMP (GNU Image Manipulation Program)

Massachusetts Institute of Technology (MIT)

VDU (Visual Display Unit)

SAGE (Semi-Automatic Ground Equipment)

Design Augmented by Computers-1 (DAC-1)

CAD (Computer-Aided Design)

Jet Propulsion Laboratory (JPL)

VICAR (Video Image Communication and Retrieval)

PARC (Palo Alto Research Center)

World Wide Web Consortium (W3C)

Scalable Vector Graphics (SVG)

OpenGL Utility Toolkit (GLUT)

Current Transformation Matrix (CTM)

Center of Projection (COP)

Direction of Projection (DOP)

View-Reference Point (VRP)

View-Up Vector (VUP)

Bidirectional Reflection Distribution Function (BDRF)

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