1998 Vis98

IEEE VISUALIZATION 1998

A D V A N C E   P R O G R A M

October 18 • October 23, 1998
Sheraton Imperial Hotel
Research Triangle Park, NC

THE INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS, INC.   IEEE
IEEE COMPUTER SOCIETY

Sponsored by IEEE Computer Society Technical Committee on Computer Graphics In Cooperation with ACM/SIGGRAPH

C O N F E R E N C E - A T - A - G L A N C E

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
7:00am	REGISTRATION	REGISTRATION	REGISTRATION	REGISTRATION		
8:00am					REGISTRATION	REGISTRATION
9:00am	Tutorials	Information Visualization Symposium / Volume Visualization Symposium / Tutorials	Information Visualization Symposium / Volume Visualization Symposium / Tutorials	Keynote Session	Papers / Papers / Case Studies	Papers / Case Studies / Hot Topics
10:00am				Panel / Papers / Case Studies	Panel / Papers / Case Studies / Demonstrations and CAL	Papers / Panel / Papers
11:00am						
12:00pm					Vis '99 Open Meeting	
1:00pm						
2:00pm				Papers / Papers / Case Studies / Demonstrations and CAL	Papers / Papers / Case Studies	Capstone Session
3:00pm						
4:00pm				Papers / Papers / Hot Topics	Papers / Panel / Hot Topics	
5:00pm						
6:00pm						
7:00pm		Symposium & Tutorial Reception	VizLies	Conference Reception	BOFs	
8:00pm						
9:00pm						

Sessions on Real-time Volume Rendering, Terrain Visualization, Flow Visualization, Surfaces & Level-of-Detail Techniques, Feature Detection & Visualization, Medical Visualization, Multi-Dimensional Visualization, Flow & Streamlines, Isosurface Extraction, Information Visualization, 3D Modeling & Visualization, Multi-Source Data Analysis Challenges, Interactive Visualization/VR/Animation, Terrain & Large Data Visualization, Isosurface & Volume Rendering, Simplification, Marine Data Visualization, Tensor/Flow, Key Problems & Thorny Issues, Image-based Techniques and Volume Analysis, Engineering & Design, Texturing and Rendering, Art & Visualization

Get complete, up-to-date listings of program information from

URL: http://www.erc.msstate.edu/vis98
http://davinci.informatik.uni-kl.de/Vis98
Volvis URL: http://www.erc.msstate.edu/volvis98
InfoVis URL: http://www.erc.msstate.edu/infovis98
FTP server: ftp.erc.msstate.edu, directory vis98
or contact: **Theresa-Marie Rhyne**, Lockheed Martin/U.S. EPA Sci Vis Center, 919-541-0207, trhyne@vislab.eps.gov
Robert Moorhead, Mississippi State University, 601-325-2850, rjm@erc.msstate.edu

Welcome to IEEE Visualization '98

Welcome to the ninth IEEE Visualization conference! As has become the tradition for this annual conference, we believe we have a strong technical program that examines the varied aspects of visualization: algorithms, techniques, and applications. This year, our keynote speaker (Patrick Hanrahan) and capstone speaker (Turner Whitted) promise to share with us their unique perspectives on this field. To facilitate more interaction and discussion among conference attendees, lunch will be included for each day that you register. We hope these lunch sessions will provide a forum for lively exchanges of information and viewpoints. We are also providing a new arena for interactive technical information exchange: The Creative Applications Laboratory (CAL). At the CAL, you will have the opportunity to see and discuss examples of visualizations highlighted in the papers, cases, panels, tutorials, and LBHT sessions, in real time, with their authors.

The conference has a varied program for you to choose from. The week unofficially begins on Saturday with a full day workshop on "Distributed Visualization Systems" and a half day workshop on "Multi-Resolution Representation of 3D Geometry for Progressive Transmission". Seven Tutorials are offered on Sunday through Tuesday and cover subjects for the beginner and advanced attendee. We have two Symposia this year: Information Visualization (Info Vis) and Volume Visualization (Vol Vis). The technical program starts Wednesday and begins with the Keynote Address. This is followed by concurrent sessions of papers, panels, case studies, and Late Breaking Hot Topics (LBHTs) that present the latest issues, research, and applications in visualization. Demonstrations of visualization products, tools and applications will begin mid-day on Wednesday and continue through Thursday afternoon. Our conference climaxes with the Capstone address on Friday afternoon. We have upgraded our registration system this year to offer attendees increased opportunities to move between the various offerings on Sunday through Tuesday.

We hope you join us in Research Triangle Park, North Carolina during the week of October 17 - 23, 1998 for IEEE Visualization 98. We promise both a dynamic and casual atmosphere that supports opportunities to meet and talk with leaders in the field of visualization.

Theresa-Marie Rhyne, Lockheed Martin/U.S. EPA Scientific Visualization Center

Robert Moorhead, Mississippi State University

IEEE Visualization '98 Conference Co-Chairs

Visualization '98 Conference Committee

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VISUALIZATION '98 TUTORIALS

Sunday, Monday, Tuesday

TUTORIAL 1

Sunday 9:30-6:30

Wavelet and Numerical Methods for Visualization

Instructors: Raghu Machiraju, Nelson Max, Torsten Moeller, Robert Moorhead

Level: Intermediate

Course Description:
The focus of this course is a survey of wavelet and numerical tools for the imaging and visualization process. We will introduce basic numerical concepts of interpolation and approximation theory. The application of this theory to volume rendering and image analysis is demonstrated by different current research results. We especially introduce signal processing analysis tools and wavelet techniques. We show their origin (connection) to numerical analysis and their practical interpretation and use for the specification of image artifacts such as blurring and aliasing as well as for efficient algorithms (multi-resolution analysis).

Who Should Attend:
This tutorial is designed for scientists, engineers, computer graphicists, and graduate students who are interested in learning more about the mathematical foundations of imaging and visualization algorithms. It would also be of interest to professionals who would like to learn state-of-the-art techniques in image analysis and compression using multi-resolution techniques, including wavelets. Some basic mathematical background and exposure to volume rendering is assumed.

TUTORIAL 2

Sunday 9:30-6:30

Visualization Toolkits: Applications and Techniques

Instructors: Kenneth M. Martin, Lisa Sobierajski Avila, William E. Lorensen, James V. Miller, William J. Schroeder

Level: Intermediate

Course Description:
In this tutorial we will discuss fundamental issues regarding the design, implementation, and application of 3D graphics and visualization systems. We will describe and contrast some current systems such as Open Inventor, Java3D, Data Explorer and the Visualization Toolkit. We will examine in more detail the implementation of the Visualization Toolkit. This will be used to illustrate important design issues such as graphics portability, interpreted versus compiled languages, multiple versus single inheritance, data flow models, and user interaction methods. In the remainder of this tutorial we will focus on applying visualization techniques and toolkits to solve problems from a selection of application domains.

Who Should Attend:
Attendees should have a basic understanding of computer graphics principles, software development techniques, and visualization algorithms such as color mapping and contouring. This course is intended for users, developers, researchers, and practitioners of 3D graphics and data visualization.

TUTORIAL 3

Monday 8:30-5:30

Introduction to Programming with Java 3D

Instructors: David R. Nadeau (Organizer and Speaker), Michael J. Bailey, Henry A. Sowizral

Level: Intermediate

Course Description:
Java 3D is a new cross-platform API for developing 3D graphics applications in Java. Java 3D's feature set has been designed to enable quick development of complex 3D applications, and at the same time enable fast and efficient implementations on a variety of platforms, from PCs to workstations. Using Java 3D, software developers can build cross-platform applications that build 3D scenes programmatically, or via loading 3D content from VRML, OBJ, and/or other external files.

The Java 3D API includes a rich feature set for building shapes, composing behaviors, interacting with the user, and controlling rendering details. Participants in this tutorial learn the concepts behind Java 3D, the Java 3D class hierarchy, typical usage patterns, ways of avoiding common mistakes, animation and scene design techniques, and tricks for increasing performance and realism.

Who Should Attend:
This tutorial assumes an intermediate level knowledge of Java programming and a beginning understanding of 3D graphics concepts. No advanced math background is required.

TUTORIAL 4

Monday 8:30-5:30

Perception for Visualization: From Design To Evaluation

Instructors: Haim Levkowitz (Organizer and Speaker), Victoria Interrante, Hans Peter Meinzer

Level: Intermediate

Course Description:
1. What is the smallest sample I can show that will be perceived?
2. What is the smallest sample I can show that will be perceived in color?
3. Can I afford using image compression? If yes, how much and what kind?
4. Should I use a grayscale or another color scale? How many gray levels do I absolutely need? What color scale should I use? How many bits for color do I need to have?
5. Should I use 3D, stereo, texture, motion? If so what kinds? and
6. Has my visualization been successful meeting its goals and needs?

If you have ever designed a visualization, you probably have asked yourself (perhaps others) some of these questions; at least you should have.

Since visualization "consumers" are humans, the answers to these questions can only come from a thorough analysis and understanding of human perceptual capabilities and limitations, combined with the visualization's goals and needs.

This tutorial will teach you the basics of human perception and how to utilize them in the complete process of visualization: from design to evaluation.

Who Should Attend:
Anybody engaged in the design, implementation, and evaluation of visualizations.

TUTORIAL 5

Tuesday 8:30-5:30

Interactive Visualization and Web-based Exploration in the Physical and Natural Sciences

Instructors: Theresa Marie Rhyne (Organizer and Speaker), Mike Bailey, Mike Botts, Lloyd Treinish

Level: Intermediate

Course Description:
This tutorial will examine the convergence of visualization methods with the World Wide Web as well as the relationship between real-time interactivity and scientific information exploration. The application of visualization tools and interactive techniques to the examination and interpretation of scientific data sets will be discussed. Highly illustrative atmospheric, oceanographic, and geographic examples will be demonstrated in real time. The process of developing effective visualization paradigms for supporting high speed networking, database management, heterogeneous computing platforms, user interface design, collaborative computing, science education, and the implementation of animation techniques will be highlighted. In addition to examining 3D graphics displays, one case study will also explore solid freeform fabrication as a visualization tool.

Who Should Attend:

Scientific researchers, educators, and computer graphics specialists interested in exploring particular issues associated with handling the visual display of scientific information and large scientific data sets. Experience with scientific visualization systems and terminology is helpful as well as an understanding of computer graphics programming.

New This Year!!!

CREATIVE APPLICATIONS LAB

The Creative Applications Lab (CAL) is designed to let conference attendees interact with presenters on an individual basis. The CAL will have a variety of computers on which contributors can install their materials for attendees' experimentation and enjoyment. The CAL will be open in conjunction with demonstrations at Visualization '98. This is a unique opportunity for conference attendees to interface directly with conference contributors. Please come visit the CAL while you are at Vis '98 !

TUTORIAL 6

Tuesday 8:30-5:30

Level-Of-Detail in Surface and Volume Modeling

Instructors: L. De Floriani, E. Puppo, R. Scopigno

Level: Intermediate

Course Description:
Participants will learn how to manage the complexity of 3D graphics datasets (surfaces and volumes). The course offers in-depth coverage of compression and simplification techniques, and multiresolution data representation schemes. Applications will also be presented in the fields of terrain visualization, volume data rendering, surface rendering, and web-based systems.

Who Should Attend:
This tutorial is intended for programmers or researchers interested in developing efficient, interactive 3D visual applications.

TUTORIAL 7

Tuesday 8:30-12:30

Clifford Algebra, Quaternions and their Applications in Visualization

Instructors: Hans Hagen, Andrew Hanson, Alyn Rockwood, and Gerik Scheuermann

Level: Beginner

Course Description:
Quaternions build a four-dimensional algebra for three-dimensional geometry. They give the best way to deal with rotations in 3-space. In Scientific Visualization, one has used them to deal with vector fields in space and for animations because of their nice interpolation properties.

Clifford algebra is a mathematical language for geometry extending the usual vector space description. It incorporates such important concepts as complex numbers, quaternions, and matrices which are widely used in modern computer graphics and visualization. The central idea is defining elements of different grades like scalars, vectors, bivectors, trivectors, and quaternions together with a multiplication of different graded elements that unify scalar multiplication, scalar product, quaternion, and matrix multiplication. Its extension to Clifford analysis results in a coordinate invariant differential operator unifying gradient, divergence, and rotation. It opens new ways to understand geometry and physics, making it an excellent choice for new scientific visualization algorithms.

Who Should Attend:
This tutorial is designed for those wanting a good starting base for research in the application of Clifford algebra to scientific visualization.

IEEE VISUALIZATION '99

October 24 - 29, 1999
Hyatt Regency
San Francisco Airport

IEEE SYMPOSIUM ON VOLUME VISUALIZATION (VOLVIS '98)

Sponsored by the IEEE Computer Society Technical Committee on Computer Graphics in Cooperation with ACM/SIGGRAPH

October 19-20, 1998 ■ RESEARCH TRIANGLE PARK, NC

VOLVIS98 KEYNOTE SESSION

Volume Visualization – a sleeping giant about to awaken
Speaker: Jim Foley, Chairman and CEO, *Mitsubishi Electric ITA*

The coming era of inexpensive volume rendering will enable many volumetric applications that heretofore have been impractical. We describe one such application – surgical simulation and an inexpensive real-time volume rendering hardware capable of processing 500 megavoxels per second.

Monday, October 19

8:30 - 8:45 **Opening**

8:45 - 9:45 *Keynote Address* : **Volume Visualization – a sleeping giant about to awaken**, Jim Foley

9:45 - 10:15 Coffee Break

10:15 - 12:00 *Papers*: **Volume Graphics I**
- (1) **3D Scan Conversion of CSG Models into Distance Volume**, David E. Breen, Sean Mauch, Ross T. Whitaker
- (2) **Coloring Internal Cavities for Virtual Endoscopy**, Omer Shibolet, Daniel Cohen-Or
- (3) **Using Distance Maps for Accurate Surface Reconstruction in Sampled Volumes**, Sara F. F. Gibson

12:00 - 1:30 Lunch Break

1:30 - 2:45 *Papers*: **Hardware**
- (1) **A Real-Time Volume Rendering Architecture for Parallel and Perspective Projections**, Masato Ogata, TakaHide Ohkami, Hugh C. Laur, Hanspeter Pfister
- (2) **Adding Shadows to a Texture-Based Volume Renderer**, Uwe Behrens, Ralf Ratering

2:45 - 3:15 Coffee Break

3:15 - 5:00 *Papers*: **Rendering and Animation**
- (1) **Volume Animation using the Skeleton Tree**, Dilip Kenchammana-Hosekote, Deborah Silver, Nikhil Gagvani
- (2) **Adaptive Perspective Ray Casting**, Kevin Kreeger, Ingmar Bitter, Frank Dachille, Baoquan Chen, Arie Kaufman
- (3) **Edge Preservation in Volume Rendering Using Splatting**, Jian Huang, Roger Crawfis, Don Stredney

Tuesday, October 20

8:30 - 9:45 *Papers*: **Segmentation**
- (1) **Probabilistic Segmentation of Volume Data for Visualization Using SOM-PNN Classifier**, Feng Ma, Wenping Wang, Wai Wan Tsang, Zesheng Tang, Shaowei Xia
- (2) **Semi-Automatic Generation of Transfer Functions for Direct Volume Rendering**, Gordon Kindlmann

9:45 - 10:15 Coffee Break

10:15 - 12:00 *Papers*: **Volume Visualization**
- (1) **An Exact Interactive Time Visibility Ordering Algorithm for Polyhedral Cell Complexes**, Claudio T. Silva, Joseph S.B. Mitchell, Peter L. Williams
- (2) **Hypervolume Visualization: a Challenge in Simplicity**, C. Bajaj, V. Pascucci, G. Rabbiolo, D. Schikore
- (3) **Extracting Iso-Valued Features in 4-Dimensional Scalar Fields**, Chris Weigle, David C. Banks

12:00 - 1:30 Lunch Break

1:30 - 2:45 *Papers*: **Volume Graphics II**
- (1) **Object Voxelization by Filtering**, Milos Sramek, Arie Kaufman
- (2) **Accurate Method for the Voxelization of Planar Objects**, Jian Huang, Roni Yagel, Vassily Filippov

2:45 - 3:15 Coffee Break

3:15 - 5:00 *Papers*: **Reconstruction and Sampling**
- (1) **Wavelets Based Adaptive Interpolation for Volume Rendering**, Ricardo Sanchez, Marcelo Carvajal
- (2) **Opacity-Weighted Color Interpolation for Volume Sampling**, Craig M. Wittenbrink, Thomas Malzbender, Michael E. Goss
- (3) **Design of Accurate and Smooth Filters for Function and Derivative Reconstruction**, Torsten Möller, Klaus Möller, Yair Kurzion, Roni Yagel, Raghu Machiraju

IEEE SYMPOSIUM ON INFORMATION VISUALIZATION (INFOVIS '98)

Sponsored by the IEEE Computer Society Technical Committee on Computer Graphics

October 19-20, 1998 ■ RESEARCH TRIANGLE PARK, NC

Monday, October 19

8:30 - 10:00 **Opening Remarks and Keynote Address**–*details and abstract will become available on the web page at a later date*

10:00 - 10:30 Break

10:30 - 12:00 *Papers*: **Visualizing Hierarchies and Networks**

(1) **WebPath - a Three-dimensional Web History**, Emmanuel Frecon, Gareth Smith

(2) **Traversal-based Visualization of Data Structures,** Jeffrey Korn, Andrew Appel

(3) **Reconfigurable Disc Trees,** Chang Sung Jeong, Alex Pang

(4) **An Interactive View for Hierarchical Clustering,** Graham Wills

12:00 - 1:30 Lunch

1:30 - 3:00 *Papers*: **Visualizing Large Information Spaces**

(1) **Taming Large Datasets with Dynamic Aggregation,** Mei Chuah

(2) **The Generalized Detail-In-Context Problem,** T. Alan Keahey

(3) **Similarity Clustering of Dimensions for an Enhanced Visualization of Multidimensional Data,** Mihael Ankerst, Stefan Berchtold, Daniel Keim

3:00 - 3:30 Break

3:30 - 5:00 *Papers*: **Visualization Frameworks and Systems**

(1) **An Operator Interacton Framework for Visualization Spreadsheets,** Ed Chi, John Riedl

(2) **Algorithm Visualization for Distributed Environments,** Yoram Moses, Zvi Polunsky, Ayellet Tal, Leonid Ulitsky

(3) **IVORY - an object-oriented Framework for Physics-Based Information Visualization in Java,** T.C. Sprenger, M.H. Gross, D. Bielser, T. Strasser

(4) **Geographic Visualization: Designing Manipulable Maps for Exploring Temporally Varying Georeferenced Statistics,** Alan MacEachren, Frank Boscoe, Daniel Haug, Linda Pickle

7:00 **Reception**

IEEE InfoVis '98 Symposium gratefully acknowledges support from:
Intel Corporation

**Information Technology Laboratory,
National Institute of Standards and Technology**

For further information see *http://www.erc.msstate.edu/infovis98*

Tuesday, October 20

8:30 - 9:45 *Panel*: **Visualization in Command and Control Centers** – *A discussion of issues and challenges for both military and industry centers for command and control of large complex systems*

9:45 - 10:15 Break

10:30 - 12:00 *Short Reports and Late Breaking Hot Topics**

(1) **Saying It in Graphics: From Intentions to Visualizations,** Stephan Kerpedjiev, Giuseppe Carenini, Nancy Green, Johanna Moore, Steven Roth

(2) **Visualizing Decision Table Classifiers,** Bary Becker

(3) **Comparative Visualization of Protein Structure-Sequence Alignments,** Marc Hansen, Doanna Meads, Alex Pang

(4) **Tactical map-based information,** Steven Holste

* see web page for other late breaking topics

12:00 - 1:30 Lunch

1:30 - 3:00 *Papers:* **Visualizing Text and Documents**

(1) **Lensbar - Visualization for Browsing and Filtering Large Lists of Data,** Toshiyuki Masui

(2) **The Shape of Shakespeare: Visualizing Text Using Implicit Surfaces,** Randall Rohrer, David Ebert, John Sibert

(3) **BiblioMapper: A Cluster-based Information Visualization Technique,** Min Song

(4) **Multi-faceted Insight Through Interoperable Visual Information Analysis Paradigms,** Beth Hetzler, Paul Whitney, Lou Martucci, Jim Thomas

3:00 - 3:30 Break

3:30 - 5:00 *Capstone Address: and Closing Remarks*–*details and abstract will become available on the web page at a later date*

Symposium Chair
Jim Hollan, *University of California, San Diego*

Program Co-Chairs
John Dill, *Simon Fraser University,* dill@cs.sfu.ca
Graham Wills, *Lucent Technologies' Bell Labs,* gwills@research.bell-labs.com

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Nahum Gershon, *The MITRE Corporation*
George Robertson, *Microsoft*

TUESDAY EVENING SPECIAL SESSION – PARTY

Tuesday, October 20, 7:30pm (VizLies '98)

How to Lie and Confuse with Visualization

People have misled with statistics and maps for years. Now it's time to look again into misleading and confusing in the field of visualization. Your once-a-year big chance to do just that, in the open, will be in this special party session on Tuesday, October 20, 1998 at 7:30 PM.

You are invited to bring with you visualization lies and confusing articles (yours or others), on 35 mm slides or video. During this evening, it will be allowed to lie and confuse, but not to take credit for the work of others *, so please do not forget to mention the producers' names.

After the informal presentations and truthful debates, the audience will choose the biggest (visualization) lie for 1998. When the evening is over, lying will be outlawed again (for another year). Quite seriously, we hope that by presenting common and uncommon errors occurring in the visual presentation of information, all of us in the visualization community will benefit, or at least have a good laugh at the expense of others.

Reservations and advance submissions are now being accepted. Please send them to **Nahum Gershon**, The MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102-3481 and **F. David Fracchia**, Simon Fraser University, Computing Science, Burnaby, BC V5A 1S6 Canada. Reservations and advance submissions are not required but are strongly recommended. Confused? For more information (genuine!), please contact gershon@mitre.org or fracchia@cs.sfu.ca.

*It is rather allowed to professionally blame those responsible for the lies and confusion.

DISTRIBUTED VISUALIZATION SYSTEMS

Saturday, October 17, 1998 – 8:00am-5:00pm

Michel Grave, *ONERA & Université de La Rochelle*
grave@onera.fr

Wilfrid Lefer, *Université du Littoral, Calais*
lefer@lil.univ-littoral.fr

http://www-lil.univ-littoral.fr/~lefer/IEEEWorkshop.html

Distributed Visualization Systems have been studied since the very beginning of the Computer Graphics adventure, and widely implemented and used. The evolution of computing technologies, especially in the Internet context, has changed the way we design and implement such systems. The spectrum of potential users has been greatly enlarged, and new types of services are needed to allow access to remote services and to support remote collaborative work and concurrent engineering. This full-day workshop shall gather a group of people, with different backgrounds and areas of interest, to share and consolidate their various experiences in the field of remotely accessing distributed data through visual interfaces, including CSCW, distributed VR, and database issues.

A few invited talks have already been planned, but additional contributions are welcome and may be submitted electronically by August 15, 1998 to the workshop co-ordinators. Submission may be either a full paper or a 1-2 page position paper, and be presented either by end-users or system developers.

Discussions are planned to be organized around three main topics; Applications of Distributed Visualization, Environments & User Interfaces, and Technologies for Distributed Visualization. However, this could be reorganized, depending on the submissions.

A report about the workshop will be prepared and is planned for publication in an international journal.

Finally, this mini-workshop is intended to prepare a larger workshop or a full symposium with refereed papers at future Visualization conferences.

MULTI-RESOLUTION REPRESENTATION OF 3D GEOMETRY FOR PROGRESSIVE TRANSMISSION

Saturday, October 17, 1998 – 1:00pm-5:00pm

André Gueziec, *IBM T.J. Watson Research Center*
gueziec@watson.ibm.com

Gabriel Taubin, *IBM T.J. Watson Research Center*
taubin@watson.ibm.com

There has recently been considerable interest in methods for representing 3D surface geometry in compressed form and progressively delivering it across a network or to a display terminal. It is a particularly good time to discuss these issues now, because of the current interest in network-based visualization of large surface datasets, and the continued growth of the Internet. Also, there is considerable activity in the standardization of such techniques, for instance in VRML and MPEG.

The purpose of this workshop is to present the state of the art in the field for visualization problems involving large geometric databases (such as geographic data sets), where the issue of progressive transmission or display is important.

There will be several short "invited" talks by experts in the field, and then participants will discuss the state of the art, compare alternatives, and outline the issues to be solved by attempting to answer the questions listed below.

- What problems can be considered as solved today?
- Should we use wavelet-based approaches or polygonal surface based approaches for progressive transmission of 3D geometry and why?
- How do progressive transmission and view-dependent refinement of 3D geometry relate?
- How do current methods handle singular (non-manifold) input geometry?
- What are the main unsolved problems? changing the topology?

If you are interested in participating in this workshop, please contact the organizers listed above.

WORKSHOP REQUIREMENTS

- **Participation is limited to 20 people.**
- **Submit proposals to the organizers by August 15, 1998.**
- **Submitters will be notified of acceptance by September 15, 1998.**

See http://www.erc.msstate.edu/vis98 for updates on the workshop requirements.

TECHNICAL CONFERENCE PROGRAM

	Wednesday			Thursday			Friday		
	Track A	*Track B*	*Track C*	*Track A*	*Track B*	*Track C*	*Track A*	*Track B*	*Track C*
8:00am 9:00am	**Keynote Session** *Pat Hanrahan*			**5A** *Papers:* Isosurface Extraction	**5B** *Papers:* Information Visualization	**5C** *Cases:* 3D Modeling & Visualization	**9A** *Papers:* Image-based Techniques & Volume Analysis	**9B** *Cases:* Engineering & Design	**9C** *Hot Topics:* Session III
10:00am 11:00am 12:00pm	**2A** *Panel:* Why is Real-Time Volume Rendering No Longer a Year Away?	**2B** *Papers:* Terrain Vis. & Level of Detail Techniques	**2C** *Cases:* Flow Visualization	**6A** *Panel:* Multi-Source Data Analysis Challenges	**6B** *Papers:* Interactive Visualization /VR/ Animation	**6C** *Cases:* Terrain & Large Data Visualization	**10A** *Papers:* Texturing & Rendering	**10B** *Panel:* Art & Visualization: Oil & Water?	**10C** *Papers:* Surfaces II
1:00pm 2:00pm 3:00pm	**3A** *Papers:* Surfaces & Level of Detail Techniques	**3B** *Papers:* Feature Detection & Visualization	**3C** *Cases:* Medical Data Visualization	**7A** *Papers:* Isosurface & Volume Rendering	**7B** *Papers:* Simplification	**7C** *Cases:* Marine Data Visualization	**Capstone Session** *Turner Whitted*		
4:00pm 5:00pm	**4A** *Papers:* Multi-Dimensional Visualization	**4B** *Papers:* Flow & Streamlines	**4C** *Hot Topics:* Session I	**8A** *Papers:* Tensor/Flow	**8B** *Panel:* Key Problems & Thorny Issues	**8C** *Hot Topics:* Session II			

VIS'98 DEMONSTRATIONS & CAL *open at 12:15pm Wednesday*

Wednesday, 8:00 - 10:00am

KN *Keynote Session:* **Modern Trompe L'oeil,** *Pat Hanrahan*

Wednesday, 10:15 - 12:15pm

2A *Panel:* "Why is Real-Time Volume Rendering No Longer a Year Away?"
Moderator: Arie Kaufman
Panelists: Marty Brady, Bill Lorensen, Fred Kitson, Hanspeter Pfister

2B *Papers:* Terrain Visualization and Level of Detail Techniques
(1) **Large scale Terrain Visualization using the Restricted Quadtree Triangulation**, Renato B. Pajarola
(2) **Contour Interpolation and Surface Reconstruction of Smooth Terrain Models,** Jianyun Chai, Takaharu Miyoshi, Eihachiro Nakamae
(3) **Smooth View-Dependent Level-of-Detail Control and Its Application to Terrain Rendering**, Hugues H. Hoppe
(4) **Efficient Implementation of Multi-Triangulations**, Leila De Floriani, Paola Magillo, Enrico Puppo

2C *Cases:* Flow Visualization
(1) **Task Specific Visualization Design: A Case Study in Operational Weather Forecasting**, Lloyd A. Treinish
(2) **Development of a Multi-Source Visualization Prototype**, Leslie Keely, Sam Uselton
(3) **Data Level Comparison of Wind Tunnel and Computational Fluid Data Dynamics Data**, Qin Shen, Alex Pang, Sam Uselton
(4) **Selective Visualization of Vortices in Hydrodynamic Flows**, I. Ari Sadarjoen, Frits H. Post, Bing Ma, David C. Banks, Hans-Georg Pagendarm

KEYNOTE SESSION

Modern Trompe L'oeil

Speaker: Pat Hanrahan, *Stanford University*

The traditional goal of 3D computer graphics has been to create more and more realistic visual simulations, and, recently, more and more immersive technology. In art, there was a similar drive towards realism and immersion that culminated in the "trompe l'oeil" (literally, "to fool the eye") style of architectural painting. For example, A. Pozzo painted an image of St. Ignazio rising into the heavens onto the hemi-cylindrical ceiling of the St. Ignazio church. The image was painted so precisely and realistically that when viewed from the center of projection, in this case a yellow marble tile in the center of the church, the painted ceiling and the architecture are seamlessly merged to create a dramatic sense of immersion.

In this talk I will describe this odd style from art history and try to extract some lessons of interest to computer graphics and visualization researchers. Surprisingly, the trompe l'oeil style, although technically sophisticated, is usually considered a failure. Can the goals of trompe l'oeil be rescued with modern technology? And, what can be learned about the limitations of immersive environments, particularly their effectiveness, from these early efforts?

Biography: Pat Hanrahan is the CANON USA Professor of Computer Science and Electrical Engineering at Stanford University where he teaches computer graphics. His current research involves visualization, image synthesis, and graphics systems and architectures. Before joining Stanford he was a faculty member at Princeton. He has also worked at Pixar where he developed volume rendering software and was the chief architect of the RenderMan™ Interface - a protocol that allows modeling programs to describe scenes to high quality rendering programs. Previous to Pixar he directed the 3D computer graphics group in the Computer Graphics Laboratory at New York Institute of Technology. Professor Hanrahan has received three university teaching awards. He has also received an Academy Award for Science and Technology, the Spirit of America Creativity Award, and the SIGGRAPH Computer Graphics Achievement Award.

CAPSTONE SESSION

Draw on the Wall

Speaker: Turner Whitted, *Microsoft Research*

Graphics workstations provide us a desktop window into large scale observations or complex simulations. The increasing speed of these visualization engines gives us the flexibility to view our data in a manner that is both appealing and instructive. While we are still not absolutely sure how best to present views of data to users, the price and performance of our desktop technology is now less of a limitation than our own imaginations.

What will new presentation and interaction technology do for visualization applications? Today, the most exciting development in interactive technology is the un-tethering of users from their desktops. We can imagine scientific, engineering, and business users with thoughtful looks on their faces, surrounded by their data as they wander through their offices and hallways, talking to the applications, listening to the results, and drawing on the walls. This is the popular picture of smart environments and wearable computers. The component devices for this technology have no magic; they obey the same laws of physics as the rest of the world; and there are unsolved problems in making this picture reality. While the un-tethered computing world is inevitable, its details are not completely clear and the path to its realization is rocky. This talk is both a look forward and a sanity check.

Biography: Turner Whitted recently joined Microsoft as a senior researcher. He has been a Research Professor of Computer Science at the University of North Carolina at Chapel Hill for the past 14 years, as well as a cofounder and director of Numerical Design Limited. Prior to that he was a technical staff member in Bell Labs' Computer Systems Research Laboratory. He earned BSE and MS degrees in Electrical Engineering from Duke University and a PhD from North Carolina State University. He is an editorial board member of IEEE Computer Graphics and Applications, was papers chair for SIGGRAPH 97, and is an ACM Fellow.

CALL FOR STUDENT VOLUNTEERS

If you are a student, then we invite you to be a part of Visualization '98! In exchange for helping to run the conference, student volunteers may attend paper and panel sessions as well as workshops, symposia, and tutorials. For more information or to apply online, see the student volunteer web site:

URL: http://glug.cs.uml.edu/vis98

BIRDS OF A FEATHER (BOF) SESSIONS

Birds of a Feather (BOF) sessions will be held Thursday evening. These sessions will provide participants the opportunity to discuss current topics with others. BOFs are open to all Vis '98 attendees. If you wish to lead a BOF, please contact Steve Talent (talent@acm.org). Be sure to check the final program to see what BOFs are offered and when you arrive, be sure to check for additional BOFs.

Wednesday, 1:45 - 3:45pm

3A *Papers:* **Surfaces and Level of Detail Techniques**

(1) **Visualization of Scalar Topology for Structural Enhancement**, Chandrajit L. Bajaj, Valerio Pascucci, Daniel Schikore

(2) **A General Method for Recovering Attribute Values on Simplified Meshes,** Paolo Cignoni, Claudio Montani, Claudio Rocchini, Roberto Scopigno

(3) **Surface Reconstruction with Anisotropic Density-Scaled Alpha Shapes,** Marek Teichmann, Michael Capps

(4) **Level of Detail Visualization of Scalar Data Sets on Irregular Surface Meshes**, Georges-Pierre Bonneau, Alexandre Gerussi

3B *Papers:* **Feature Detection and Visualization**

(1) **Tracking Features in Unstructured Datasets**, D. Silver, X. Wang

(2) **Feature Detection in Linked Derived Spaces**, Chris Henze

(3) **Extremal Feature Extraction from 3-D Vector and Noisy Scalar Fields,** Chi-Keung Tang, Gerard G. Medioni

(4) **Feature Comparisons of Vector Fields using Earth Mover's Distance**, Yingmei Lavin, Rajesh Kumar Batra, Lambertus Hesselink

3C *Cases:* **Medical Data Visualization**

(1) **Visual Presentation of Magnetic Resonance Images**, J. E. van der Heyden, M. S. T. Carpendale, K. Inkpen, M. S. Atkins

(2) **Visualization in Corneal Topography,** F. M. Vos, H. J. W. Spoelder

(3) **Case Study Using the Virtual Environment for Reconstructive Surgery**, Kevin Montgomery, Michael Stephanides, Stephen Schendel, Muriel Ross

(4) **Interactive Virtual Angioscopy**, Enrico Gobbetti, Piero Pili, Antonio Zorcolo, and Massimiliano Tuveri

Wednesday, 4:00 - 5:30pm

4A *Papers:* **Multi-Dimensional Visualization**

(1) **Building Perceptual Textures to Visualize Multidimensional Datasets**, Christopher G. Healey, James T. Enns

(2) **Efficient Co-Triangulation of Large Data Sets**, Henrik Weimer, Joe Warren, Jane Troutner, Wendell Wiggins, John Shrout

(3) **Visualizing Diffusion Tensor Images of the Mouse Spinal Cord**, David H. Laidlaw, Eric T. Ahrens, David Kremers, Matthew J. Avalos, Carol Readhead, Russell E. Jacobs

4B *Papers:* **Flow and Streamlines**

(1) **Image-Guided Streamline Placement on Curvilinear Grid Surfaces**, Xiaoyang Mao, Yuji Hatanaka, Hidenori Higashida, Atsumi Imamiya

(2) **A Higher-Order Method For Finding Vortex Core Lines**, Martin Roth, Ronald Peikert

(3) **Automatic Detection of Open and Closed Separation and Attachment Lines**, David N. Kenwright

4C *Hot Topics Session I*

For information on the Technical Committee on Computer Graphics conferences, publications, and programs, check

http://www.cc.gatech.edu/gvu/tccg/

VISUALIZATION '98 LATE BREAKING HOT TOPICS

Come and be a part of the Late Breaking Hot Topics Sessions during the Visualization '98 Conference. Presentations of late breaking results, works in progress, innovative ideas, and applications of visualization will be given. These shorter talks allow for lively interaction. The sessions will be held Wednesday, Thursday, and Friday as part of the technical program.

IMPORTANT DATES:		
August 1:	**Announcement of accepted papers**	
August 21:	**Final camera ready papers are due**	
August 31:	**Final video submissions are due**	

Descriptions for the late breaking hot topics will be posted to http://www.erc.msstate.edu/vis98 after August 15.

Thursday, 8:30 - 10:00am

5A *Papers:* **Isosurface Extraction**

(1) **Isosurface Extraction from Time-Varying Fields Using a Temporal Hierarchical Index Tree**, Han-Wei Shen

(2) **Interactive Out-Of-Core Isosurface Extraction,** Yi-Jen Chiang, Claudio T. Silva, William J. Schroeder

(3) **View Dependent Isosurface Extraction**, Yarden Livnat, Charles Hansen

5B **Papers: Information Visualization**

(1) **The Gridfit Approach: An Efficient and Effective Approach to Visualizing Large Amounts of Spatial Data,** Daniel A, Keim, Annemarie Herrmann

(2) **TOPIC ISLANDS - A Wavelet-Based Text Visualization System**, Nancy E. Miller, Pak C. Wong, Mary Brewster, Harian Foote

(3) **Continuous Cartogram Construction**, Christopher J. Kocmoud, Donald H. House

5C *Cases:* **3D Modeling and Visualization**

(1) **Volumetric Visualization of Acoustic Fields in CNMAT's Sound Spatialization Theatre**, Sami Khoury, Adrian Freed, David Wessel

(2) **Supporting Detail-in-Context for the DNA Representation, H-Curves**, M. L. Lantin, M. S. T. Carpendale

(3) **Visualizing Hilbert Curves**, Nelson Max

6A *Panel:* "Multi-Source Data Analysis Challenges"
Panelists: Sam Uselton, Jim Ahrens, Wes Bethel, Lloyd Treinish, Andrei State

6B *Papers:* Interactive Visualization / VR/ Animation

(1) **A Concept for Virtual Reality Tools for Design Reviews**, Klaus Kremer

(2) **Efficient Warping for Architectural Walkthroughs using Layered Depth Images**, Voicu S. Popescu, Anselmo Lastra, Daniel G. Aliaga, Manuel M. de Oliveira Neto

(3) **Visualizing Differences in Movies of Cortical Activity**, Kay A. Robbins, David M. Senseman

(4) **A Distributed Blackboard Architecture for Interactive Data Visualization**, Robert van Liere, Jan A. Harkes, Wim C. de Leeuw

6C *Cases:* Terrain & Large Data Visualization

(1) **Rear-Projecting Virtual Data onto Physical Terrain: An Exercise in Two Senses Being Better Than One**, Dru Clark, Rosemarie McKeon, Richard Marciano, Michael Bailey

(2) **Intent, Perception, and Out-of-Core Visualization Applied to Terrain**, Douglass Davis, T. Y. Jiang, William Ribarsky, Nickolas Faust

(3) **Production Visualization for the ASCI One TeraFLOPS Machine**, Philip D. Heermann

(4) **Battlefield Visualization on the Responsive Workbench,** Jim Durbin, J. Edward Swan II, Brad Colbert, Chris Scannell, John Crowe, Rob King, Tony King, Terry Welsh, Zachary Wartel

7A *Papers:* Isosurface & Volume Rendering

(1) **Interactive Ray Tracing for Isosurface Rendering**, Steven Parker, Peter Shirley, Yarden Livnat, Charles Hansen, Peter-Pike Sloan

(2) **Fast, Pop-Free Sheet Buffer-Based Splatting with Grid Warping for Volumes with Unequal Grid Scaling**, Klaus Mueller, Roger Crawfis

(3) **Accelerated Ray-Casting for Curvilinear Volumes**, Lichan Hong, Arie E. Kaufman

(4) **High Quality Rendering of Attributed Volume Data**, Ulf Tiede, Thomas Schiemann, Karl Heinz Hoehne

7B *Papers:* Simplification

(1) **Simplifying Surfaces with Color and Texture using Quadric Error Metrics**, Michael Garland, Paul S. Heckbert

(2) **A Unified Approach for Simplifying Polygonal and Spline Models,** M. Gopi, Dinesh Manocha

(3) **Fast and Memory Efficient Polygonal Simplification**, Peter Lindstrom, Greg Turk

(4) **Efficient and Robust Simplification of Tetrahedral Meshes,** Issac J.Trotts, Bernd Hamann, Kenneth I. Joy, David F. Wiley

7C *Cases:* Marine Data Visualization

(1) **Scientific Visualization and Data Modeling of Scattered Sediment Contaminant Data in New York/New Jersey Estuaries**, Hong Ma, Keith W. Jones, Eric A. Stern

(2) **POPTEX: Interactive Ocean Model Visualization Using Texture Mapping Hardware**, Allen McPherson, Mathew Maltrud

(3) **Acoustic Imaging and Visualization of Plumes Discharging from Black Smoker Vents on the Deep Seafloor**, P. Rona, K. Bemis, D. Kenchammana-Hosekote, D. Silver

(4) **Seabed Visualization**, Paul Chapman, Peter Stevens, Derek Wills, Graham Brookes

8A *Papers:* Tensor/Flow

(1) **Interactive Deformations from Tensor Fields,** Ed Boring, Alex Pang

(2) **Real-Time Techniques for 3D Flow Visualization**, Anton L. Fuhrmann, Eduard Groeller

(3) **Tools for Computing Tangent Curves for Linearly Varying Vector Fields over Tetrahedral Domains,** Gregory M. Nielson, Il-Hong Jung

8B *Panel:* "Key Problems and Thorny Issues in Multidimensional Visualization"
Panelists: Georges Grinstein, Alfred Inselberg, Sharon Laskowski

8C *Hot Topics Session II*

9A *Papers:* Image-based Techniques and Volume Analysis

(1) **Image-Based Transfer Function Design for Data Exploration in Volume Visualization,** Shiaofen Fang, Tom Biddlecome

(2) **Image-Based Rendering with Occlusions via Cubist Images,** Andrew J. Hanson, Eric A. Wernert

(3) **Hierarchical Volume Analysis and Visualization Based on Morphological Operators**, Christoph Luerig, Thomas Ertl

9B *Cases:* Engineering & Design

(1) **Configuration Space Visualization for Mechanical Design**, Elisha Sacks, Leo Joskowicz

(2) **Metallurgical Application of Three Dimensional Visualization Techniques**, Marco Lanzagorta, Milo V. Kral, J. Edward Swan II, George Spanos, Rob Rosenberg, Eddy Kuo

(3) **Visualization for Multiparameter Aircraft Designs**, Cliff A. Shaffer, Duane L. Knill, Layne T. Watson

9C *Hot Topics Session III*

10A *Papers:* Texturing and Rendering

(1) **Interactive Display of Very Large Textures,** David Cline, Parris K. Egbert

(2) **Pixel Masks for Screen-Door Transparency** Jurriaan D. Mulder, Frans C.A. Groen, Jarke J. van Wijk

(3) **Comparing LIC and Spot Noise**, Wim C. de Leeuw, Robert van Liere

(4) **Size Preserving Pattern Mapping**, Yair Kurzion, Torsten Moeller, Roni Yagel

10B *Panel:* "Art and Visualization: Oil and Water?"
Organizer: David Laidlaw
Panelists: David Kremers, Victoria Interrante, Felice Frankel, Thomas Banchoff

10C *Papers:* Surfaces II

(1) **Constrained Optimal Framings of Curves and Surfaces using Quaternion Gauss Maps,** Andrew J. Hanson

(2) **Converting Sets of Polygons to Manifold Surfaces by Cutting and Stitching,** André P. Gueziec, Gabriel Taubin, Francis Lazarus, William Horn

(3) **Interpolation of Triangle Hierarchies**, Axel Friedrich, Konrad Polthier, Markus Schmies

(4) **Progressive Tetrahedralizations**, Oliver G. Staadt, Markus H. Gross

CS *Capstone Session:* Awards for Best Paper, Best Panel, Best Hot Topics, and Best Case Study
Capstone Address: **Draw on the Wall,** *Turner Whitted*

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VISUALIZATION '98 DEMONSTRATIONS

Wednesday, Thursday

Attending Visualization '98 will be a multinational audience of innovators and leaders from academia, business, and government – people who purchase and recommend computer hardware and software for their organizations. Join them by participating in one of these demonstration categories:

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Our Corporate Partners will have a place of prominence at Visualization '98, as we acknowledge their support of the conference and its goals.

Corporate Demonstrations   Cost $1,750
These demonstrations are more technical presentations as opposed to traditional trade show style presentations. The goal is to emphasize research results, novel tools, new equipment, and new applications.

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You can be associated with Visualization '98 as Corporate Support, gaining attention for your products and providing the conference with your assistance without the need to mount a demonstration.

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The Non-Profit Demonstrator is one whose organization does not sell any visualization products. Non-Profit Demonstrators typically come from research groups in government, industry or academia that have developed visualization software, but do not sell them as a commercial product.

Academic Institution Demonstrator   No fee
This category is for academic institutions who do not sell any visualization products. Demonstrations may be proposed in this category and a limited number will be accepted depending on the quality of and interest in the presentation.

We must receive your commitment to participate soon so that we can make arrangements and you can benefit from full publicity for your participation. Don't Delay! For further information, please contact:

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NOTE: *Please sign up at the conference hotel. We understand that you are all on a budget, but so are we. We need your hotel room reservations in the Vis '98 block at the conference hotel, or else the conference has to pay extra for the conference room rental. Because we have a heavy AV requirement, we have to book a hotel that has large conference rooms and high ceilings. There aren't many of those who will book a small conference like ours. Please help us out by supporting the conference hotel. We don't want to have to raise our rates to cover hotel penalties.*

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Sunday / Monday / Tuesday Registration *You may attend any tutorial or symposium and receive a lunch on the day(s) registered. Registration includes Volume Visualization proceedings, Information Visualization proceedings, Monday reception, Wednesday Keynote, Wednesday-Thursday demonstrations, the conference videotape, and CD. All tutorial, symposia, and conference proceedings and notes are on the Vis98 CD.*

Please check the day(s) that you wish to sign up for:

_____Sunday   _____Monday   _____Tuesday

	Early Registration *(received by Sept.25)*			Late/Onsite Registration *(Sept. 26 or later)*		
	1-day	2-day	3-day	1-day	2-day	3-day
IEEE/ACM member	$260	$370	$480	$310	$440	$570
Nonmember	$335	$470	$605	$390	$560	$730
Full-time student	$165	$215	$265	$200	$250	$300

Sunday-Monday-Tuesday Registration $_____

Conference: *Registration includes technical sessions and lunch for Wednesday, Thursday, and Friday, Vis98 Conference proceedings, Wednesday reception, Wednesday Keynote, Friday Capstone, Wednesday-Thursday demonstrations, and the conference videotape and CD. All tutorial, symposia, and conference proceedings and notes are on the Vis98 CD.*

	Early Registration *(received by Sept.25)*	Late Registration *(Sept. 26 or later)*
IEEE/ACM member	$380	$480
Nonmember	$470	$580
Full-time student	$225	$280

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Total Fee Enclosed (Sunday-Monday-Tuesday, Conference Fee) $_____

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   ☐ email   ☐ magazine ad
   ☐ mailer   ☐ colleague
   ☐ web   ☐ other
   ☐ attended before

2. ☐ Please do ***NOT*** include my name, address, or telephone number on a published list of attendees.

3. ☐ Please do ***NOT*** include my telephone number on a published list of attendees.

4. For *student registration*, attach a copy of a valid student identification card.

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http://www.erc.msstate.edu/vis98

Questions about Registration?
Please call +1·202·371·1013 between 8:30 and 5:00pm (Eastern Time) or send email to register@computer.org.

Do not send credit card numbers over email

Find out more about Visualization '98 and making your Vis98 hotel reservation at http://www.erc.msstate.edu/vis98

Vis98

IEEE VISUALIZATION 1998

- **Tutorials**
- **Papers and Panels**
- **Case Studies**
- **Birds-of-a-Feather Sessions**
- **Workshops**
- **Late Breaking Hot Topics**
- **Creative Applications Lab**
- **Volume Visualization Symposium '98**
- **Information Visualization '98**
- **Demonstrations**

Vis98

REGISTRATION INFORMATION

URL: http://www.erc.msstate.edu/vis98
Phone: 202·371·1013 (Eastern Time)
Fax: 202·728·0884 (Attn: VIS '98 registration)

CRITICAL DATES

September 25	Close of Early Registration
September 25	Cut-off for Guaranteed Hotel Reservations (*5pm, Eastern time*)
Oct. 18	Conference Commences

- **Multivariate Visualization**
- **Information Visualization**
- **Biomedical Visualization**
- **Visualization Techniques**
- **Visualization Education**
- **Flow Visualization**
- **Virtual Reality**
- **Visualization Applications**
- **Vector & Tensor Topology**
- **Exploratory Visualization**
- **Volume Visualization**
- **Parallel Rendering**
- **Human Factors**
- **Databases**

WHAT YOU GET WITH YOUR REGISTRATION

	SUNDAY-MONDAY-TUESDAY	
	CONFERENCE	
Vis'98 Proceedings	●	
Wednesday Vis'98 Reception	●	
Vis'98 Keynote	●	●
Vis'98 Capstone	●	
Papers	●	
Panels	●	
Cases	●	
Late Breaking Hot Topics	●	
CD-ROM	●	●
Conference Video	●	●
Tutorial Attendance		●
Vol Vis Symposium Attendance		●
Vol Vis Symposium Proceedings		●
Info Vis Symposium Attendance		●
Info Vis Symposium Proceedings		●
Monday Reception		●
Demonstrations	●	●
BOFs	●	●

Sponsored by IEEE Computer Society Technical Committee on Computer Graphics In Cooperation with ACM/SIGGRAPH

October 18 - October 23, 1998 ● Sheraton Imperial Hotel

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