
Contents

Foreword	vii
Preface	ix
I Geometry-Based Approaches	1
1 Introduction to Photorealistic Rendering	3
1.1 Physical Quantities of Light	3
1.2 Modeling the Behavior of Light	8
1.3 Structure of Rendering	16
2 Global Illumination	23
2.1 The Rendering Equation and Its Solutions	23
2.2 The Radiosity Method	25
2.3 Monte Carlo Ray and Path Tracing	27
2.4 Photon Mapping	38
2.5 Programmable Graphics Hardware and GI	43
3 Volume Rendering and Participating Media	53
3.1 Volume Visualization Techniques	53
3.2 Volume Rendering	55
3.3 Participating Media	62
4 Subsurface Scattering	83
4.1 Subsurface Scattering	83
4.2 Modeling Subsurface Scattering	87
4.3 BSSRDF Models	92
4.4 Recent Progress in Subsurface Scattering	119

II Image-Based Approaches	123
5 Image-Based Rendering	125
5.1 Stereo	125
5.2 Image Warping	137
5.3 Image-Based Modeling and Rendering	138
5.4 The Light Field	147
6 High Dynamic Range Imaging	165
6.1 Response Curves and HDR Imaging	165
6.2 HDR File Formats	173
6.3 HDR Video	179
7 Image-Based Lighting	187
7.1 The Basics of Image-Based Lighting	187
7.2 Environment Maps and IBL	190
III Coalescence of Geometry-Based and Image-Based Approaches	211
8 Reconstruction of Reflectance	213
8.1 BRDF Models	213
8.2 The Reflectance Field	240
8.3 Separation of Direct and Global Illumination	258
8.4 Reflectance of Hair	274
8.5 Multiple Scattering in Hair	282
8.6 Recovering Details of Hair	291
9 Bidirectional Texture Function	305
9.1 Origin of BTFs	306
9.2 BTF Synthesis	309
9.3 BTF Models	317
10 Radiance Transfer	339
10.1 PRT Fundamentals	340
10.2 Advancing Radiance Transfer	351
10.3 PRT and Dynamic Simulation	372
10.4 Precomputed Acoustic Transfer	381
10.5 Precomputed Radiance Transfer in Movies	383
Bibliography	387
Index	405