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Research Interests

Scientific Visualization, Data Provenance, Visualization Systems, Large-Scale and Out-of-Core Rendering Techniques, GPU Algorithms, Parallel Rendering, Computer Graphics, and Computer Games

Education

- Ph.D., Computing (August 2005–August 2008), GPA: 4.0
  Dissertation Title: "Adaptive Volume Rendering of Dynamic Unstructured Meshes"
  Advisor: Dr. Cláudio T. Silva
  University of Utah, Salt Lake City, UT
- M.S., Computational Engineering and Science (January 2004–August 2005), GPA: 3.892
  Thesis Title: "The K-Buffer and Its Applications to Volume Rendering"
  Advisor: Dr. Cláudio T. Silva
  University of Utah, Salt Lake City, UT
- B.S., Computer Science (August 2001–May 2002) GPA: 3.700
  Utah State University, Logan, UT

Honors and Awards

- Utah Innovation Award Finalist, Vutara SR-200 Microscope, 2011
- Utah Innovation Award, VisTrails Provenance Explorer for Maya, 2009
- PI on NSF and DOE awards, 2007-2009
- Graduate Research Fellowship, University of Utah, 2007-2008
- Paper selected for Parallel Computing special issue, best papers from EGPGV, 2006
- Invited paper, International Provenance and Annotation Workshop, 2006
- Graduated Cum Laude, Utah State University, 2002

Professional Experience

- Project Lead (August 2009–present), Software Development Center, University of Utah
- Director of Software Engineering (August 2007–November 2009), VisTrails, Inc.
- Post-Doctoral Research Fellow, (May 2008–December 2008), Visualization and Geometric Computing Laboratory (Dr. Cláudio T. Silva, Director), Scientific Computing and Imaging Institute, University of Utah

- Research Assistant, (January 2004–April 2008), Visualization and Geometric Computing Laboratory (Dr. Cláudio T. Silva, Director), Scientific Computing and Imaging Institute, University of Utah
- Co-Lecturer—CS5630/6630 Scientific Visualization (August 2007–December 2007), School of Computing, University of Utah
- Teaching Assistant—CS6292 Advanced Algorithms (August 2005–December 2005), School of Computing, University of Utah
- Technical Scholar (June 2004–July 2004, June 2005–August 2005), Institute for Scientific Computing Research (Dr. Valerio Pascucci, Advisor), Lawrence Livermore National Laboratory
- Software Engineer—3DPaint and Pro/Concept Groups (April 1998–December 2003), Parametric Technology Corporation

Funded Proposals

[1] *National Science Foundation*, SBIR Phase I and IB: A Collaborative Architecture to Support Large-Scale Exploratory Workflows, IIP-0712592, S. Callahan(PI). $150,000 (2007).

[2] *Department of Energy*, SBIR Phase I and II: Provenance-Enabling DoE Visualization Applications, DE-FG02-08ER85157, S. Callahan(PI). $850,000 (2008-2009).

Patents

[1] US patent application no. 13/610,877, *Facial Recognition Lost Pet Identifying System*, filed by Finding Rover, Inc. 06/06/13.

[2] US provisional patent no. 61/418,844, *Faint and Fall Assessment*, filed by the University of Utah on 12/01/11.

[3] International application no. PCT/US2009/060342, *Automated Development of Data Processing Results*, filed by the University of Utah on 10/12/09.

[4] US patent no. 8,190,633; *Enabling Provenance Management for Pre-existing Applications*, filed by the University of Utah on 06/16/08, awarded 05/29/12.

[5] US utility patent application no. 11/697,922, *Managing Provenance of the Evolutionary Development of Workflows*, filed by the University of Utah on 04/09/07.

[6] US utility patent application no. 11/697,926, *Managing Provenance for an Evolutionary Workflow Process in a Collaborative Environment*, filed by the University of Utah on 04/09/07.

Journal Publications

[1] *A Mill Based Instrument and Software System for Dissecting Slide-Mounted Tissue that Provides Digital Guidance and Documentation*, N. Adey, D. Emery, D. Bosh, S. Callahan, J Schreiner, Y. Chen, A. Greig, K. Geiersbach, R. Parry. BMC Clinical Pathology 13(1):29, 2013.

[2] *Sample Drift Correction in 3D Fluoresence Photoactivation Localization Microscopy*, M. J. Mlodzianoski, J. M. Schreiner, S. P. Callahan, K. Smolková, A. Dlasková, J. Šantorová, P. Ježek, J. Bewersdorf. Optics Express 19(16):15009–15019, 2011.

[3] *Accelerating Unstructured Volume Rendering with Joint Bilateral Upsampling*, S. P. Callahan and C. T. Silva. Journal of Graphics, GPU, & Game Tools, 14(1):1–15, 2009.

[4] *Transfer Function Specification for Rendering Disparate Volumes*, F. F. Bernardon, L. K. Ha, S. P. Callahan, J. L. D. Comba, and C. T. Silva. Computing in Science & Engineering, 10(6):82–89, 2008.

[5] *VisComplete: Automating Suggestions for Visualization Pipelines*, D. Koop, C. E. Scheidegger, S. P. Callahan, J. Freire, and C. T. Silva. IEEE Transactions on Visualization and Computer Graphics (Proceedings of Visualization 2008), 14(6):1691–1698, 2008.

[6] *Robust Soft Shadow Mapping with Backprojection and Depth Peeling*, L. Bavoil, S. P. Callahan, and C. T. Silva. Journal of Graphics Tools, 13(1):19–30, 2008.

[7] *Direct Volume Rendering: A 3D Plotting Technique for Scientific Data*, S. P. Callahan, J. H. Callahan, C. E. Scheidegger, and C. T. Silva. Computing in Science & Engineering, 10(1):88–92, 2008.

[8] *Tackling the Provenance Challenge One Layer at a Time*, C. Scheidegger, D. Koop, E. Santos, H. Vo, S. Callahan, J. Freire, C. Silva, Concurrency and Computation: Practice and Experience, 20(5):473–483, 2008.

[9] *Provenance for Visualizations: Reproducibility and Beyond*, C. T. Silva, J. Freire, S. P. Callahan, Computing in Science & Engineering, 9(5):82–89, 2007.

[10] *An Adaptive Framework for Visualizing Unstructured Grids with Time-Varying Scalar Fields*, F. F. Bernardon, S. P. Callahan, J. L. D. Comba, and C. T. Silva, Parallel Computing, 33(6):391–405, 2007.

[11] *Streaming Simplification of Tetrahedral Meshes*, H. T. Vo, S. P. Callahan, P. Lindstrom, V. Pascucci, and C. T. Silva, IEEE Transactions on Visualization and Computer Graphics, 13(1):145–155, 2007.

[12] *Progressive Volume Rendering of Large Unstructured Grids*, S. P. Callahan, L. Bavoil, V. Pascucci, and C. T. Silva, IEEE Transactions on Visualization and Computer Graphics (Proceedings Visualization / Information Visualization 2006), 12(5):1307–1314, 2006.

[13] *A Survey of GPU-Based Volume Rendering of Unstructured Grids*, C. T. Silva, J. L. D. Comba, S. P. Callahan, and F. F. Bernardon, Brazilian Journal of Theoretic and Applied Computing (RITA), 12(2):9–29, 2005.

[14] *Hardware-Assisted Visibility Sorting for Unstructured Volume Rendering*, S. P. Callahan, M. Ikits, J. L. D. Comba, and C. T. Silva, IEEE Transactions on Visualization and Computer Graphics, 11(3):285–295, 2005.

Refereed Conference Publications

[15] *DEM Simulation of Mill Charge in 3D via GPU Computing*, R. K. Rajamani, S. Callahan, J. Schreiner. Proceedings of the Fifth International Conference on Autogenous and Semiautogenous Grinding Technology, 2011.

[16] *Towards Provenance-Enabling ParaView*, S. P. Callahan, J. Freire, C. E. Scheidegger, C. T. Silva, and H. T. Vo. Second International Provenance and Annotation Workshop (IPAW), Lecture Notes in Computer Science (LNCS) Vol. 5272, pp. 120–127, 2008.

[17] *Examining Statistics of Workflow Evolution Provenance: A First Study*, L. Lins, D. Koop, E. W. Anderson, S. P. Callahan, E. Santos, C. E. Scheidegger, J. Freire, and C. T. Silva. 20th International Conference on Scientific and Statistical Database Management (SSDBM), Lecture Notes in Computer Science (LNCS) Vol. 5069, pp. 573–579, 2008.

[18] *Hardware-Assisted Point-Based Volume Rendering of Tetrahedral Meshes*, E. W. Anderson, S. P. Callahan, C. E. Scheidegger, J. M. Schreiner, C. T. Silva, Brazilian Symposium on Computer Graphics and Image Processing (SIBGRAPI), pp. 163–170, 2007.

[19] *iRun: Interactive Rendering of Large Unstructured Grids*, H. T. Vo, S. P. Callahan, N. Smith, C. T. Silva, W. Martin, D. Owen, and D. Weinstein. Eurographics Symposium on Parallel Graphics and Visualization (EGPGV), pp. 93–100, 2007.

[20] *Multi-Fragment Effects on the GPU using the k-Buffer*, L. Bavoil, S. P. Callahan, A. Lefohn, J. L. D. Comba, and C. T. Silva. ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (i3D), pp. 97–104, 2007.

[21] *Managing Rapidly-Evolving Scientific Workflows*, J. Freire, C. T. Silva, S. P. Callahan, E. Santos, C. T. Scheidegger, and H. T. Vo. Proceedings of the International Provenance and Annotation Workshop (IPAW), Lecture Notes in Computer Science (LNCS) Vol. 4145, pp. 10–18, 2006.

[22] *Interactive Volume Rendering of Unstructured Grids with Time-Varying Scalar Fields*, F. F. Bernardon, S. P. Callahan, J. L. D. Comba, and C. T. Silva. Eurographics Symposium on Parallel Graphics and Visualization, pp. 51–58, 2006.

[23] *VisTrails: Visualization meets Data Management*, S. P. Callahan, J. Freire, E. Santos, C. E. Scheidegger, C. T. Silva, and H. T. Vo. Proceedings of ACM SIGMOD, pp. 745–747, 2006.

[24] *Managing the Evolution of Dataflows with VisTrails*, S. P. Callahan, J. Freire, E. Santos, C. E. Scheidegger, C. T. Silva, and H. T. Vo. IEEE Workshop on Workflow and Data Flow for Scientific Applications (SciFlow), 2006.

[25] *VisTrails: Enabling Interactive Multiple-View Visualizations*, L. Bavoil, S. P. Callahan, P. Crossno, J. Freire, C. E. Scheidegger, C. T. Silva, and H. T. Vo. IEEE Visualization, pp. 135–142, 2005.

[26] *Interactive Rendering of Large Unstructured Grids Using Dynamic Level-Of-Detail*, S. P. Callahan, J. L. D. Comba, P. Shirley, and C. T. Silva. IEEE Visualization, pp. 199–206, 2005.

[27] *Hardware Accelerated Simulated Radiography*, D. Laney, S. P. Callahan, N. Max, C. T. Silva, S. Langer, and R. Frank. IEEE Visualization, pp. 343–350, 2005.

Posters and Abstracts

[28] *VisTrails: Using Provenance to Streamline Data Exploration*, E. Anderson, S. P. Callahan, D. A. Koop, E. Santos, C. E. Scheidegger, H. T. Vo, J. Freire, and C. T. Silva. In Poster Proceedings of the International Workshop on Data Integration in the Life Sciences (DILS), pp. 8, 2007. *Invited for oral presentation.*

[29] *Adaptive Volume Rendering of Dynamic Unstructured Meshes*, S. P. Callahan, Proceedings of IEEE Vis/InfoVis/VAST 2006 Conference Compendium, 2006.

[30] *Progressive Volume Rendering of Unstructured Grids on Modern GPUs*, S. P. Callahan, L. Bavoil, V. Pascucci, and C. T. Silva, ACM SIGGRAPH 2006 Sketches, 2006.

Unpublished Manuscripts

[31] *Adaptive Visualization of Dynamic Unstructured Meshes*, S. P. Callahan, Ph.D. Dissertation in Computing, University of Utah, 2008.

[32] *VisTrails: User's Guide, Version 1.0*, E. Anderson, J. H. Callahan, S. P. Callahan, J. Freire, D. Koop, E. Santos, C. E. Scheidegger, C. T. Silva, and H. Vo. Available at http://www.vistrails.org.

[33] *Visualization in Radiation Oncology: Towards Replacing the Laboratory Notebook*, E. W. Anderson, S. P. Callahan, G. C. Y. Chen, J. Freire, E. Santos, C. E. Scheidegger, C. T. Silva, and H. T. Vo. SCI Institute Technical Report, No. UUSCI-2006-017, University of Utah, 2006.

[34] *Using Provenance to Streamline Data Exploration through Visualization*, S. P. Callahan, J. Freire, E. Santos, C. E. Scheidegger, C. T. Silva, and H. T. Vo. SCI Institute Technical Report, No. UUSCI-2006-016, University of Utah, 2006.

[35] *The K-Buffer and Its Applications to Volume Rendering*, S. P. Callahan. M.S. Thesis in Computational Engineering and Science, University of Utah, 2005.

Presentations

- *Towards Provenance-Enabling ParaView*, International Provenanance and Annotation Workshop 2008; Salt Lake City, UT; June 17, 2008.
- *Adaptive Visualization of Dynamic Unstructured Meshes*, Dissertation Defense; Salt Lake City, UT; April 28, 2008.
- *iRun: Interactive Rendering of Large Unstructured Grids*, Eurographics Symposium on Parallel Graphics and Visualization 2007; Lugano, Switzerland; May 21, 2007.
- *Progressive Volume Rendering of Large Unstructured Grids*, IEEE Visualization 2006; Baltimore, MD; Nov. 3, 2006.
- *Adaptive Visualization of Dynamic Unstructured Meshes*, IEEE Vis/InfoVis/VAST 2006 Doctoral Colloquium; Baltimore, MD; Nov. 2, 2006.
- *Progressive Volume Rendering of Unstructured Grids with Modern GPUs*, ACM SIGGRAPH 2006 Sketch; Boston, MA; Aug. 2, 2006.
- *VisTrails: Visualization meets Data Management*, ACM SIGMOD 2006 Demonstration; Chicago, IL; Jun. 27–28, 2006.
- *Interactive Rendering Of Large Unstructured Grids Using Dynamic Level-of-Detail*, IEEE Visualization 2005; Minneapolis, MN; Oct. 26, 2005.
- *GPU-based Volume Rendering of Unstructured Grids*, SIBGRAPI, *tutorial*; Natal, Brazil; October 9, 2005.
- *The K-Buffer and Its Applications to Volume Rendering*, Thesis Defense; Salt Lake City, UT; May 2, 2005.
- *Hardware-Assisted Volume Rendering*, Lawrence Livermore National Laboratory, *invited talk*, July 30, 2004.
- *Hardware-Assisted Volume Rendering*, DOE VIEWS Alliance Forum; Salt Lake City, UT; July 19, 2004.

Source Code

- *Volumetric Tractography*, Slicer3D extension,
  https://gforge.sci.utah.edu/gf/project/slicer3d
- *Hardware-Assisted Visibility Sorting*, Sourceforge project,
  http://havs.sourceforge.net
- *Hardware-Assisted Visibility Sorting*, VTK contribution,
  http://public.kitware.com/VTK
- *VisTrails*, Contributor,
  http://www.vistrails.org

Special Skills

- Programming: C++, Python, Perl, Java, Lisp, OpenGL, QT, GPU programming
- Systems: Windows, Unix, Linux, Mac OS
- Applications: Visual Studio, Unix compilers and debuggers, and graphic design software
- Languages: Fluent in English (native) and Brazilian Portuguese
- Strong writing, grammar, and linguistic skills
- Strong graphic-design skills useful in presentations, publications, and proposals

Professional Activities

- Program Committee: International Symposium on Visual Computing (2008-2010)
- Session Chair: Eurographics Symposium on Parallel Graphics and Visualization (2007)
- Reviewer: Brazilian Symposium on Computer Graphics and Image Processing (2005-2006), Computer Graphics Forum (2007,2008), Computer Graphics International (2006), Computing in Science & Engineering (2008), Eurographics (2006-2008), EuroVis (2006,2008,2009), International Provanance and Annotation Workshop (2008), International Symposium on 3D Data Processing, Visualization, and Transmission (2006), International Symposium on Visual Computing (2006,2008), Pacific Graphics (2005, 2007), Point Based Graphics (2005), Shape Modeling International (2007), Siggraph (2008,2009), Solid and Physical Modeling (2006), Transactions on Visualization and Computer Graphics (2008), Visualization (2005-2009), Volume Graphics (2006-2008), and VolVis (2004)
- Student Volunteer: IEEE Visualization (2006,2007)