ACM SIGGRAPH VIDEO REVIEW

ISSUE 42

Special issue on
Visualization in Scientific Computing
July 1989

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ACM SIGGRAPH Video Review

Issue 42

Special issue on Visualization in Scientific Computing, July 1989

1. Thinking Machines: Best of Visualization

Contact:

James B. Salem
Thinking Machines Corp.
245 First St.
Cambridge, MA 02142
(617) 876-1111

Credits:

James B. Salem, Karl Sims, Hubert Delaney, John Richardson, Keira Bromberg, Creon Levit (NASA Ames), Scott Baden (UC Berkeley), A.F. Ghoneim (MIT), Michael Halle (MIT), Peter Kijewsky (Brigham and Woman's Hospital), Gary Puckett (UC Berkeley), J.A. Sethian (UC Berkeley), Crystal Shaw (NCSA), Michael Stracher (Harvard), Van Wedeen (Mass. General Hospital), Robert Wilhelmson (NCSA), Jim Bailey, Donna Fritzsche, Lew Tucker, and the folks at CF Video (Watertown, MA).

Technical Notes:

This tape explores some of the possibilities of interactive visualization on the CM-2. This includes fluid dynamics, medical imaging, whole Earth seismic modeling, quantum scattering, and others.

The narrated sequences were produced in real time and taped directly from the Connection Machine graphics display.

Hardware:
Connection Machine CM-2 supercomputers.

Software:
*LISP, FORTRAN 8x, CM Parallel Instruction Set.

2. Random Dot Motion

Contact:
Daniel J. Sandin
University of Illinois at Chicago
Electronic Visualization Laboratory
Box 4348, M/C 154
Chicago, IL 60680
(312) 996-3002

Credits:
Daniel J. Sandin and Thomas A. DeFanti.

Technical Notes:
This demonstration shows the importance of animation in discovering patterns in data that changes over time.

Hardware:
AT&T 386 with Truevision VISTA

Software:
RT/1

3. Spectral Density Functions

Contact:
George T. Rogan
Alcoa Technical Center
7th St. Ext.
Alcoa Center, PA 15069
(412) 337-2366

Technical Notes:
This animation demonstrates how the number of polygons needed to model complex surface topographies can be drastically reduced using spectral density functions (SDF).

Hardware:
Silicon Graphics 4D/80GT

Software:
In-house ray-tracing software.

4. Volume Rendering for Scientific Visualization

Contact:
Donna McMillan
Sun Microsystems
P.O. Box 13447
Research Triangle Park, NC 27709
(919) 469-8300

Credits:
Chuck Mosher, Ruth Johnson, Herman Towles, Doug Schiff (Sun Microsystems);

Contributors: Jeff Shaw (Vanderbilt University); Eric Hoffman (UPA); Sandy Napel (University of West Ontario); Dave Case, Lou Noodleman, Mike Pique (Scripps Clinic); Paul Lauterbur (University of Illinois at Urbana-Champaign); Jim Schutt (Sandia National Laboratories).

Technical Notes:
The following movies demonstrate volume rendering for visualization of scientific data from a variety of applications, including 3D medical imaging, computational chemistry and computational fluid flows.

Hardware:
Sun TAAC-1 Application Accelerator; Sun 3 and Sun 4

Software:
Sun TAAC-1 Volume Toolkit

5. MATLAB on the Ardent Titan

Contact:
Cleve Moler
Ardent Computer
880 W. Maude
Sunnyvale, CA 94086
(408) 732-0400

Credits:
Cleve Moler and Mike Keeler.

Technical Notes:
MATLAB is a general-purpose mathematical analysis tool for scientific and engineering problems. Coupled with dynamic 3D graphics, it allows users to visually investigate complex numerical problems.

Hardware:
Ardent Titan graphics supercomputer.

Software:
MATLAB; Doré.

6. Fractal Transitions

Contact:
Alan Norton
IBM T.J. Watson Research Center
P.O. Box 704
Yorktown Heights, NY 10598
(914) 789-7195

Credits:
Animation by Alan Norton; Music by Stuart Arbright and Steve Breck; Additional help provided by Frankie Chan, Evelyn Melton and Paula Sweeney.

Technical Notes:
This animation shows two evolving quaternion Julia sets, based on the formula $e^{iq} x(1-x)$ as q (time) goes from 0 to 2π. Each frame is a quaternion Julia set associated with the polynomial having the appropriate value of q. The continuous shape is derived

from the discontinuous shape by applying a 90-degree rotation in the complex plane. Although pure mathematics, the resulting animation reveals the aesthetics of simple mathematical processes.

Hardware:
IBM 3081, Raster Tech 1/80

Software:
Home-grown, using FORTRAN and C

7. Dynamics in the Quaternions

Contact:

John C. Hart
University of Illinois at Chicago
Electronic Visualization Laboratory
Box 4348, M/C 154
Chicago, IL 60680
(312) 996-3002

Credits:
Art Director, M. Rawlings; Advisor, Daniel J. Sandin; Additional help from the faculty and staff of the Electronic Visualization Lab.

Technical Notes:
Using the single complex Julia set $f(z)=z^2 + 0.2809 + 0.53i$, the quaternion extensions are animated as the set is rotated through the complex plane, the real-j plane, and the real-k plane. Last, a fly-through shows the details of the surface as the set rotates through the complex plane

Hardware:
AT & T Pixel Machine

Software:
Algorithm described in "Ray-tracing Deterministic 3-D Fractals," Computer Graphics, 23, 3, 1989, published by ACM SIGGRAPH.

8. Cubic Polynomial Volume Rendering

Contact:

Charlie Gunn
Geometry Supercomputer Project
Minnesota Supercomputer Institute
1200 Washington Ave. South Rm. 279
Minneapolis, MN 55415
(612) 624-6084

Credits:
Charlie Gunn.

Technical Notes:
This tape applies volume visualization to mathematical structures, specifically the parameter space of cubic polynomials.

9. Fluoropolymer Simulations

Contact:

David A. Dixon
E.I. du Pont de Nemours & Co., Inc.
Central Research & Development Dept.
P.O. Box 80328
Experimental Station
Wilmington, DE 19880-0328
(302) 695-2619

Credits:
David A. Dixon and Patrick Capobianco.

Technical Notes:
The video shows the low-energy vibrational modes of model polymers calculated from the first principles of physics. The model polymers shown are Teflon®, Teflon FEP® and Krytox®. The visualization enabled scientists to study the motions of the atoms as they vibrated. There was no other way to study these motions than through visualization.

Hardware:
CRAY X-MP/24, Raster Technologies 1/380, Lyon Lamb VAS DELTA, Sony BVH-25005

Software:
OASIS (Cray Research) visualization software; GRADSCE (Polyatomics Research) vibration displacement software

10. Molecular Genesis

Contact:

Karen M. Rogers
E.I. du Pont de Nemours & Company, Inc.
Central Research & Development Dept.
P.O. Box 80328
Wilmington, DE 19880
(302) 695-1423

Credits:
Graphics by John J. Cristy; Music by Steve David Green.

Technical Notes:
An idealized simulation of the synthesis of the enzyme dihydrofolate-reductase on the surface of a mitochondrion.

Hardware:
Sun 4, Ardent Titan

Software:
Tracer from Ray Tracing Corporation.

11. Imine Ion Interactions in the Gramicidin Channel

Contact:

Ingfei Chen
Brown University
Computer Graphics Group
Computer Science Dept.
Box 1910
Providence, RI 02912
(401) 863-7693

Credits:
Energy minimization calculations by Brian Turano, Ingfei Chen, David Busath and Michael Pear; Original music by Linton Hale.

Technical Notes:
Researchers are studying whether an ion can pass through a membrane ion channel if both dimensions of the ion and the size of the channel pore are known. Once this is better understood, they will understand nerve impulse conduction, which occurs via ion channel activity.

This animation demonstrates that the ions guanidinium, acetamidinium and formamidinium theoretically have favorable energy pathways through gramicidin.

Hardware:
Sun 4, Apollo workstations

Software:
Brown Computer Graphics Group's BAGS (Brown Animation Generation System); CHARM.

12. Tempest in a Teapot

Contact:
Thomas D. Desmarais
Battelle
P.O. Box 999, K1-86
Richland, WA 99352
(509) 375-2782

Credits:
Simulation by Loren Eyler. Visualization software by Kevin Adams, George Chin, Tom Desmarais, Mike Portwood, Jim Thomas, Dave Thurman. Narration by Larry Rader.

Technical Notes:
A variety of techniques are used to visualize the results of simulating water being heated in a teapot.

Hardware:
Silicon Graphics 4D/120GTX

Software:
Custom software developed at Battelle, Memorial Institute, Pacific Northwest Division

13. Rendering of PLIF Flowfield Images

Contact:
Ike van Cruyningen
Dept. of Mechanical Eng., Bldg. 521F
Stanford University
Stanford, CA 94305
(415) 723-3188

Credits:
I. van Cruyningen, A. Lozano, R.K. Hanson (High Temperature Gasdynamics Laboratory).

Technical Notes:
Using a planar, laser-induced fluorescence (PLIF) technique, multi-dimensional data from flow fields are captured with a camera, and digitized and

stored in a computer. Acquiring a sequence of images allows study of flow development; time or space can be used as a third coordinate. Examples of laminar, pulsed and turbulent flows are visualized, enabling viewers to examine the details of flow behavior.

Hardware:
Sun/Pixar

Software:
ChapVolumes; ChapC

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   Herr, Pacific Interface

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    Herr and Zaritsky, Pacific Interface

HDTV & the Quest for Virtual Reality Special Issue 60

This two-tape video report, including transcript and reference documentation, will give you an up to the minute overview of the standards, hardware and controversies that are as rooted in geopolitical and philosophical differences as they are technological.

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