Changxi Zheng

Contact Information

Department of Computer Science
Columbia University
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Research Interests

Computer Graphics, with a focus on

- Physics-based simulation and animation
- Computational acoustics
- Computational modeling

Education

Cornell University, Ithaca, NY, USA
Ph.D. in Computer Science — Sep. 2006–Aug. 2012
Minor: Applied Mathematics
Advisor: Professor Doug L. James
Thesis: Physics-Based Sound Rendering for Computer Animation

Cornell University, Ithaca, NY, USA
M.S. in Computer Science — 2009

Shanghai Jiaotong University, Shanghai, China
B.Eng. in Computer Science — 2001–2005

Academic Positions

Associate Professor (tenure-track) — Jul. 2017–present
Department of Computer Science, Columbia University, New York, NY, USA

Assistant Professor (tenure-track) — Sep. 2012–Jun. 2017
Department of Computer Science, Columbia University, New York, NY, USA

Recent Honors

Best Paper Award, UIST	2017
Best Paper Award, ACM/Eurographics Symposium on Computer Animation	2016
Hot Paper Award, HotWireless	2015
NSF CAREER Award	2015–2020
Forbes “30 under 30” for Science and Healthcare	2013
Cornell Computer Science Department Best Dissertation Award	2013

Publications

Publications in different areas are indicated by colored boxes:
G computer graphics; H human-computer interaction; M applied mathematics and machine learning; P applied physics and mechanics; N networking and Wireless systems; R robotics;

[58] *BourGAN: Generative Networks with Metric Embeddings.* Chang Xiao, Peilin Zhong, and Changxi Zheng. Advances in Neural Information Processing Systems (NeurIPS), 2018 (**Spotlight presentation**). M

[57] *Characterization of CO_2 Laser Browning of Dough.* Jonathan Blutinger, Yorán Meijers, Yichen (Peter) Chen, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Journal of Innovative Food Science and Emerging Technologies, 2018. P

[56] *Computational Design of Transformables.* Ye Yuan, Changxi Zheng, and Stelian Coros. ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), 2018. G

[55] *Visual Modeling of Laser-induced Dough Browning.* Yichen (Peter) Chen, Jonathan Blutinger, Yorán Meijers, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Journal of Food Engineering, 2018. G

[54] *Scene-Aware Audio for 360° Videos.* Dingzeyu Li, Timothy Langlois, and Changxi Zheng. ACM Transactions on Graphics (SIGGRAPH 2018). G

[53] *A Multi-Scale Model for Simulating Liquid-Fabric Interactions.* Yun (Raymond) Fei, Christopher Batty, Eitan Grinspun, and Changxi Zheng. ACM Transactions on Graphics (SIGGRAPH 2018). G

[52] *Multi-Scale Simulation of Nonlinear Thin-Shell Sound with Wave Turbulence.* Gabriel Cirio, Ante Qu, George Drettakis, Eitan Grinspun, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH 2018). G

[51] *FontCode: Embedding Information in Text Documents using Glyph Perturbation.* Chang Xiao, Cheng Zhang, and Changxi Zheng. *ACM Transactions on Graphics*, 2018. G H

[50] *Two-Color and 3D Phase-Amplitude Modulation Holograms.* Adam C. Overvig, Sajan Shrestha, Chang Xiao, Changxi Zheng, and Nanfang Yu. Conference on Lasers and Electro-Optics (CLEO), May 2018. P

[49] *Augmenting Indoor Inertial Tracking with Polarized Light.* Zhao Tian, Yu-Lin Wei, Wei-Nin Chang, Xi Xiong, Changxi Zheng, Hsin-Mu Tsai, Kate Ching-Ju Lin, and Xia Zhou. ACM MobiSys, 2018. N

[48] *Characterization of Dough Baked via Blue Laser.* Jonathan Blutinger, Yorán Meijers, Yichen (Peter) Chen, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Journal of Food Engineering, 2018. P

[47] *AirCode: Unobtrusive Physical Tags for Digital Fabrication.* Dingzeyu Li, Avinash Nair, Shree Nayar, and Changxi Zheng. *ACM Symposium on User Interface Software and Technology* (UIST 2017) (**Best Paper Award**). G H

[46] *A Multi-Scale Model for Simulating Hair-Water Interactions.* Yun Fei, Henrique Maia, Christopher Batty, Changxi Zheng, and Eitan Grinspun. *ACM Transactions on Graphics* (SIGGRAPH 2017). G

[45] *Interactive Design Space Exploration and Optimization for CAD Models.* Adriana Schulz, Jie Xu, Bo Zhu, Changxi Zheng, Eitan Grinspun, and Wojciech Matusik. *ACM Transactions on Graphics* (SIGGRAPH 2017). G

[44] *Position: Augmenting Inertial Tracking with Light.* Zhao Tian, Y. Wei, Xi Xiong, W. Chang, H. Tsai, K. Lin, Changxi Zheng, and Xia Zhou. *ACM Workshop on Visible Light Communication Systems* (VLCS), 2017. N

[43] *Customizing Indoor Wireless Coverage via a 3D-Fabricated Reflector.* Xi Xiong, Justin Chan, Ethan Yu, Nisha Kumari, Ardalan Amiri Sani, Changxi Zheng, and Xia Zhou. *ACM Sys-*

tems for Energy-Efficient Built Environments (BuildSys), 2017. N

[42] *Inverse Diffusion Curves using Shape Optimization.* Shuang Zhao, Frédo Durand, and Changxi Zheng. *IEEE Transactions on Visualization and Computer Graphics* (TVCG), 2017. G

[41] *High-Efficiency Amplitude-Phase Modulation Holograms Based on Dielectric Metasurfaces.* Adam Overvig, Sajan Shrestha, Changxi Zheng, and Nanfang Yu. *Laser Science to Photonic Applications* (CLEO), 2017 P

[40] *Crumpling Sound Synthesis.* Gabriel Cirio, Dingzeyu Li, Miguel A. Otaduy, Eitan Grinspun, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH Asia 2016), 35(6), November, 2016. G

[39] *Dynamic Furniture Modeling Through Assembly Instructions.* Tianjia Shao, Dongping Li, Yuliang Rong, Changxi Zheng, and Kun Zhou. *ACM Transactions on Graphics* (SIGGRAPH Asia 2016), 35(6), November, 2016 G

[38] *Example-Based Subspace Stress Analysis for Interactive Shape Design.* Xiang Chen, Changxi Zheng, and Kun Zhou. *IEEE Transactions on Visualization and Computer Graphics* (TVCG), 2016 G

[37] *Acoustic Voxels: Computational Optimization of Modular Acoustic Filters.* Dingzeyu Li, David I.W. Levin, Wojciech Matusik, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH 2016), 35(4), July, 2016 G H

[36] *Deployable 3D Linkages with Collision Avoidance.* Changxi Zheng, Timothy Sun, and Xiang Chen. *ACM/Eurographics Symposium on Computer Animation* (SCA), July, 2016 (**Best Paper Award**). G

[35] *Toward Animating Water with Complex Acoustic Bubbles.* Timothy R. Langlois, Changxi Zheng, and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2016), 35(4), July, 2016 G

[34] *Adaptive Skinning for Interactive Hair-Solid Simulation.* Menglei Chai, Changxi Zheng, and Kun Zhou. *IEEE Transactions on Visualization and Computer Graphics* (TVCG), April, 2016 G

[33] *Computational Design of Metallophone Contact Sounds.* Gaurav Bharaj, David Levin, James Tompkin, Yun Fei, Hanspeter Pfister, Wojciech Matusik, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH Asia 2015), 34(6), November, 2015 G H

[32] *Expediting Precomputation for Reduced Deformable Simulation.* Yin Yang, Dingzeyu Li, Weiwei Xu, Yuan Tian, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH Asia 2015), 34(6), November, 2015. G

[31] *3D Printing Your Wireless Coverage* Justin Chan, Changxi Zheng and Xia Zhou. *ACM Workshop on Hot Topics in Wireless* (HotWireless), 2015 (**Hot Paper Award**). N

[30] *Computational Design of Twisty Joints and Puzzles.* Timothy Sun and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH 2015), 34(4), August, 2015. G

[29] *Computational Hydrographic Printing.* Yizhong Zhang, Chunji Yin, Changxi Zheng, and Kun Zhou. *ACM Transactions on Graphics* (SIGGRAPH 2015), 34(4), August, 2015. G

[28] *Interactive Acoustic Transfer Approximation for Modal Sound.* Dingzeyu Li, Yun Fei, and

Changxi Zheng. *ACM Transactions on Graphics*, 35(1), December, 2015 (presented at SIGGRAPH 2016). G

[27] *Continuum Foam: A Material Point Method for Shear-Dependent Flows.* Yonghao Yue, Breannan Smith, Christopher Batty, Changxi Zheng and Eitan Grinspun. *ACM Transactions on Graphics*, 2015 (presented at SIGGRAPH Asia 2015). G

[26] *Dynamic Hair Capture using Spacetime Optimization.* Zexiang Xu, Hsiang-Tao Wu, Lvdi Wang, Changxi Zheng, Xin Tong and Yue Qi. *ACM Transactions on Graphics* (SIGGRAPH Asia 2014), 33(6), December, 2014. G

[25] *Fast Multipole Representation of Diffusion Curves and Points.* Timothy Sun, Papoj Thamjaroenporn, and Changxi Zheng. *ACM Transactions on Graphics* (SIGGRAPH 2014), 33(4), August, 2014. G

[24] *A Reduced Model for Interactive Hairs.* Menglei Cai, Changxi Zheng, and Kun Zhou. *ACM Transactions on Graphics* (SIGGRAPH 2014), 33(4) , August, 2014 G

[23] *An Asymptotic Continuation Method for Inverse Elastic Shape Design.* Xiang Chen, Changxi Zheng, Weiwei Xu, and Kun Zhou. *ACM Transactions on Graphics* (SIGGRAPH 2014), 33(4) , August, 2014 G

[22] *Interactive Localized Liquid Motion Editing.* Zherong Pan, Jin Huang, Yiying Tong, Changxi Zheng, and Hujun Bao. *ACM Transactions on Graphics* (SIGGRAPH Asia 2013), 32(6) G

[21] *One-to-Many: Example-Based Mesh Animation Synthesis.* Changxi Zheng. *ACM SIGGRAPH/Eurographics Symposium on Computer Animation* (SCA), July, 2013. G

[20] *A fast implicit method for time-dependent Hamilton-Jacobi PDEs.* Alexander Vladimirsky and Changxi Zheng. arXiv:1306.3506, June, 2013. M

Before joining Columbia

[19] *Energy-based Self-Collision Culling for Arbitrary Mesh Deformations.* Changxi Zheng and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2012), 31(4), August, 2012. G

[18] *Precomputed Acceleration Noise for Improved Rigid-body Sound.* Jeffery Chadwick, Changxi Zheng and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2012), 31(4), August, 2012. G

[17] *Faster Acceleration Noise for Multibody Animations using Precomputed Soundbanks.* Jeffrey N. Chadwick, Changxi Zheng and Doug L. James. *ACM/Eurographics Symposium on Computer Animation* (SCA), July, 2012. G

[16] *Learning to Place New Objects in a Scene.* Yun Jiang, Marcus Lim, Changxi Zheng and Ashutosh Saxena. *International Journal of Robotics Research* (IJRR), 2012. R

[15] *Learning to Place New Objects.* Yun Jiang, Changxi Zheng, Marcus Lim and Ashutosh Saxena. *IEEE International Conference on Robotics and Automation* (ICRA), May, 2012. R

[14] *Toward High-Quality Modal Contact Sound.* Changxi Zheng and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2011), 30(4), August, 2011. G

[13] *Learning to Place New Objects.* Yun Jiang, Changxi Zheng, Marcus Lim and Ashutosh Saxena. *RSS Workshop on Mobile Manipulation*, Los Angeles, June, 2011. R

[12] *Rigid-Body Fracture Sound with Precomputed Soundbanks.* Changxi Zheng and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2010), 29(3), July, 2010. G

[11] *Harmonic Fluids.* Changxi Zheng and Doug L. James. *ACM Transactions on Graphics* (SIGGRAPH 2009), 28(3), August, 2009. G

[10] *A Light-Weight Distributed Scheme for Detecting IP Prefix Hijacks in Real-time.* Changxi Zheng, Lusheng Ji, Dan Pei, Jia Wang and Paul Francis. *Proceeding of ACM SIGCOMM*, Kyoto, Japan, August, 2007. N

[9] *Distributed Segment Tree: A Unified Architecture to Support Range Query and Cover Query.* Guobin Shen, Changxi Zheng, Wei Pu and Shipeng Li. *Technical Report* MSR-TR-2007-30, 2007. N

[8] *Distributed Segment Tree: Support of Range Query and Cover Query over DHT.* Changxi Zheng, Guobin Shen, Shipeng Li, and Scott Shenker. *The 5th International Workshop on Peer-to-Peer Systems* (IPTPS) Santa Barbara, US, February, 2006. N

[7] *MOVIF: A Lower Power Consumption Live Video Multicasting Framework over Ad-hoc Networks with Terminal Collaboration.* Ke Liang, Zaoyang Gong, Changxi Zheng, and Guobin Shen. *International Symposium on Intelligent Signal Processing and Communication Systems* (ISPACS), Hong Kong, December, 2005. N

[6] *Distributed Prefetching Scheme for Random Seek Support in Peer-to-Peer Streaming Applications.* Changxi Zheng, Guobin Shen, and Shipeng Li. *Workshop on Advances in Peer-to-Peer Multimedia Streaming*, ACM Multimedia 2005, Singapore, November, 2005. N

[5] *Segment Tree Based Control Plane Protocol for Peer-to-Peer On-Demand Streaming Service Discovery.* Changxi Zheng, Guobin Shen, and Shipeng Li. *Proceeding of Visual Communication and Image Processing* (VCIP), Beijing, China, July, 2005. N

[4] *Joint Sender/Receiver Optimization Algorithm for Multi-Path Video Streaming Using High Rate Erasure Resilient Code.* Changxi Zheng, Guobin Shen, Shipeng Li and Qianni Deng. *Proceeding of IEEE International Conference on Multimedia and Expo* (ICME), Amsterdam, Netherlands, July, 2005. N

PhD Thesis

[3] *Physics-Based Sound Rendering for Computer Animation.* Changxi Zheng. Cornell University, 2012 (**Best Dissertation Award**).

Selected production credits

Short Animations

[2] *Harmonic Fluid Sound Synthesis.* Changxi Zheng and Doug L. James. *ACM SIGGRAPH Computer Animation Festival*, 2009. (`http://www.youtube.com/watch?v=l95tZCl7YlQ`)

Published Course Notes

[1] *Physically Based Sound for Computer Animation and Virtual Environments.* Doug L. James, Timothy R. Langlois, Ravish Mehra, and Changxi Zheng. *SIGGRAPH 2016 Courses*.

Patents

- Tool for Interactive Exploration and Optimization of CAD Shapes submitted, 2017
  by Eitan Grinspun, Wojciech Matusik, Adriana Schulz, Jie Xu, Changxi Zheng, and Bo Zhu
- US15903888, Systems and methods for steganography based on text fonts 2018
  by Changxi Zheng, Chang Xiao, and Cheng Zhang

- US15533297, Real-Time Animation Method for Hair-Object Collisions 2018
  by Kun Zhou, Menglei Chai, and Changxi Zheng
- WO2016123740, Calculable 3D color printing method 2016
  by Kun Zhou, Yizhong Zhang, Chunji Yin, and Changxi Zheng
- WO2016127421, Real-time motion simulation method for hair and object collisions 2016
  by Kun Zhou, Menglei Chai, and Changxi Zheng
- US7640353, Guided random seek support for media streaming 2009
  by Guobin Shen, Shipeng Li, and Changxi Zheng
- US20070239759, Range and cover queries in overlay networks 2007
  by Guobin Shen, Changxi Zheng, and Shipeng Li

Selected Professional Activities

Committee member and editorial board

2019, Technical Papers Committee, ACM SIGGRAPH
2018, Technical Papers Committee, ACM SIGGRAPH
2017, Conference co-chair, ACM/Eurographics Symposium on Computer Animation
2015–2018, Associate Editor, ACM Transactions on Graphics (a three-year term)
2016–present, Associate Editor, Computer Animation and Virtual Worlds
2017, Papers Committee, Pacific Graphics
2016, Papers Committee, ACM/Eurographics Symposium on Computer Animation
2015, Technical Papers Committee, ACM SIGGRAPH Asia
2015, Technical Papers Committee, ACM SIGGRAPH
2015, Panelist, NSF
2015, Papers Committee, ACM/Eurographics Symposium on Computer Animation
2015, Organizer, Tristate Workshop on Imaging and Graphics
2015, Papers Committee, CAD/Graphics
2014, Papers Committee, ACM/Eurographics Symposium on Computer Animation
2014, Papers Committee, Computer Animation and Social Agents
2013, ACM/Eurographics SCA best paper committee

Referee

SIGGRAPH, SIGGRAPH Asia, ACM Transactions on Graphics, ACM User Interface Software and Technology Symposium, Eurographics, IEEE Transactions on Visualization and Computer Graphics, ACM/IEEE Transactions on Computer Systems, The Visual Computer, Graphical Models, Computer Music Journal, and IEEE Transactions on Knowledge and Date Engineering

Memberships

ACM and ACM SIGGRAPH

Previous Research Experience

Cornell University. Graduate research assistant Aug. 2006–Aug. 2012

- Graphics: Physically based simulation and sound rendering (Ph.D. Thesis)
- Applied Math: Fast numerical methods for time-dependent Hamilton-Jacobi PDEs
- Robotics: Robot learning of grasping and placing strategies in personal robotics
- Networking: Distributed detection of IP prefix hijacks

Pixar Animation Studio. Research intern May 2011–Aug. 2011

Algorithm design for synthesizing coupled nonlinear motion effects

UC Berkeley. Short-term visiting scholar Sep. 2005

Extension of distributed hash table in peer-to-peer networks and its applications

Microsoft Research Asia. Visiting student/scholar 2004–2006

Multi-media streaming over Internet and peer-to-peer networks

Selected Media Coverage

- "You can send invisible messages with subtle font tweaks", WIRED, May 20, 2018
- "Hiding Information in Plain Text", IEEE Spectrum, May 15, 2018
- "This algorithm can hide secret messages in regular-looking text", Digital Trends, April 11, 2018
- "Clever Technique Can Hide Secret Messages in the Most Unassuming Text", Popular Mechanics, April 10, 2018
- "Helvetica Is Now An Encryption Device", CO.Design, April 9, 2018
- "3D printing with air pockets for physical tagging: Aircode", 3dPrintingIndustry, July 24, 2017
- "Boffins back bubbles for better bonding with beautiful belongings", The Register, July 21, 2017
- "Columbia researchers' AirCode system uses 3D printed air pockets for physical object tagging", 3ders.org, July 15, 2017
- "Controlling Sound Computationally", Columbia Engineering Magazine, Fall, 2016
- "Shaping Sound!", ASME Mechanical Engineering Magazine, September, 2016
- "Noisy Information - Embedding Data in Sound", engineering.com August 29, 2016
- "Detangling the Complexity of Waves with Acoustic Voxels", engineering.com, August 17, 2016
- "Acoustic voxels used to embed sound with data", NSF Science360 News, July, 2016
- "Researchers use acoustic voxels to embed sound with data", Science Daily, July, 2016
- "Hippopotamus that sounds like a trumpet key to acoustic tagging", InAVate, July, 2016
- "Researchers Use Acoustic Voxels to Embed Sound with Data", ECNmag.com, July, 2016
- "Looking Toward Cloaking & Acoustic Tagging: Researchers Implant 3D Printed Objects with Sound Data", 3DPrint.com, July, 2016
- "Columbia Engineering Researchers Use Acoustic Voxels to Embed Sound with Data", Columbia Engineering, July, 2016
- "Animal Sounds", NSF Science360, episode, November, 2015
- "This Animal-Shaped Glockenspiel Is Really a Rad Experiment", WIRED, November, 2015
- "3D Printed 'Zoolophone' Demonstrates Connection Between Shape And Sound", Popular Science, November, 2015
- ""Zoolophone" features custom-shaped keys that still produce the right notes", gizmag.com, November, 2015
- "Making New Music with 3D Printed Metallophone Instruments", 3DPrint.com, October, 2015
- "You Need Geniuses at MIT, Harvard, and Columbia To Make an Animal-Shaped Xylophone", gizmodo.com, October, 2015
- "A Computer Scientist Is Building the Musical Instruments of the Future", Inverse.com, October, 2015
- "Would you like to play this 3D-printed 'zoolophone'?", TechRadar.com, October, 2015

- “Change the shape, change the sound: Researchers develop algorithm to 3-D print vibrational sounds”, Columbia Engineering, October, 2015
- “Coloring Complex 3D Printed Objects”. ASME.org, September, 2015
- “How to Turn Any Object Into a Rubik’s Cube”. Popular Mechanics, Jun 26, 2015
- “New Software Turns Any 3D Printable Model into a Rubik’s Cube Style Twisty Puzzle”. 3DPrint.com, June 25, 2015
- “New Computational Technique Advances Color 3D Printing Process”. Science Daily, May 22, 2015
- “Watch This Futuristic Vat of Water Paint a Cat”. Popular Science, May 14, 2015
- “Crazy Way To Paint Patterns On 3-D Objects Is Like A Cartoon Come To Life”. fastcodesign.com, May 14, 2015
- “Precision Hydrographic Printing: A Fascinating New Way to Precisely Add Color to 3D Prints”. 3DPrint.com, May 14, 2015
- “3-D Print and Rubik’s Cube-ify Almost Anything”, IEEE Spectrum, May 13, 2015
- “A Crazy Way to Add Intricate Color to 3-D Printed Creations”. WIRED, May 13, 2015
- “Meet The Forbes Under 30 Inventors Who Are Breaking The Boundaries”. Forbes, Otc 21, 2014
- “Are We Hearing This For Real?”. Columbia Engineering Excellentia, Mar 8, 2013
- “‘Acceleration noise’ adds realism to animated collisions”. Cornell Chronicle, August 20, 2012
- “The Future Of Computer-Generated Sound Effects”. Science Friday, NPR Radio, August 12, 2011.
- “The Art of Water Music”. BBC Radio, August 11, 2011.
- “Future of virtual reality: Make a crash sound lifelike”. New Scientist, June 14, 2011.
- “Perfecting synthetic sounds for animated worlds”. New Scientist, July 26, 2010.
- “Researchers Synthesize Real-Time Fracture Sounds”. Slashdot, July 16, 2010.
- “Researchers create sounds of animated things breaking”. Cornell Chronicle, July 14, 2010.
- “Computer-generated sound effects make a splash”. New Scientist, June 9, 2009.
- “Computergrafiker lassen Wassertropfen klingen” (in German). Pressetext, June 6, 2009.
- “Computer graphics researchers simulate the sounds of water and other liquids”. Science Daily, June 4, 2009.
- “Splash, Splatter, Sploosh, and Bloop!”. Slashdot, June 3, 2009.
- “Computer graphics researchers simulate the sounds of water and other liquids”. Cornell Chronicle, June 1, 2009.