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IN SCIENCE AND TECHNOLOGY IN CHINA

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Weidong Geng

The Algorithms and Principles of Non-photorealistic Graphics

Artistic Rendering and Cartoon Animation

With 314 figures, mostly in color



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Author
Prof. Weidong Geng
State Key Lab of CAD&CG
Digital Media Technology Department
College of Computer Science
Zhejiang University, Hangzhou
310027, China
E-mail: gengwd@zju.edu.cn

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Preface

Non-photorealistic computer graphics is a multidisciplinary field in the research community, involving computer arts, computer graphics, computer vision, digital image/video processing and visual cognitive psychology. It aims at the computer generation of images and animations that are made in part “by hand” in appearance, and are characterized by their use of randomness, abstraction, ambiguity, or arbitrariness rather than completeness and adherence to the portrayed objects’ properties. In essence, it mimics the eyes and minds of artists and designers to create, view and depict the graphics world, effectively carrying-out the visual communication between computers and human beings.

Coverage and Audience

This book mainly focuses on the following five core issues in non-photorealistic computer graphics.

- (1) How to create the paintings, artworks or sculptures from a digitized blank canvas or a standard shape with the tools simulated by the computer.
- (2) How to convert a series of reference images into the resultant depiction with the desired visual effect.
- (3) How to automatically generate the artistic rendition or technical illustrations from the 3D models in terms of the stylized parameters.
- (4) How to produce the comprehensive and expressive visualizations from a set of graphical and textual information on the basis of the semantic meanings to be conveyed.
- (5) How to speed up the production of cartoon animation by computer-assisted refinement of traditional pipeline and the exploration of novel approaches.

The author not only take a survey of the state-of-the-art research as well as trends and open-ended questions regarding the aforementioned five

core issues, but also discuss the theoretical underpinnings of the field. This includes detailing a host of useful algorithms and addressing two applications of particular interest: artistic rendering and cartoon animation.

The book will be useful to practitioners in the field. It contains a wealth of examples, particularly in the form of images, which the authors hope will motivate the reader in the use of non-photorealistic computer graphics. The methods introduced are explained in enough detail so that programs can be written directly without a major conceptual effort.

Another use of the book is for reference by researchers in the field. The bibliographic references at the end of the chapters give the necessary pointers to the important publications. In the case of researchers in the field of non-photorealistic computer graphics, the methods that are built up are referenced appropriately, and a comprehensive index aids in selective readings.

Objective

Non-photorealistic computer graphics is a relatively young field, and new works are constantly being published. The intent of this book is to bring together a coherent conceptual framework for all of the research to date in the context of computer graphics, art history and theory, and cognitive psychology.

Although the field of non-photorealistic rendering has existed for more than two decades, it has for a long time not been taken seriously by large parts of the research community. The area has thus far been unstructured, making it increasingly difficult to identify and assess new open problems. Indeed, sometimes papers have even “reinvented the wheel,” albeit in a different context and application concern. Recent years have seen many algorithms, papers, and software tools devoted to artistic rendering and computer-assisted cartoon animation. The time has become ripe for a systematic assessment of the literature. The following are our goals:

- (1) To become the seminal reference for core issues surrounding artistic rendering and cartoon animation.
- (2) To describe and review state-of-the-art advances in the field of non-photorealistic computer graphics, and to distill the breadth of cutting-edge non-photorealistic modeling, rendering and animation technologies into a coherent, accessible treatise.
- (3) To provide the guidelines for researchers and software developers to assess and implement the best solution for their interactive arts application.

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Weidong Geng
Hangzhou, China
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Contents

1	Introduction	1
1.1	The Brief History: from Photorealism to Non-photorealism ..	1
1.2	What is Non-photorealistic Computer Graphics	2
1.2.1	Image, Picture, and Visualization.....	3
1.2.2	Photorealistic versus Non-photorealistic Rendering ...	4
1.3	The Framework for Non-photorealistic Computer Graphics ..	6
	References	9
2	Simulating Artistic Media for Digitized Creation of Artworks	11
2.1	Stroke-based Artistic Drawing.....	11
2.1.1	Interactive Drawing Based on Brushstrokes	11
2.1.2	Pen-and-ink Illustration by Stroke Textures	15
2.1.3	Interactive Pencil Drawing.....	18
2.1.4	Simulating Wax Crayons	26
2.2	Oriental Calligraphy and Black Ink Painting	30
2.2.1	Modeling of Soft Brushes	31
2.2.2	Calligraphy with Soft Brushes.....	39
2.2.3	Oriental Black Ink Painting.....	43
2.3	Simulation of a Colored Painting	54
2.3.1	The Computational Model of Rendering Colored Pigments	55
2.3.2	Simulation of Watercolor Painting	58
2.3.3	Simulation of Oil Painting	68
2.4	Digitized Sculpting	77
2.4.1	Digitized Wood Sculpting	78
2.4.2	Digitized Metal Embossing	81
2.5	Creation of Artwork in a Virtual Environment	83
2.6	Summary	86
	References	87

- 3 Computer-aided Design of Art Patterns** 91
 - 3.1 The Overview of Art Pattern Design 92
 - 3.2 Art Pattern Creation by Fractals 94
 - 3.3 Art Pattern Creation by Shape Grammars 96
 - 3.4 Layout-based Creation of Art Patterns 100
 - 3.4.1 Novel Layout Creation Based on Regular Structures .. 100
 - 3.4.2 Layout Creation Integrated with Fabrication Craft ... 103
 - 3.4.3 Art Pattern Creation by Stylized Layout 104
 - 3.5 Knowledge-based Creation of Art Patterns 106
 - 3.5.1 Aesthetical Knowledge Representation for Art
Pattern Generation 107
 - 3.5.2 Generation of Art Patterns by Synthesis Reasoning ... 108
 - 3.6 Summary 111
 - References 111

- 4 Artistic Painting by Reference Images** 113
 - 4.1 Artistic Effect Generation by Pixel-level Image Processing ... 113
 - 4.1.1 Artistic Processing via Digital Half-toning 114
 - 4.1.2 Artistic Processing with Heuristic Rules 115
 - 4.2 Converting Images into Artistic Painting by Strokes 118
 - 4.2.1 Image-based Stippling Drawing 120
 - 4.2.2 Image-based Mosaic and Stained Glass Simulation ... 124
 - 4.2.3 Image-based Pen-and-ink Illustration 127
 - 4.2.4 Image-based Pencil Drawing 131
 - 4.2.5 Image-based Oriental Painting 137
 - 4.2.6 Image-based Colored Painting 138
 - 4.3 Artistic Transfer of Color and Texture from Reference
Images 145
 - 4.3.1 Artistic Transfer of Color 146
 - 4.3.2 Artistic Transfer of Texture 149
 - 4.4 Image-based Painting Driven by Examples 152
 - 4.4.1 Painting Style Simulation by Image Analogy 153
 - 4.4.2 Artistic Painting Generation by Stroke Templates
from Examples 155
 - 4.5 Summary 157
 - References 158

- 5 Artistic Rendering for 3D Object** 161
 - 5.1 Artistic Rendering Based on Traditional 3D Rendering
Pipeline 162
 - 5.1.1 Non-photorealistic Lighting Model 162
 - 5.1.2 Non-realistic Projection 168
 - 5.1.3 Non-photorealistic Texture Mapping and Synthesis ... 174
 - 5.2 Non-photorealistic Rendering with Interim Images 179
 - 5.2.1 Pen-and-ink Illustration from 3D Object 180

5.2.2	Pencil Drawing from 3D Polygonal Object	185
5.2.3	Chinese Painting from 3D Model	187
5.2.4	Colorful Painting from 3D Model	191
5.3	Artistic Silhouette and Line-drawing for 3D Model	192
5.3.1	Silhouette Rendering from 3D Polygonal Object	192
5.3.2	Line-drawing for 3D Surface	198
5.4	Artistic Rendering for 3D Landscape	201
5.4.1	Artistic Simulation by Placing Artistic Particles and Strokes on the 3D Surface	202
5.4.2	Artistic Rendering of Plants Based on Their 3D Structure	204
5.4.3	Artistic Rendition for Point-based Models	209
5.5	Artistic Illustration of Volume-based Models	212
5.5.1	Artistic Rendering of Surface Features of Volume Model	213
5.5.2	Artistic Illustration of Internal Structure of Volume Model	217
5.6	Summary	223
	References	224
6	Expressive Rendering	229
6.1	Comprehensible Rendering	230
6.1.1	Enhancement of Rendering by Emphasis of Visual Cues	230
6.1.2	Cutaway Illustration	236
6.1.3	Comprehensive Rendering via Composite Viewpoints	239
6.2	Shape-conveying Illustrations	241
6.2.1	Expressing Shape Features via Stroke Texture	241
6.2.2	Expressing Shape Features by Selective Depiction	243
6.3	Intent-based 3D Illustration	249
6.3.1	Intent Communication by Multimedia Presentation	250
6.3.2	Interpreting Intent by Graphical Abstraction	252
6.3.3	Visual Explanation of Iconic Symbols	254
6.4	Expressive Rendering for Transparency	255
6.5	Summary	259
	References	260
7	Computer-assisted Cartoon Animation by Traditional Production Pipeline	263
7.1	The Traditional Animation Process	263
7.2	The Role of the Computer in Traditional 2D Animation	268
7.3	Computer-assisted Coloring	270
7.3.1	Auto-coloring of Inbetweening Frames	271
7.3.2	Colorizing Black-and-white Cartoons	277
7.4	Computer-assisted Inbetweening	282

- 7.4.1 Generation of Inbetween Poses 282
- 7.4.2 Generation of inbetweening Facial Expression 288
- 7.5 Summary 290
- References 291

- 8 Novel Approaches to Computer-assisted Cartoon Animation** 293
- 8.1 Video Driven Cartoon Animation 294
 - 8.1.1 Directly Converting Video Segment into Painterly Animation 294
 - 8.1.2 Contour-based Animation Generation from Video 300
 - 8.1.3 Video-driven Facial Animation with Style 303
- 8.2 Cartoon Production Integrated with 3D Geometric Elements. 310
 - 8.2.1 Automated inbetweening by the 3D Approximate Model 311
 - 8.2.2 Cartoon Animation by 3D Canvas 315
 - 8.2.3 Cartoon Animation by View-dependent Geometry 318
- 8.3 Cartoon Generation by Temporal Coherent Rendering 322
- 8.4 Cartoon Generation Together with 3D Graphical Processing Techniques 327
 - 8.4.1 Cartoon Production Integrated with 3D Transformation 327
 - 8.4.2 Cartoon Animation Enhanced with Artistic Texture Mapping 330
 - 8.4.3 Cartoon Motions Augmented by 3D Physical Models.. 331
 - 8.4.4 Stylized Highlight and Shadow Generation for Cartoon Animation 334
- 8.5 Cartoon Production via Reuse of Traditional Animation 336
 - 8.5.1 Reusing Visual Style for Cartoon Animation 337
 - 8.5.2 Reusing Motions for Cartoon Animation 340
- 8.6 Summary 343
- References 345

- 9 Perspectives of Non-photorealistic Computer Graphics** ... 349
- References 353

- Index** 355