

ADARSH KRISHNAMURTHY

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EDUCATION

Ph.D., **University of California, Berkeley**, September 2010

Department of Mechanical Engineering
Major : Manufacturing
Minors : Computer Science, Design
Advisor : Prof. Sara McMains
Thesis : Parallel GPU Algorithms for Interactive CAD

B.Tech. and M.Tech., **Indian Institute of Technology, Madras**, August 2005

Department of Mechanical Engineering
Five Year Dual Degree Program, Ranked **first** in the department
Major : Product Design
Minor : Theoretical Computer Science
Advisor : Prof. Krishnan Balasubramaniam
Thesis : Modeling Ultrasonic Fields in Complex Geometries

CURRENT POSITION

Post-Doctoral Researcher,
Cardiac Mechanics Research Group, Bioengineering, **University of California, San Diego**

AWARDS AND HONORS

- **Spotlight Paper**, “GPU-Accelerated Minimum Distance and Clearance Queries,” June 2011 issue of IEEE Transactions on Visualization and Computer Graphics.
- **Best Paper Award** (second place), ACM Symposium on Solid and Physical Modeling, 2008.
- **Best Poster Award**, ACM Symposium on Solid and Physical Modeling, 2007.
- **Berkeley Outstanding GSI Award**, *Precision Manufacturing (ME220)*, 2008.
- Recipient of the **Berkeley Graduate Fellowship**, 2005-2007 (Full tuition, fees, and research stipend).
- Student Fellow at the **Berkeley Summer Institute for Preparing Future Faculty**, 2009.
- Prof. GVN Rayudu Memorial Prize for the student with the **Best Academic Record** in Mechanical Engineering Dual Degree program, 2000–2005, IIT-Madras, India.
- Recipient of the National Talent Search Examination (NTSE) Scholarship, India, 1998.

RESEARCH INTERESTS

Computer-Aided Manufacturing (CAM)
Biomechanics and Geometry Modeling
Parallel and GPU Computing
Numerical Simulations
Environmentally Conscious Design

Interactive Design Tools (DFX)
Finite Element Analysis
High Performance Computing (HPC)
Computer-Aided Design (CAD)
Non-Destructive Testing and Applications

TEACHING INTERESTS

Precision Manufacturing
Biomechanics
New Product Development

Manufacturing Processes and Systems
Parallel and High Performance Computing
Engineering Graphics

PROFESSIONAL EXPERIENCE

- Intern, SolidWorks Corporation, Concord, MA (June 11 – August 17, 2007; June 5 – August 20, 2008).
- Short Term Scholar, Michigan State University (May 15 – July 15, 2004).
- Intern, GE John F. Welch Technology Center (JFWTC), Bangalore, India (May 15 – July 15, 2003).

TEACHING EXPERIENCE

- Instructor for the NBCR Summer Institute, 2011 and 2012
- Guest lectures in the “Cardiac Mechanics Freshman Seminar,” UC San Diego, Fall 2011 and Fall 2012.
- Graduate Student Instructor for the graduate course “Precision Manufacturing,” UC Berkeley, Fall 2008.
- Assisted in the development of assignments and tutorials for the graduate course “Topics in Manufacturing: General Purpose Computations on the GPU,” UC Berkeley, Spring 2009.

PUBLICATIONS

JOURNAL PUBLICATIONS

1. Adarsh Krishnamurthy, Christopher Villongco, Joyce Chuang, Lawrence Frank, Vishal Nigam, Ernest Belezzuoli, Paul Stark, David Krummen, Sanjiv Narayan, Jeffrey Omens, Andrew McCulloch, Roy Kerckhoffs, “*Patient-Specific Models of Cardiac Biomechanics*,” Journal of Computational Physics, In Press, 2012.
2. Matthew Gonzales, Gregory Sturgeon, Adarsh Krishnamurthy, Johan Hake, René Jonas, Paul Stark, Wouter-Jan Rappel, Sanjiv Narayan, Yongjie Zhang, W. Paul Segars, Andrew McCulloch, “A three-dimensional finite element model of human atrial anatomy: New methods for cubic Hermite meshes with extraordinary vertices,” Medical Image Analysis, submitted 2012.
3. Iddo Hanniel, Adarsh Krishnamurthy, Sara McMains, “*Computing the Hausdorff Distance Between NURBS Surfaces Using Numerical Iteration on the GPU*,” Graphical Models, 2012.
4. Yongjie Zhang, Xinghua Liang, Jun Ma, Yiming Jing, Matthew Gonzales, Christopher Villongco, Adarsh Krishnamurthy, Lawrence Frank, Vishal Nigam, Paul Stark, Sanjiv Narayan, Andrew McCulloch, “*An Atlas-Based Geometry Pipeline for Cardiac Hermite Model Construction and Diffusion Tensor Reorientation*,” Medical Image Analysis, 2012.
5. Jazmin Aguado-Sierra, Adarsh Krishnamurthy, Christopher Villongco, Joyce Chuang, Elliot Howard, Matthew Gonzales, Jeff Omens, David Krummen, Sanjiv Narayan, Roy Kerckhoffs, Andrew McCulloch, “*Patient-Specific Modeling of Dyssynchronous Heart Failure: A Case Study*,” Progress in Biophysics and Molecular Biology, Vol. 107, No. 1, pp. 147-155, 2011.
6. Adarsh Krishnamurthy, Sara McMains, Iddo Hanniel, “*GPU-Accelerated Hausdorff Distance Computation between Dynamic Deformable NURBS Surfaces*,” Computer-Aided Design, 2011.
7. Adarsh Krishnamurthy, Sara McMains, “*Accurate GPU-Accelerated Surface Integrals for Moment Computation*,” Computer-Aided Design, 2011. (**Invited Paper**)
8. Adarsh Krishnamurthy, Sara McMains, Kirk Haller, “*GPU-Accelerated Minimum Distance and Clearance Queries*,” IEEE Transactions on Visualization and Computer Graphics, Vol. 17, No. 6, pp. 729-742, 2011. (**Spotlight Paper**)
9. Adarsh Krishnamurthy, Rahul Khardekar, Sara McMains, “*Optimized GPU Evaluation of Arbitrary Degree NURBS Curves and Surfaces*,” Computer-Aided Design, Vol. 41, pp. 971-980, 2009.
10. Adarsh Krishnamurthy, Rahul Khardekar, Sara McMains, Kirk Haller, Gershon Elber, “*Performing Efficient NURBS Modeling Operations on the GPU*,” IEEE Transactions on Visualization and Computer Graphics, Vol. 15, No. 4, pp. 530-543, 2009 (**Invited Paper**).

11. Adarsh Krishnamurthy, Mohan Varadarajan, Soumya K., Krishnamurthy Chitti Venkata, Krishnan Balasubramaniam, "A Simulation Tool For Ultrasonic Inspection," Journal of the Korean Society for Non Destructive Testing, Vol. 26, No. 3, pp. 153-161, 2006.

REFEREED BOOK CHAPTER

12. Adarsh Krishnamurthy, Benjamin Coppola, Jared Tangney, Roy Kerckhoffs, Jeffrey Omens, Andrew McCulloch, "A Microstructurally-Based Multi-Scale Constitutive Model of Active Myocardial Mechanics," Structure-Based Mechanics of Tissues and Organs: A Tribute to Yoram Lanir, In press, 2012.

REFEREED PUBLICATIONS

13. Adarsh Krishnamurthy, Christopher Villongco, Jeffrey Omens, Roy Kerckhoffs, Andrew McCulloch, "Patient-Specific Biomechanics Models of the Heart," Proceedings of the IEEE Engineering Medicine and Biology Conference (EMBC), 2012.
14. Yongjie Zhang, Xinghua Liang, Jun Ma, Yiming Jing, Matthew Gonzales, Adarsh Krishnamurthy, Paul Stark, Sanjiv Narayan, Andrew McCulloch, "An Atlas-Based Geometry Pipeline for Cardiac Hermite Model Construction," Workshop on Mesh Processing in Medical Image Analysis (MeshMed), 2011.
15. Adarsh Krishnamurthy, Sara McMains, "Accurate Moment Computation using the GPU," Proceedings of the ACM Symposium of Solid and Physical Modeling, 2010.
16. Adarsh Krishnamurthy, Sara McMains, Kirk Haller, "Accelerating Geometric Queries using the GPU," Proceedings of the SIAM/ACM Joint Conference on Geometric and Physical Modeling, 2009 (**Award Paper Finalist**).
17. Adarsh Krishnamurthy, Wei Li, Sara McMains, "Simulation and Optimization of the Water-Jet Cleaning Process," Proceedings of the ASME Design Engineering Technical Conferences, Design Automation Conference, 2009.
18. Adarsh Krishnamurthy, Rahul Khardekar, Sara McMains, Kirk Haller, Gershon Elber, "Performing Efficient NURBS Modeling Operations on the GPU," Proceedings of the ACM Symposium on Solid and Physical Modeling, 2008 (**Award Paper**).
19. Adarsh Krishnamurthy, Rahul Khardekar, Sara McMains, "Direct Evaluation of NURBS Curves and Surfaces on the GPU," Proceedings of the ACM Symposium on Solid and Physical Modeling, 2007 (**Award Paper**).
20. Adarsh Krishnamurthy, Soumya K., Krishnamurthy Chitti Venkata, Krishnan Balasubramaniam, "Simultonic: A Simulation Tool for Ultrasonic Inspection," Review of Progress in Quantitative Nondestructive Evaluation, Vol. 25B, pp. 1894-1901, 2006.
21. Bharat Rangan, Adarsh Krishnamurthy, Vijay Raghavan, "Analysis of Flow and Heat Transfer at a Finned Tube in Crossflow," Proceedings of ASME Summer Heat Transfer Conference, 2003.

OTHER PUBLICATIONS

22. Adarsh Krishnamurthy, Jared Tangney, Benjamin Coppola, Roy Kerckhoffs, Jeffrey Omens, Andrew McCulloch, "Multi-scale Constitutive Model of Active Myocardial Mechanics," Cardiac Physiome Workshop, Poster Presentation, 2012
23. Adarsh Krishnamurthy, Christopher Villongco, Jeffrey Omens, Roy Kerckhoffs, Andrew McCulloch, "Acute CRT Response Correlates with Regional Variation in Work Density from Patient-Specific Ventricular Models," Cardiac Physiome Workshop, Poster Presentation, 2012.
24. Adarsh Krishnamurthy, Christopher Villongco, Jeffrey Omens, Roy Kerckhoffs, Andrew McCulloch, "Multi-Scale Modeling of Patient-Specific Ventricular Geometry, Fiber Structure, and Biomechanics," Biophysical Society Annual Meeting, Poster Presentation, 2012.

25. Adarsh Krishnamurthy, Iddo Hanniel, Sara McMains, “*Computing Hausdorff Distances between Freeforms on the GPU*,” NVIDIA GPU Technology Conference, Session ID 0410, 2012.
26. Adarsh Krishnamurthy, Sara McMains, “*Parallel Algorithms for Interactive Mechanical CAD*,” NVIDIA GPU Technology Conference, Session ID 2171, 2010.
27. Adarsh Krishnamurthy, Sara McMains, “*GPU Algorithms for NURBS Minimum Distance and Clearance Computations*,” NVIDIA GPU Technology Conference, Poster Presentation, 2010.
28. Sara McMains, Adarsh Krishnamurthy, “*Parallel GPU Algorithms for Interactive CAD/CAM Operations*,” Proceedings of the NSF Engineering Research and Innovation Conference, Honolulu, Hawaii, 2009.
29. Adarsh Krishnamurthy, Rahul Khardekar, Sara McMains, Kirk Haller, Xiaobin Wu, “*NURBS Modeling Operations on GPUs*,” Tenth SIAM Geometric Design and Computing Conference, San Antonio, TX, 2008.
30. Sara McMains, Adarsh Krishnamurthy, Rahul Khardekar, Wei Li, “*Design and Manufacturing using GPUs*,” Proceedings of the NSF Engineering Research and Innovation Conference, Knoxville, Tennessee, 2008.
31. David Dornfeld, Sara McMains, Diego Arbelaez, Miguel Avila, Adarsh Krishnamurthy, Wei Li, Yusuke Yasui, “*Cleanability of Mechanical Components*,” Proceedings of the NSF Engineering Research and Innovation Conference, Knoxville, Tennessee, 2008.
32. Sandeep Dewangan, Bharat Rangan, Adarsh Krishnamurthy, Gopichand Katragadda, “*Generic Ultrasonic 3D Ray Tracing Incorporating Beam Energy Models*,” Review of Progress in Quantitative Non Destructive Evaluation, 2003.

PATENTS

- Olivier Zegdoun, Bruce W. Holway, Amit Mandloi, Adarsh Krishnamurthy, “Reducing the size of a model using visibility factors,” *Dassault Systemes SolidWorks Corporation*, US Patent application number 12/354290.

INVITED TALKS

- Patient-Specific Biomechanics Models of the Heart, IEEE EMBC Conference, September 31, 2012.
- Parallel GPU Algorithms for Interactive CAD, IIT Madras, July 8, 2010.
- Interactive Distance Queries Using the GPU, Mori Seiki DTL Corporation, Davis, April 30, 2010.
- Teraflop Parallel Computing on a Budget: Applications of GPU Computing in Mechanical Engineering, ASME Design Engineering and Technical Conferences Workshop, August 30, 2009.
- Primitives for GPU-Accelerated Mechanical CAD, ParLAB, UC Berkeley, July 13, 2009.
- Using GPUs for Design and Manufacturing, SolidWorks Corporation, March 6, 2007.
- Modeling Ultrasonic Fields in Complex Geometries, Center for Non-Destructive Evaluation, IIT Madras, May 20, 2005.

PROFESSIONAL AFFILIATIONS

- Reviewer, PLoS Computational Biology, Journal of Computer Aided Design, IEEE Transactions on Biomedical Engineering, ASME Journal of Computing and Information Science in Engineering.
- Reviewer, Eurographics, 2013.
- Reviewer, SIAM/ACM Joint Conference on Geometric and Physical Modeling, 2009.
- Reviewer, ASME International Design Engineering Technical Conferences (2006 – 2008).

RESEARCH EXPERIENCE

- **Patient Specific Heart Geometry Modeling and Biomechanics Simulations:** Currently working on developing a framework for patient-specific heart modeling and simulations. The framework includes methods to construct ventricular geometry from MR Images and perform biomechanics simulations.
- **Isogeometric Analysis:** Developed methods to perform mechanics finite element simulations on unstructured cubic Hermite meshes with extraordinary nodes. These methods allow construction of anatomically correct ventricular models with valve openings.
- **GPU Accelerated CAD Modeling:** Developed a hybrid framework for using Graphics Processing Units (GPUs) to accelerate CAD modeling operations for my doctoral research. The performance improvements attained by using the GPUs facilitate interactive feedback and real-time interaction with the design.
- **NURBS Modeling:** Developed fast algorithms that utilize the GPU to accelerate NURBS (Non-Uniform Rational B-Spline) modeling operations. The algorithms enable direct sketching, interactive trimming, and accelerated surface-surface intersections of NURBS surfaces.
- **Water-jet Modeling:** Developed a model to simulate water-jet cleaning process and optimized the process parameters such as standoff distance and nozzle radius for different geometries.
- **NURBS Evaluation:** Developed a method for fast evaluation and display of trimmed NURBS surfaces using GPU. The method reduced the computation time by at least 50 times over conventional CPU-based methods.
- **Ultrasonic Simulations:** Developed a model to simulate ultrasonic wave propagation in any material at GE Global Research Center, Bangalore. The model uses ray tracing to calculate the ultrasonic field intensity. The model is applicable to any complex geometry and runs as a plug-in inside UGS NX 3D modeling software.
- **Finite Element Spectral Analysis:** Used finite element spectral analysis to determine the dynamic characteristics of an artificial heart valve at Michigan State University. The results agreed closely with experimental observations.
- **Post-processing Software:** Developed post-processing software for Hindustan Aeronautics Limited for processing ultrasonic data. The software has advanced image-processing capabilities and automated the process of defect classification and sizing.