Taosong He

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Research Interests

3D Network Visualization; Real Time and Distributed Visualization System; Virtual Endoscopy; Interactive Navigation, Rendering, Visibility, Collision Detection, and Object Simplification; Volume Visualization; Information Visualization; and Medical Imaging.

Professional Experiences

Network&Service Management Research Department, Bell Labs, Holmdel, NJ Febuary'99-present
Member of technical staff. Developing web-based interactive visual interfaces to varieties of network management tools by applying and inventing the state of the art visualization techniques. Research also focused on 3D graphics and medical applications such as virtual endoscopy.

Data Visualization Research Group, Bell Labs, Lucent Technologies, Naperville, IL June'96-January'99
Member of technical staff. Developed innovative techniques and systems for visualizing and controlling complex systems. Research also included graphics, volume visualization, and medical applications.
Consulting Visual Insight ™, a Bell Labs venture providing visualization solutions to business problems.

Visualization Lab, State University of New York at Stony Brook September'92-May'96
Research assistant. Developed volumetric virtual environment, medical imaging, and visibility techniques.

Department of Computer Science, State University of New York at Stony Brook September'91-May'96
Instructor and teaching assistant. Designed and directed many graphics and visualization course projects, and several Master thesis projects. Organized and taught an 80 hour computer science major course.

Education

Ph.D. Computer Science May'96
State University of New York at Stony Brook, New York
Thesis Title: "Volumetric Virtual Environments", Advisor: Dr. Arie Kaufman

M.S. Computer Science May'93
State University of New York at Stony Brook, New York

B. S Computer Science May'91
FuDan University, Shanghai, China

System Development and Research Projects

- **NetViz.** Developing a Java based distributed and web-based interactive visualization toolkit that can be served as the front-end visual interface to varieties of network management applications. NetViz supports real time monitoring, analysis, and manipulation of back-end applications; incorporates effective visualization techniques such as clustering and level of detail for rapid cognition and interactive decision-making; employs a rich and expandable portfolio of 2D and 3D network views; and provides a distributed framework for collaborated network visualization. It is being applied to applications such as IP topology discovery and network fault management.

- **Virtual Endoscopy.** Proposed and developed the first reliable navigation system for virtual endoscopy based on an innovative path and camera control model. Virtual endoscopy provides a computerized, non-invasive procedure for detecting anomalies inside human organs**.** Unfortunately, previous techniques including both clinical and virtual procedures can not guarantee that an existing anomaly be detected. Our system solves this "blind area" problem by introducing the concept of reliable path and ensuring that the interior organ surface is fully examined by the physician.
- **Real Time Collision Detection.** Developed a real time collision detection algorithm based on a new and innovative hierarchical structure. It provides significant performance improvement compared to the sphere tree, *K-dops* or OOBBs algorithms.
- **Network Visual Interfaces.** Developed a C++ based cross-platform and high level framework as an efficient programming environment for designing, visualizing, and manipulating complex, hierarchical, and real time networks. Proposed the principles for designing interactive network interface, and built within the generic OO framework a suite of innovative 2D and 3D visual metaphors.
- **Java Front End to Network Simulator**. Developed a portable and mobile Java front end to a switching-based voice network simulator. It allows the users to interactively create and modify a network, remotely invoke and control the network simulation through Internet, and visualize the simulation results with variety of analytical tools in real time.
- **Volumetric Virtual Environments.** Developed virtual environment techniques supporting both volumetric and surface-based models. Some research results include wavelet-based volume morphing and rendering; voxel-based topology simplification for both volumetric and polygon-based objects; optimized stereo volume rendering; stochastic generation of transfer functions; hierarchical volumetric collision detection; and a hardware assisted visibility algorithm.
- **Virtual Colonoscopy.** This project employs noninvasive computerized medical procedure for examining the entire colon to detect polyps. Our system uses a physical-based cameral control model and the hardware-assisted visibility algorithm to achieve the interactive navigation inside the patient colon.
- ***VolVis*.** *VolVis* is a comprehensive volume visualization system developed at Stony Brook, and has been widely distributed and used around the world. As a primary developer, implemented the 3D interaction component, and was responsible for the enhancement of rendering, navigation, and user interface.

Journal Papers

1. T. He, "Volumetric Virtual Environment", *Journal of Computer Science and Technology,* 1999.
2. T. He and S. Eick, "Constructing Interactive Network Visual Interface", *Bell Labs Technical Journal*, 3(2), Spring 1998, pp. 47-57.
3. K. Cox, S. Eick, and T. He, "3D Geographic Network Displays", *SIGMOD Record*, 25(4), December 1996, pp. 50-54.
4. T. He, L. Hong, A. Varshney, and S. Wang, "Controlled Topology Simplification*", IEEE Transactions on Computer Graphics and Visualization*, 2(2), June, 1996, pp. 171-184.

Refereed Conference Papers

1. T. He and L. Hong, "Reliable Navigation for Virtual Endoscopy", IEEE Medical Imaging Conference, Seattle, October 1999.
2. T. He, "Internet-Based Network Simulator Front-End"*, VisSym'99-Joint EUROGRAPHICS - IEEE TCCG Symposium on Visualization*, pp. 247-252, May 1999, Vienna, Austria.
3. T. He, "Fast Collision Detection Using QuOSPO Trees", *1999 ACM Symposium on Interactive 3D Graphics*, pp. 55-62, Atlanta, GA, April 1999.
4. T. He, "Java-Based Visual Interface to Network Simulator", *Applied Telecommunication Symposium*, v31, n4, pp. 100-104, San Diego, CA, April 1999.

5. T. He, “Wavelet-Assisted Volume Ray Casting”, *Pacific Symposium on Biocomputing’98*, pp. 153-164, Maui, HW, January 1998.
6. T. He and A. Kaufman, “Collision Detection for Volumetric Objects”, *IEEE Visualization'97*, pp. 27-34, Phoenix, AZ, October 1997.
7. T. Chiueh, C. Yang, T. He, H. Pfister, A. Kaufman, "Integrated Volume Compression and Visualization", *IEEE Visualization'97,* pp. 49-56, Phoenix, AZ, October 1997.
8. L. Hong, S. Muraki, A. Kaufman, D. Bartz, and T. He, “Virtual Voyage: Interactive Navigation in the Human Colon”, *SIGGRAPH’97*, pp. 27-34, Los Angles, August 1997.
9. T. He and S. Eick, “Design of Network Interface*”, CODOTA Euro American Workshop on Visualization of Information and Data*, June 1997, Paris.
10. T. He and A. Kaufman, “Fast Stereo Volume Rendering”, *IEEE Visualization'96*, pp.49-56, San Francisco, CA, October 1996.
11. T. He, L. Hong, H. Pfister and A. Kaufman, "Generation of Transfer Functions with Stochastic Search Techniques", *IEEE Visualization'96*, pp. 227-234, San Francisco, CA, October 1996.
12. T. He, L. Hong, A. Kaufman, A. Varshney, and S. Wang, "Voxel-Based Object Simplification*", IEEE Visualization'95 Proceedings*, pp. 296-303, Atlanta, GA, October 1995.
13. T. He, S. Wang, and A. Kaufman, "Wavelet-Based Volume Morphing", *IEEE Visualization'94*, pp. 85-92, Washington, D.C., October 1994.
14. R. Avila, T. He, L. Hong, A. Kaufman, H. Pfister, C. Silva, L. Sobierajski, and S. Wang, "VolVis: A Diversified Volume Visualization System", *IEEE Visualization'94*, pp. 31-38, Washington, D.C., October 1994.
15. T. He and A. Kaufman, "Virtual Input Devices for 3D Systems", *IEEE Visualization'93*, pp. 142-148, San Jose, CA, October 1993.
16. T. He and A. Kaufman, "Virtual Input Devices for a Virtual World", *Virtual Reality System'93*, New York, October 1993.
17. A. Kaufman, R. Avila, L. Sobierajski, and T. He, "Navigation and Animation in a Volume Visualization System", *Models and Techniques in Computer Animation*, Spring-Verlag, 1993, pp. 64-74.

Book Chapter

1. T. He, "Network Visualization", *Emerging Trends and Challenges in Network Manage*ment, Plenum, March 2000.

Patents

- T. He and L. Hong, "Reliable Navigation for Virtual Endoscopy", October’99, pending.
- T. He, "Fast Collision Detection Using QuOSPO Trees", September’99, pending.
- T. He, “Wavelet-Assisted Volume Ray Casting”, May’98, pending.
- S. Eick and T. He, “Method and Apparatus for Constructing Network Interfaces”, November’97,pending.

Invited Activities

- Invited Talk: “Constructing Network Visual Interface”, *Bell Labs Technical Journal Visiting Lecturer Program,* Columbia University and Rutgers University, 2000.
- Invited Talk: “Visual Interface to Complex Networks”, *ISS’97: World Telecommunication Congress*, Toronto, September, 1997.
- Invited Talk: “3D Network Interfaces”, *Lucent Software Symposium'96*, Holmdel, NJ, October, 1996.
- Invited to design the theme poster of National Mathematics Awareness Week’97, 20-26, April 1997.

Skills

- Languages: C++, Java, C, VRML, Java Script, OpenGL, Tcl/Tk, Perl, Visual C++, Visual Basic, SQL, X-Motif, SML, HTML, Prolog, LISP.
- Systems: Unix, Window NT/95, Oracle.

Awards and Recognition

- Arc Map for Internet Visualization, *BBC news on line* (11/3/99), *MSNBC* (10/29/99), *New York Times* (9/30/99),…
- "Constructing Interactive Network Visual Interfaces", best paper published in the *Bell Labs Technical Journal* in 1998 in the Software Category.
- Bell Labs President Silver Award, 1997.
- Network visual interface, feature article, "R&D Matchmaking at Tech Symposium", *Bell Labs News*, December 30, 1996.
- 3D Virtual Colonoscopy project, feature article "From Stony Brook, a New Way to Examine Colons, Externally", *New York Times*, April 14, 1996.
- *VolVis* project, feature article, "From Cyberspace, a Program to Help Doctors Make Diagnoses*", New York Times*, January 29, 1995.
- First prize fellowship, FuDan University, '88-'89, '89-'90, '90-'91.

Cover Images

- "A network global view showing international packet traffic", *Bell Labs Technical Journal*, Spring 1998.
- "Wavelet-based volume morphing from a CT-Lobster to an MRI-head", *Journal of the Japan Society for Simulation Technology*, 16(4), December 1997.
- "User interface for stochastic transfer function generation", *IEEE Visualization'96*.
- "Volumetric Ray Tracing of a fractal ellipsoid-flake", *IEEE Transactions on Visualization and Computer Graphics*, 2(2), June, 1996.
- "Volumetric ray tracing of a cell using maximum-value projection", *IEEE Visualization'94*.

References

Available upon request.