COMPUTER GRAPHICS

Annual Conference Series 1996

SIGGRAPH 96
Conference Proceedings
August 4 – 9, 1996
Papers Chair: Holly Rushmeier
Panels Chair: Theresa-Marie Rhyne

A publication of ACM SIGGRAPH

Sponsored by the ACM's Special Interest Group on Computer Graphics

PROCEEDINGS

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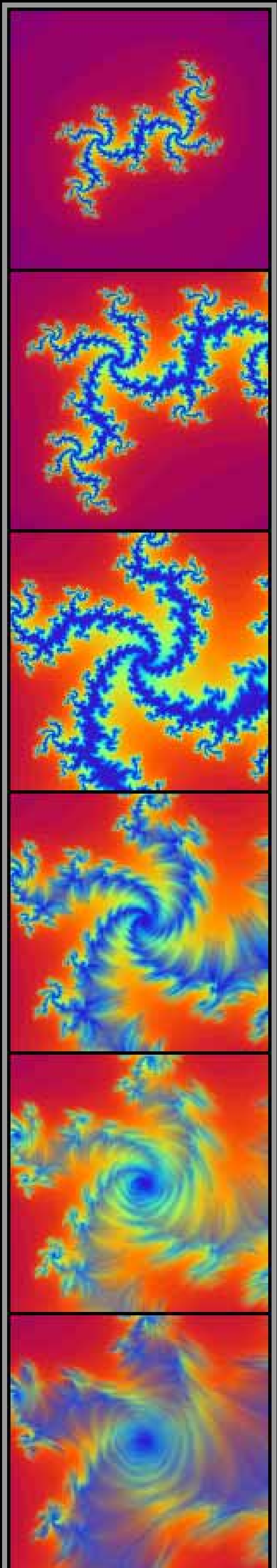

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Cover Image Credits

Front Cover

"Haystacks at Sunset"

In this impressionist image from an animation of Monet-style haystacks, we demonstrate our rendering algorithm which creates painterly style images and is suitable for animation. Geometric 3D surface models have been populated with particles which are rendered in screen space as individual brush strokes. The color, orientation, and size of brush strokes are determined from reference pictures which are traditionally rendered images of the underlying geometry. This technique improves on previous methods by maintaining frame-to-frame coherence for animations.

The painterly renderer is particularly well-suited for abstracting natural textures like the cloudy sky, hay, and plowed ground in this example because it creates texture by composing the image with many semi-transparent textured brush strokes that vary randomly in position, color, orientation, and size based on user-selectable parameters. We have used many traditional painting techniques such as building up layers of paint, allowing silhouette edges to be broken by brush strokes, and letting the brush strokes define the detailed texture of objects to create the painterly look.

Ken Hahn, Scott Johnston, Jason Herschaft, and Craig Thayer wrote parts of the painterly renderer. Many thanks to Dave Mullins and Andrea Losch for modeling and rendering and to David Laidlaw who provided many hours of production support. We are grateful to Al Barr and Scott Fraser of Caltech and to Hammer-head Productions for providing production facilities.

Reference: "Painterly Rendering for Animation," Barbara J. Meier, pp. 477–484.

Frontispiece

"Talisman-rendered Farm Scene"

This image was rendered using a hardware simulator of the Talisman graphics architecture. The actual hardware will render animations of scenes with this quality at 60 frames per second and higher. Scene design courtesy of Andrew Glassner; modelling and animation courtesy of the Microsoft Blender group.

Reference: "Talisman: Commodity Realtime 3D Graphics for the PC," Jay Torborg and Jim Kajiya, pp. 353–364.

Back Cover, left

"Multiresolution Views of the Julia Set"

This figure shows several frames from a multiresolution video sequence of a fractal pattern known as a Julia set. The multiresolution video representation allows a viewer to zoom in and out in both space and time. The top cell shows an entire frame from the animation. The next two cells show zooming in on the lower-left vortex of this fiery beast. The bottom three cells show motion-blurred frames from "zooming out" temporally on the video sequence.

Reference: "Multiresolution Video," Adam Finkelstein, Charles E. Jacobs, David H. Salesin, pp. 281–290.

Back Cover, center top

"Blue Screen Boots"

The goblet and boots on the left are two image objects, or sprites, extracted automatically from shots (not shown) against a pure blue backing and then against a black backing. The sprites are then recomposited with a new background on the right. This shows that an appropriate alpha channel has been created for each sprite to convey its transparency information. The technique is a new one called triangulation matting. Blue screen matting is notoriously difficult, especially for blue or cyan objects, and is not algorithmic as practiced. The triangulation technique is algorithmic but works only for objects that don't move, such as these. Triangulation does not require constant color backings nor the ideal conditions of this example. It requires only that the two backings be completely different, pixel by pixel.

Reference: "Blue Screen Matting," Alvy Ray Smith and James F. Blinn, pp. 259–268.

Back Cover, center middle

"Reconstruction of a prosthetic foot"

These three images demonstrate our automatic procedure for reconstructing a B-spline surface model from a set of 3D points. The first image shows a set of 20,021 3D points obtained by laser scanning the surface of a prosthetic foot. The second image shows an initial reconstructed surface consisting of 29 (bicubic) B-spline patches. Both the network of patches and the parametrizations of the data points over these patches are determined without user assistance. The use of a surface spline construction permits an efficient algorithm for fitting the surface while maintaining tangent plane continuity between patches. The third image shows a surface of 156 B-spline patches obtained after adaptive refinement and refitting. This surface deviates from the points by no more than 0.27% of the object diameter.

The prosthetic foot, courtesy of Moeller Design and Development Inc. (Seattle, WA), was created for Flex-Foot Inc. (Laguna, CA). It was scanned by Ken Birdwell of Technical Arts Co. (Bellevue, WA), using a 3-axis line laser digitizer. The object was mounted on a glass table over a mirrored surface, allowing the entire surface to be scanned without repositioning the object.

Reference: "Automatic Reconstruction of B-Spline Surfaces of Arbitrary Topological Type," Matthias Eck and Hugues Hoppe, pp. 325–334.

Back Cover, center bottom

"Wind over Australia"

This is a visualization of wind velocity over Australia that is based on data from a numerical weather model. Higher velocity wind is represented by larger arrows. The arrows were deposited along streamlines in an end-to-end fashion so that the eye follows the chains of arrows. The streamlines underlying this image were placed by an optimization procedure that uses an energy function that penalizes overly dense or sparse regions of streamline.

Wind simulation data is courtesy of Glenn Wightwick of IBM Australia, and the earth image is courtesy of Geosphere, Inc. We thank Lloyd Treinish of the IBM T.J. Watson Research Center for his extensive aid with this data.

Reference: "Image-Guided Streamline Placement," Greg Turk and David C. Banks, pp. 453–460.

Back Cover, right

"A Sense of Time"

This image shows frames from an animation of the development of a metallic patina on a small copper statue of a buddha. The buddha model was created from a Cyberware scan and consists of approximately 60,000 small, evenly sized triangles. The various stages of the development of the patina were simulated in the RenderMan shading language. A shader was written that modeled a three-layered surface: base copper, a tarnish layer, and a green patina. The thickness of different layers was varied as a function of time according to position and other factors, using devices such as exposure and accessibility maps. Thanks to Brian Curless for scanning the statue and Matt Pharr for computing the accessibility map.

Reference: "Modeling and Rendering of Metallic Patinas," Julie Dorsey and Pat Hanrahan, pp. 387–396.