

Craig Schroeder

Department of Computer Science & Engineering
University of California, Riverside
Riverside, CA 92521
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Curriculum Vitae

<http://www.cs.ucr.edu/~craigs/index.html>

RESEARCH INTERESTS

My research interests include computational fluid dynamics, solid mechanics, fluid-structure interaction, physically-based simulation for computer graphics, mathematical modelling, and scientific computing.

EDUCATION

- ◆ **Stanford University, Stanford, CA** *June 2011*
 - ◇ Ph.D. in Computer Science *Advisor: Ronald Fedkiw*
 - ◇ *Ph.D. Thesis: "Coupled Simulation of Deformable Solids, Rigid Bodies, and Fluids with Surface Tension"*
- ◆ **Drexel University, Philadelphia, PA** *June 2006*
 - ◇ M.S. in Computer Science *Advisor: Ali Shokoufandeh*
 - ◇ B.S. in Computer Science
 - ◇ B.S. in Mathematics
 - ◇ Summa Cum Laude; Cumulative G.P.A. 3.97
 - ◇ *Masters Thesis: "Metric Tree Weight Adjustment and Infinite Complete Binary Trees As Groups"*

RESEARCH EXPERIENCE

- ◆ **Assistant Professor** *July 2016 to Present*
University of California Riverside, Department of Computer Science & Engineering
- ◆ **Postdoctoral Scholar** *Advisor: Joseph Teran* *July 2011 to June 2016*
University of California Los Angeles, Department of Mathematics
- ◆ **Graduate Research Assistant** *Advisor: Ronald Fedkiw* *October 2006 to June 2011*
Stanford University, Department of Computer Science
- ◆ **Research Intern** *Advisor: John Anderson* *June 2007 to June 2011*
Pixar Animation Studios
- ◆ **Guest Researcher** *June 2006 to September 2006*
Center for Computing Sciences, Bowie, MD
- ◆ **Guest Researcher** *Advisor: Ana Ivelisse Aviles* *June 2005 to September 2005*
National Institute of Standards and Technology, Gaithersburg, MD

- ◆ **Undergraduate Research Assistant** *Advisor: William Regli* June 2002 to June 2005
Drexel University, Department of Computer Science

PUBLICATIONS

- [1] Bai, S. and **Schroeder, C.**, “Stability analysis of explicit MPM,” ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), (In press).
- [2] **Schroeder, C.**, Chowdhury, R. R., Shinar, T. “Local divergence-free polynomial interpolation on MAC grids,” *Journal of Computational Physics*, (In press).
- [3] Muzaffer, A., **Schroeder, C.**, Shinar, T. “Boundary pressure projection for partitioned solution of fluid-structure interaction with incompressible Dirichlet fluid domains,” *Journal of Computational Physics*, 425, (2021).
- [4] Sun, Y., Shinar, T., **Schroeder, C.**, “Effective time step restrictions for explicit MPM simulation,” ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), (2020).
- [5] Ding, O., **Schroeder, C.** “Cached Gaussian elimination for simulating Stokes flow on domains with repetitive geometry,” *Journal of Computational Physics*, 423, (2020).
- [6] Ding, O., Shinar, T., **Schroeder, C.** “Affine particle in cell method for MAC grids and fluid simulation,” *Journal of Computational Physics*, 408, (2020).
- [7] Ding, O., **Schroeder, C.**, “Penalty Force for Coupling Materials with Coulomb Friction,” *IEEE Transactions on Visualization and Computer Graphics*, 26 (7), 2443-2455 (2020).
- [8] Jiang, C., **Schroeder, C.**, Teran, J. “An angular momentum conserving affine-particle-in-cell method,” *Journal of Computational Physics*, 338, 137-164 (2017).
- [9] Klár, G., Gast, T., Pradhana, A., Fu, C., **Schroeder, C.**, Jiang, C., Teran, J. “Drucker-Prager Elastoplasticity for Sand Animation,” *SIGGRAPH 2016*, ACM Transactions on Graphics (SIGGRAPH 2016).
- [10] Jiang, C., **Schroeder, C.**, Selle, A., Teran, J., Stomakhin, A. “The Affine Particle-In-Cell Method,” *SIGGRAPH 2015*, ACM Transactions on Graphics (SIGGRAPH 2015), 34(4), pp. 51:1–51:10, (2015).
- [11] Ram, D., Gast, T., Jiang, C., **Schroeder, C.**, Stomakhin, A., Teran, J., Kavehpour, P. “A Material Point Method for Viscoelastic Fluids, Foams and Sponges,” *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 157–163, (2015).
- [12] Gast, T., **Schroeder, C.**, Stomakhin, A., Jiang, C., Teran, J. “Optimization Integrator for Large Time Steps,” *IEEE Transactions on Visualization and Computer Graphics*, 21(10), 1103-1115 (2015).

- [13] Stomakhin, A., **Schroeder, C.**, Jiang, C., Chai, L., Teran, J., Selle, A. "Augmented MPM for phase-change and varied materials," *SIGGRAPH 2014*, ACM Transactions on Graphics (SIGGRAPH 2014), 33(4), pp. 138:1-138:11, (2014).
- [14] Gast, T., **Schroeder, C.** "Optimization Integrator for Large Time Steps," *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 31-40, (2014). Awarded best paper honorable mention.
- [15] Wang, Y., Jiang, C., **Schroeder, C.**, Teran, J. "An Adaptive Virtual Node Algorithm with Robust Mesh Cutting," *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 77-85, (2014).
- [16] **Schroeder, C.**, Stomakhin, A., Howes, R., Teran, J. "A Second Order Virtual Node Algorithm for Navier Stokes Flow Problems with Interfacial Forces and Discontinuous Material Properties." *Journal of Computational Physics*, 265, 221-245 (2014).
- [17] Hegemann, J., Jiang, C., **Schroeder, C.**, Teran, J. "A Level Set Method for Ductile Fracture." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 193-201, (2013). Awarded best paper.
- [18] Stomakhin, A., **Schroeder, C.**, Chai, L., Teran, J., Selle, A. "A material point method for snow simulation." *SIGGRAPH 2013*, ACM Transactions on Graphics (SIGGRAPH 2013), 32(4), pp. 102:1-102:10, (2013).
- [19] Howes, R., **Schroeder, C.**, Teran, J. "A Virtual Node Algorithm for Hodge Decomposition Problems with Irregular Domains." *Methods and Applications of Analysis*, 200(4), 439-455 (2013).
- [20] Stomakhin, A., Howes, R., **Schroeder, C.**, Teran, J. "Energetically Consistent Invertible Elasticity." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 25-32, (2012).
- [21] **Schroeder, C.**, Zheng, W., Fedkiw, R. "Implicit Surface Tension Formulation with a Lagrangian Surface mesh on an Eulerian Simulation Grid." *Journal of Computational Physics*, 231, 2092-2115 (2012).
- [22] **Schroeder, C.**, Kwatra, N., Zheng, W. and Fedkiw, R. "Asynchronous Evolution for Fully-Implicit and Semi-Implicit Time Integration." *Pacific Graphics 2011*, 30, 1983-1992 (2011).
- [23] Robinson-Mosher, A., **Schroeder, C.**, Fedkiw, R. "A symmetric positive definite formulation for monolithic fluid structure interaction." *Journal of Computational Physics*, 230, 1547-1566 (2011).
- [24] Lentine, M., Grfarsson, J., **Schroeder, C.**, Robinson-Mosher, A., Fedkiw, R. "Creature Control in a Fluid Environment." *IEEE Transactions on Visualization and Computer Graphics*, 17, 682-693 (2011).

- [25] Su, J., **Schroeder, C.**, Fedkiw, R. "Energy Stability and Fracture for Frame Rate Rigid Body Simulations." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, edited by Eitan Grinspun and Jessica Hodgins, pp. 155-164 (2009).
- [26] Shinar, T., **Schroeder, C.**, Fedkiw, R. "Two-way Coupling of Rigid and Deformable Bodies." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, edited by Doug James and Markus Gross, pp. 95-103 (2008).
- [27] Irving, G., **Schroeder, C.**, Fedkiw, R. "Volume Conserving Finite Element Simulations of Deformable Models." *SIGGRAPH 2007*, ACM Transactions on Graphics (SIGGRAPH 2013), 26(3), pp. 13.1-13.6, (2007)
- [28] **Schroeder, C.**, Breen, D., Cera, C., Regli, W.. "Stochastic Microgeometry for Displacement Mapping." *Shape Modeling International 2005*, MIT, Cambridge, 15-17 July 2005.
- [29] **Schroeder, C.**, Regli, W., Shokoufandeh, A., Sun, W. "Computer-Aided Design of Porous Artifacts." *Journal of Computer-Aided Design*, Sept 2004, Vol. 36.
- [30] **Schroeder, C.**, Regli, W., Shokoufandeh, A., Sun, W.. "Representation of Porous Artifacts for Bio-Medical Applications." *8th ACM Symposium on Solid Modeling and Applications*, 2002, Seattle, Washington, 16 Jun 2003.

COURSES

- [1] SIGGRAPH 2022: "Practical course on computing derivatives in code"
- [2] SIGGRAPH 2019: "Practical course on computing derivatives in code"
- [3] SIGGRAPH 2016: "The material point method for simulating continuum materials"
- [4] SIGGRAPH 2011: "PhysBAM: Physically based simulation"

PROGRAM COMMITTEES

- ◆ ACM SIGGRAPH Technical Papers 2016
- ◆ ACM Symposium on Computer Animation 2016, 2017, 2020, 2021, 2022
- ◆ Computer Animation and Social Agents 2017, 2019, 2020, 2021, 2022
- ◆ Pacific Graphics 2020, 2021, 2022

PROFESSIONAL SERVICE

- ◆ ACM Symposium on Computer Animation, Co-Chair 2019
- ◆ Journal Computer Animation and Virtual Worlds, Associate Editor 2017-Present
- ◆ SIGGRAPH Press Release Coordinator 2022

TEACHING EXPERIENCE

- ◆ Assistant Professor
University of California Riverside, Department of Computer Science & Engineering
 - Computer Graphics Summer 2022
 - Project in Computer Science Spring 2022
 - Computer Graphics (grad) Winter 2022
 - Computer Graphics Fall 2021
 - Project in Computer Science Spring 2021
 - Software Construction Winter 2021
 - Computer Graphics Fall 2020
 - Computer Animation (grad) Spring 2020
 - Computer Graphics (grad) Winter 2020
 - Computer Graphics Fall 2019
 - Project in Computer Science Spring 2019
 - Computer Graphics (grad) Winter 2019
 - Seminar in Computer Science (grad) Fall 2018
 - Computer Graphics Fall 2018
 - Project in Computer Science Spring 2018
 - Computer Graphics (grad) Winter 2018
 - Computer Graphics (grad) Summer 2017
 - Computer Graphics (grad) Winter 2017
 - Computer Graphics Fall 2016

- ◆ **Assistant Adjunct Professor**
University of California Los Angeles, Department of Mathematics
 - Ordinary Differential Equations *Spring 2016*
 - Mathematical Modelling *Winter 2016*
 - Mathematical Modelling *Fall 2015*
 - Mathematical Modelling *Spring 2015*
 - Calculus of several variables *Winter 2015*
 - Integration and Infinite Series *Fall 2014*
 - Mathematical Modelling *Spring 2014*
- ◆ **RIPS Program Academic Mentor** *Summer 2014*
University of California Los Angeles, Department of Mathematics
- ◆ **RIPS Program Academic Mentor** *Summer 2011*
University of California Los Angeles, Department of Mathematics
- ◆ **Course Assistant**
Stanford University, Department of Computer Science
 - Math and Computer Science behind Special Effects *Spring 2011*
 - Mathematical Methods for Fluids, Solids and Interfaces *Spring 2009*
 - Mathematical Methods for Fluids, Solids and Interfaces *Spring 2008*
 - Mathematical Methods for Fluids, Solids and Interfaces *Spring 2007*
- ◆ **Course Assistant**
Drexel University, Department of Computer Science
 - Computer Graphics I *Winter 2004*

STUDENT SUPERVISION

- ◆ Current
 - ◆ Jason Goulding, PhD
 - ◆ Mehrnaz Ayazi, PhD
 - ◆ Chen Zhao, PhD
 - ◆ Song Bai, PhD
- ◆ Past
 - ◆ Lei Zhang, MS, 2021
 - ◆ Dekang Zeng, MS, 2021
 - ◆ Zhenyu Yang, MS, 2021

- ◆ Xinlong Li, MS, 2021
- ◆ Chunhan Zhang, MS, 2021
- ◆ Song Bai, MS, 2020
- ◆ Ounan Ding, PhD, 2019
- ◆ High school and undergraduate
 - ◆ Ritoban Roy Chowdhury
 - ◆ Rachel Lau
 - ◆ Diane Ngo
 - ◆ Reuben D’Cunha
 - ◆ Jason Sadler
 - ◆ Jennifer Lee
 - ◆ Brandon Yi
 - ◆ Ryan Quach
 - ◆ Chandler Bottomly
 - ◆ Jiunn Siow

TALKS

- ◆ **ACM SIGGRAPH Conference Course Presenter (virtual)** *August 2022*
 Vancouver, Canada
 Title: Practical course on computing derivatives in code
- ◆ **ACM SIGGRAPH Conference Course Presenter** *August 2019*
 Los Angeles, CA
 Title: Practical course on computing derivatives in code
- ◆ **MPM10 Workshop Lawrence Livermore National Laboratory** *September 2017*
 Livermore, CA
 A new Particle-In-Cell technique for reducing noise
- ◆ **14th U.S. National Congress on Computational Mechanics...** *July 2017*
 Montreal, Canada
 A new Particle-In-Cell technique for reducing noise
- ◆ **Department Colloquium** *February 2015*
 University of California Riverside
 Title: Hybrid simulation methods: simulating the world around you
- ◆ **Department Colloquium** *February 2015*
 Clemson University
 Title: Hybrid simulation methods: simulating the world around you

- ◆ **Department Colloquium** *January 2015*
 Georgia Institute of Technology
 Title: Hybrid simulation methods: simulating the world around you
- ◆ **ACM SIGGRAPH Conference Presenter** *August 2015*
 Los Angeles, California
 Title: Affine Particle In Cell
- ◆ **Walt Disney Animation Studios** *July 2015*
 Burbank, California
 Title: Affine Particle In Cell
- ◆ **Department Colloquium** *February 2015*
 University of Utah
 Title: Tackling the robustness problem in physically-based simulation
- ◆ **Department Colloquium** *January 2015*
 University of Houston
 Title: Tackling the robustness problem in physically-based simulation
- ◆ **Department Colloquium** *November 2014*
 University of Wisconsin-Madison
 Title: Tackling the robustness problem in physically-based simulation
- ◆ **Department Colloquium** *October 2014*
 University of California San Diego
 Title: Robustness in physically-based simulation for computer graphics
- ◆ **Symposium on Computer Animation Conference Presenter** *July 2014*
 Copenhagen, Denmark
 Title: An Adaptive Virtual Node Algorithm with Robust Mesh Cutting
- ◆ **8th Southern California Symposium on Flow Physics** *April 2014*
 University of California Los Angeles
 Title: Second Order Interfacial Navier-Stokes
- ◆ **Department Colloquium** *November 2013*
 University of California Los Angeles
 Title: Second Order Interfacial Navier-Stokes
- ◆ **Department Colloquium** *May 2013*
 University of California Los Angeles
 Title: Implicit Surface Tension
- ◆ **Department Colloquium** *February 2013*
 University of California Los Angeles
 Title: Energetically Consistent Invertible Elasticity
- ◆ **Symposium on Computer Animation Conference Presenter** *July 2012*
 Lausanne, Switzerland

Title: Energetically Consistent Invertible Elasticity

- ◆ **Department Colloquium** *February 2012*
University of California Los Angeles
Title: Implicit Surface Tension
- ◆ **Pacific Graphics Conference Presenter** *September 2011*
Kaohsiung, Taiwan
Title: Asynchronous Evolution for Fully-Implicit and Semi-Implicit Time Integration
- ◆ **ACM SIGGRAPH Conference Course Presenter** *August 2011*
Vancouver, Canada
Title: PhysBAM: Physically Based Simulation
- ◆ **Symposium on Computer Animation Conference Presenter** *July 2008*
Dublin, Ireland
Title: Two-way coupling of rigid and deformable bodies

SCREEN CREDITS

- ◆ **"Up"** *May 2009*
Pixar Animation Studios
- ◆ **"Frozen"** *November 2013*
Walt Disney Animation Studios

HONORS

- ◆ **2013 Chancellor's Award for Postdoctoral Research** *May 2013*
University of California Los Angeles
- ◆ **Sequoia Capital Fellowship** *September 2008*
Stanford Graduate Fellowship
- ◆ **National Science Foundation Honorable Mention** *April 2006*
National Science Foundation
- ◆ **Summer Undergraduate Research Fellowship** *June 2005*
National Institute of Standards and Technology
- ◆ **A* Scholarship Award** *February 2005*
11th Annual Engineers Week
Honors Day Awards Ceremony
- ◆ **Research Day 2004 Winner** *May 2004*
Sixth Annual Research Day at Drexel University
Winner in the area of Basic/Applied Science: Undergraduate student
- ◆ **Alvin W. Wene Engineering Scholarship** *February 2004*
10th Annual Engineers Week
Honors Day Awards Ceremony

- ◆ **International Science Fair Scholarship**
Full-Tuition Scholarship for 5 years at Drexel University
2000 Intel International Science and Engineering Fair

May 2000