

Research Interests: Computer Graphics, Physically-based Simulation, Heterogeneous Computing, Robotics

Education:

- PhD, University of North Carolina, Chapel Hill** Dec 2006
Major: Computer Science
Advisor: Prof. Dinesh Manocha
Topic: Efficient Computation of Approximate Voronoi Diagram and Homotopy-Preserving Simplified Medial Axis of 3D Polygonal Models
- Master of Science, University of North Carolina, Chapel Hill** Dec 2003
Major: Computer Science
- Bachelor of Technology, Indian Institute of Technology, New Delhi** May 2000
Major: Computer Science and Engineering

Work Experience:

- Postdoctoral Researcher, University of North Carolina, Chapel Hill** 2006 – 2007
GAMMA group: Developed algorithms for real-time simulation of large heterogeneous crowds. Co-teaching a seminar level graduate course. Co-Supervised two PhD students and one undergraduate honor student.
- Research Assistant, University of North Carolina, Chapel Hill** 2003 – 2006
GAMMA group: Developed algorithms for efficient computation of the distance field and approximate Voronoi diagram using GPUs, and application to proximity queries in complex deformable environments. Also developed algorithms for computation of the Voronoi diagram and simplified medial axis of complex polyhedral models with topological guarantees.
- Research Assistant, University of North Carolina, Chapel Hill** 2001 – 2003
Walkthrough Group: Worked on systems for interactive visibility culling and shadow generation for complex environments.
- Summer Intern, Naval Research Labs, Washington DC** Summer 2001
Project: Battlefield augmented reality system. Developed hierarchical data structures for interactive spatial database queries in an augmented reality system.
- Summer Intern, IBM India Research Labs, Delhi** Summer 1999
Project: Robust lip detection to assist in multi-modal speech recognition. Used deformable templates to parameterise the lips in a video sequence and explore the best-suited energy functions that robustly detected the lips.
- System Administrator, Indian Institute of Technology, Delhi** 1998 – 2000
Involved in the systems administration of the Computer Science and Engineering Labs at IIT Delhi. The main platform maintained was Linux.

Teaching Experience:

- Co-Instructor, University of North Carolina, Chapel Hill** Spring 2007
COMP790-058: General Purpose Computation using GPUs
<http://gamma.cs.unc.edu/GPGP>
Most popular graduate level course in Computer Science, Spring 2007
- Instructor, University of North Carolina, Chapel Hill** Summer 2005
Instructor for COMP004: Power Tools for the Mind
- Teaching Assistant, University of North Carolina, Chapel Hill** Fall 2000
Teaching Assistant for COMP122: Algorithms and Analysis

Achievements and Professional Activities:

- **Program Committee:** ACM Symposium on Virtual Reality Software and Technology, Newport Beach, CA, November 2007
- **Program Committee:** ACM Solid and Physical Modelling Symposium, Beijing, China, June 2007
- **Posters Co-Chair,** Workshop on Edge Computing Using New Commodity Architectures, Chapel Hill, NC, June 2006
- **Referee** for conferences and journals including ACM SIGGRAPH, Eurographics, ACM Symposium on Geometry Processing, ACM Symposium on Interactive 3D Graphics, ACM Symposium on Solid Modelling, ACM/Eurographics Symposium on Computer Animation, Workshop on the Algorithmic Foundations of Robotics, IEEE Conference on Visualization, ACM VRCIA, Graphicsal Models, IEEE Virtual Reality, IEEE Transactions on Robotics, ACM Transactions on Graphics, Journal of Graphics Tools.
- **Faculty Recruiting Committee,** Computer Science Department, UNC Chapel Hill – Spring 2007
- **Department Facilities Committee,** Computer Science, UNC Chapel Hill – 2004-2006
- **Co-chair, Graduate Committee,** South Asian Student Association, UNC Chapel Hill – 2001-2002
- **Graphics Programming Contest,** IIT Delhi Tech Fest – 1998: Second Runner Up
- **Merit scholarship** for securing top 20 rank , IIT Delhi – 1996
- **Merit Scholarship** - National Talent Search Examination, India – 1994
- **Regional Mathematical Olympiad,** Delhi - 1994: 14th position

Invited Talks:

- *Interactive Distance Field and Proximity Computation,* Intel Platform Architecture Group, Aug 2006
- *Interactive Discrete Voronoi Diagram and Proximity Computation,* Adobe Systems, Aug 2006
- *Interactive Distance Field Computation using GPUs,* ATI Research, Jun 2006
- *Approximate Voronoi Diagrams and Homotopy Preserving Simplified Medial Axes of Polyhedral Models,* Computer Science Department Colloquium, College of William and Mary, Williamsburg, Oct 2005
- *Fast 3D Distance Field Computation,* Computer Science Seminar, IIT Delhi, Feb 2004
- *Interactive Walkthroughs of Complex Environments,* Computer Science Seminar, IIT Delhi, Jan 2002

Grants and Proposals:

- *Teaching GPGPU Using CUDA (Co-PI),* NVIDIA Corporation, \$30K, 2007

Press Coverage:

- *Multi-Agent Simulation for Urban Warfare, Capitol Hill Demonstration,* February 2007
- *GPU accelerated line-of-sight algorithms for DARPA OneSAF project,* DARPA Legacy Press Release, 2005
- *University-based Graphics Research: Interactive Shadow Generation,* ExtremeTech, 2003

Publications:

Refereed Journal Papers:

Homotopy-Preserving Approximate Voronoi Diagram of 3D Polyhedron
Avneesh Sud, Liangjun Zhang, Mark Foskey and Dinesh Manocha
Computer Graphics Forum Special Issue, In Press

Fast Simulation of Laplacian Growth
Theodore Kim, Jason Sewall, Avneesh Sud and Ming C. Lin
IEEE Computer Graphics and Applications, In Press

Fast Proximity Computation among Deformable Models using Discrete Voronoi Diagrams
Avneesh Sud, Naga Govindaraju, Russell Gayle, Ilknur Kabul and Dinesh Manocha
ACM Transaction on Graphics, 2006 (Proc SIGGRAPH 2006)

Homotopy-Preserving Medial Axis Simplification

Avneesh Sud, Mark Foskey and Dinesh Manocha

Invited to *International Journal of Computational Geometry and Applications*, 2006

DiFi: Fast 3D Distance Field Computation Using Graphics Hardware

Avneesh Sud, Miguel Otaduy and Dinesh Manocha

Computer Graphics Forum 23 (3), 2004 (Proc. *Eurographics* 2004)

Interactive Shadow Generation in Complex Environments

Naga Govindaraju, Brandon Lloyd, Sung-Eui Yoon, Avneesh Sud and Dinesh Manocha

ACM Transactions on Graphics 22(3), 2003 (Proc. *SIGGRAPH* 2003)

Refereed Conference Papers:

Surface Distance Maps

Avneesh Sud, Naga Govindaraju, Russell Gayle, Erik Andersen and Dinesh Manocha

Proc. *Graphics Interface*, 2007

Efficient Path Planning for Highly Articulated Robots using Adaptive Forward Dynamics

Russell Gayle, Stephane Redon, Avneesh Sud, Ming C. Lin, and Dinesh Manocha

IEEE International Conference on Robotics and Automation, 2007

Real-time Path Planning for Virtual Agents in Dynamic Environments

Avneesh Sud, Erik Andersen, Sean Curtis, Ming Lin, and Dinesh Manocha

Proc. *IEEE Virtual Reality Conference*, 2007

Selected for Conference Proceedings **Cover Image**

Interactive 3D Distance Field Computation using Linear Factorization

Avneesh Sud, Naga Govindaraju, Russell Gayle and Dinesh Manocha

Proc. *ACM Symposium on Interactive 3D Graphics and Games (I3D)*, 2006

Interactive Computation of Discrete Generalized Voronoi Diagrams using Range Culling

Avneesh Sud, Naga Govindaraju and Dinesh Manocha

Proc. *2nd International Symposium on Voronoi Diagrams in Science and Engineering*, 2005

Homotopy-Preserving Medial Axis Simplification

Avneesh Sud, Mark Foskey and Dinesh Manocha

Proc. *ACM Conference on Solid and Physical Modelling*, 2005

Haptic Display of Interaction between Textured Models

Miguel A. Otaduy, Nitin Jain, Avneesh Sud and Ming Lin

Proc. *IEEE Visualization Conference*, 2004

Accelerating Line-of-Sight Computations Using GPUs

Brian Salomon, Naga K. Govindaraju, Avneesh Sud, Russell Gayle, Ming Lin, Dinesh Manocha, Brett

Butler, Maria Bauer, Angel Rodriguez, Latika Eifert, Audrey Rubel, Michael Macedonia

Proceedings of *Army Science Conference*, 2004

Interactive Visibility Culling for Complex Environments using Occlusion-Switches

Naga Govindaraju, Avneesh Sud, Sung-Eui Yoon and Dinesh Manocha

Proc. *ACM SIGGRAPH Symposium on Interactive 3D Graphics*, 2003

Parallel Occlusion Culling for Interactive Walkthroughs using Multiple GPUs

Naga Govindaraju, Avneesh Sud, Sung-Eui Yoon and Dinesh Manocha

IEEE Visualization Workshop on Commodity-Based Visualization Clusters, 2002

GigaWalk: Interactive Walkthrough of Complex Environments

William V Baxter III, Avneesh Sud, Naga K. Govindaraju and Dinesh Manocha

Eurographics Workshop on Rendering, 2002

Refereed Short Papers, Research Sketches, and Video Publications:

Fast Proximity Computation among Deformable Models using Discrete Voronoi Diagrams -- Implementation Issues
Avneesh Sud, Naga Govindaraju, Russell Gayle, Ilknur Kabul and Dinesh Manocha
ACM SIGGRAPH Sketch 2006.

A Fast Fractal Growth Algorithm
Theodore Kim, Jason Sewall, Avneesh Sud and Ming C. Lin
ACM SIGGRAPH Sketch 2005.

Green's Fractal Terrains
Jason Sewall, Theodore Kim, Avneesh Sud and Ming C. Lin
ACM SIGGRAPH Electronic Theatre 2005.

Haptic Display of Interaction between Textured Models
Miguel A. Otaduy, Nitin Jain, Avneesh Sud and Ming Lin
ACM SIGGRAPH Sketch 2004.

Submitted Publications:

Real-time Simulation of Heterogeneous Crowds
Avneesh Sud, Russell Gayle, Stephen Guy, Erik Andersen, Ming Lin and Dinesh Manocha

Reactive Deformation Roadmaps: Motion Planning of Multiple Robots in Dynamic Environments
Russell Gayle, Avneesh Sud, Ming Lin and Dinesh Manocha

Technical Reports:

Fast Monte Carlo Simulation for Discrete Field Value Estimation using Graphics Hardware
Avneesh Sud and Dinesh Manocha
UNC Computer Science Technical Report TR04-003, 2004

Software Systems:

- *HAVOC3D(1999)*: A library for efficient computation of 3D Distance Fields using GPUs. Involved in debugging and maintenance of the library. Co developed by Kenneth Hoff, Andrew Zaferakis, Avneesh Sud, Ming Lin and Dinesh Manocha.

References:

Prof. Dinesh Manocha
Department of Computer Science
University of North Carolina
dm@cs.unc.edu

Prof. Ming Lin
Department of Computer Science
University of North Carolina
lin@cs.unc.edu

Prof. Mark Foskey
Department of Radiation Oncology
University of North Carolina
mark_foskey@unc.edu

Prof. Suresh Krishnan
Department of Mechanical Engineering
University of Wisconsin at Madison
suresh@engr.wisc.edu

Dr. Naga Govindaraju
Microsoft Many Core Research Group
nagag@microsoft.com