Huamin Wang

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Research Interests

Virtual reality and augmented reality have been the buzzwords around the computer graphics community for years, but their applications are still limited. The key challenge is how to realistically and efficiently generate animated visual effects that involve humans, fluids, deformable solids, cloth and thin shells, and many more. To address this challenge, I focus my research on the following areas:

- **Physics-based interactive simulation**: physics-based simulation of nonlinear cloth and soft tissues, especially with GPU acceleration; physics-based liquid simulation and real-time interaction, especially at small scales.
- **Data-driven animation, powered by deep learning**: Real-world data acquisition; parameter optimization of physics-based nonlinear models; DNN-based simulation and prediction of natural phenomena.
- **Physics-based modeling for 3D fabrication**: Nonlinear optimization of printable 3D models for saving materials and printing times; nonlinear optimization of 3D garments and sewing patterns.

Education

- **Georgia Institute of Technology**, Atlanta, GA 2004 – 2009
  - **Ph.D. in Computer Science** (Advisor: Greg Turk)
- **Stanford University**, Stanford, CA 2002 – 2004
  - **M.S. in Computer Science** (Advisor: Leo Guibas)
- **Zhejiang University**, Hangzhou, China 1998 – 2002
  - **B.Eng. in Computer Science and Engineering** (Advisor: Jinxiang Dong)
  - with highest honors from the "Mixed Class" 1998

Dissertation

Title: **Practical Water Animation using Physics and Image Based methods**

Abstract: A study of several modeling techniques to produce water animations with efficiency and realism, including: a *virtual surface* method to represent small scale surface tension at the liquid-solid interface, a *general shallow wave equation* model to efficiently animate water drops using graphics hardware, and a spatio-temporal reconstruction framework that generates realistic fluid animations from stereo video input. This work explores the possibility of combining video-based reconstruction techniques with physically based animation, illustrating a prosperous trend in natural phenomena modeling by combining computer graphics with computer vision algorithms.

Advisor: Greg Turk
Committee: Jarek Rossignac (chair), Irfan Essa, C. Karen Liu, and Peter J. Mucha
Date: August 17, 2009

Research Positions

- **The Ohio State University**, Columbus, OH — 05/01/2017 – Present
  Associate Professor
- **The Ohio State University**, Columbus, OH — 08/01/2011 – 05/01/2017
  Assistant Professor
- **The University of California, Berkeley**, Berkeley, CA — 10/01/2009 – 05/31/2011
  Postdoctoral Researcher, advised by James O'Brien and Ravi Ramamoorthi
- **Georgia Institute of Technology**, Atlanta, GA — 2004 – 2009
  Research assistant, advised by Greg Turk
- **Microsoft Research Asia**, Beijing, China — Fall 2007
  Research Intern, advised by Kun Zhou and Baining Guo
- **Microsoft Research**, Redmond, WA — Summer 2007
  Research Intern, advised by Hugues Hoppe
- **Adobe Systems Incorporated**, San Jose, CA — Summer 2006
  Research Intern, advised by Gavin Miller
- **Stanford University**, Stanford, CA — 2004
  Research Assistant, advised by Ron Fedkiw

Publications (also available at http://www.cse.ohio-state.edu/∼whmin/publications.html)

† denotes my current or former graduate advisee. ‡ denotes my current or former postdoc/visiting scholar at OSU.

Journal Articles (including SIGGRAPH)

- Huamin Wang. 2018. **Rule-free sewing pattern adjustment with precision and efficiency**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 37, no. 4, pp. 53:1–53:13.
- Xiaowei He‡, Huamin Wang and Enhua Wu. 2017. **Projective peridynamics for modeling versatile elastoplastic materials**. *IEEE Transactions on Visualization and Computer graphics*, vol. PP, no. 99, pp. 1–1.
- Ran Luo, Weiwei Xu, Huamin Wang, Kun Zhou and Yin Yang. 2017. **Physics-based quadratic deformation using elastic weighting**. *IEEE Transactions on Visualization and Computer graphics*, vol. PP, no. 99, pp. 1–1.
- Miaojun Yao†, Zhili Chen†, Weiwei Xu and Huamin Wang. 2017. **Modeling, evaluation and optimization of interlocking shell pieces**. *Computer Graphics Forum* (*Pacific Graphics*), vol. 36, no. 7, pp. 1–13.
- Aihua Mao‡, Mingle Wang, Yong-Jin Liu, Huamin Wang and Guiqing Li. 2017. **SPH-based simulation of liquid wetting across textile materials**. *Communications in Information and Systems*, vol. 17, no. 3, pp. 147–169.
- Huamin Wang and Yin Yang. 2016. **Descent methods for elastic body simulation on the GPU**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 35, no. 6, pp. 212:1–212:10.

- Rajaditya Mukherjee†, Xiaofeng Wu† and Huamin Wang. 2016. **Incremental deformation subspace reconstruction**. *Computer Graphics Forum* (*Pacific Graphics*), vol. 35, no. 7, pp. 169–178.
- Min Tang, Huamin Wang, Le Tang, Ruofeng Tong and Dinesh Manocha. 2016. **CAMA: Contact-aware matrix assembly with unified collision handling for GPU-based cloth simulation**. *Computer Graphics Forum* (*Eurographics*), vol. 35, no. 2, pp. 511–521.
- Huamin Wang. 2015. **A Chebyshev semi-iterative approach for accelerating projective and position-based dynamics**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 34, no. 6, pp. 246:1–246:9.
- Miaojun Yao†, Zhili Chen†, Linjie Luo, Rui Wang and Huamin Wang. 2015. **Level-set-based partitioning and packing optimization of a printable model**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 34, no. 6, pp. 214:1–214:11.
- Xiaofeng Wu†, Rajaditya Mukherjee† and Huamin Wang. 2015. **A unified approach for subspace simulation of deformable bodies in multiple domains**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 34, no. 6, pp. 241:1–241:9.
- Zhili Chen†, Byungmoon Kim, Daichi Ito and Huamin Wang. 2015. **Wetbrush: GPU-based painting simulation at the bristle level**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 34, no. 6, pp. 200:1–200:11.
- Tamal K. Dey, Bo Fu, Huamin Wang and Lei Wang. 2015. **Automatic posing of a meshed human model using point clouds**. *Computer and Graphics* (*Shape Modeling International*), vol. 16, no. C, pp. 14–24.
- Huamin Wang. 2014. **Defending continuous collision detection against errors**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 33, no. 4, pp. 122:1–122:10.
- Zhili Chen†, Miaojun Yao†, Renguo Feng† and Huamin Wang. 2014. **Physics-inspired adaptive fracture refinement**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 33, no. 4, pp. 113:1–113:7.
- Mao Ye, Huamin Wang, Nianchen Deng, Xubo Yang and Ruigang Yang. 2014. **Real-time human pose and shape estimation for virtual try-on using a single commodity depth camera**. *IEEE Transactions on Visualization and Computer Graphics (TVCG)* (*Virtual Reality*), vol. 20, no. 4, pp. 550–559.
- Xiaowei He, Huamin Wang, Fengjun Zhang, Hongan Wang, Guoping Wang and Kun Zhou. 2014. **Robust simulation of small-scale thin features in SPH-based free surface flows**. *ACM Transactions on Graphics* (presented at *SIGGRAPH 2015*), vol. 34, no. 1, pp. 7:1–7:9.
- Jiating Chen, Xiaoyin Ge, Li-Yi Wei, Bin Wang, Yusu Wang, Huamin Wang, Yun Fei, Kang-Lai Qian, Jun-Hai Yong and Wenping Wang. 2013. **Bilateral blue noise sampling**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 32, no. 6, pp. 216:1–216:11.
- Zhili Chen†, Renguo Feng† and Huamin Wang. 2013. **Modeling friction and air effects between cloth and deformable bodies**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 32, no. 4, pp. 88:1–88:8.
- Oleksiy Busaryev, Tamal K. Dey and Huamin Wang. 2013. **Adaptive fracture simulation of multi-layered thin plates**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 32, no. 4, pp. 52:1–52:6.
- Oleksiy Busaryev, Tamal Dey, Huamin Wang and Zhong Ren. 2012. **Animating bubble interactions in a liquid foam**. In *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 31, no. 4, pp. 63:1–63:8.
- Wei Hua, Xusheng Zeng, Rui Wang, Ying Tang, Huamin Wang and Hujun Bao. 2012. **Compressing repeated content within large-scale remote sensing images**. *The Visual Computer* (*Computer Graphics International*), vol. 8, no. 6–8, pp. 755–764.

- Qing Zhang, Jing Tong, Huamin Wang, Zhigeng Pan and Ruigang Yang. 2012. **Simulation guided hair dynamics modeling from video**. *Computer Graphics Forum* (*Pacific Graphics*), vol. 31, no. 7, pp. 2003–2010.

- Yizhong Zhang, Huamin Wang, Shuai Wang, Yiying Tong and Kun Zhou. 2012. **A deformable surface model for real-time water drop animation**. *IEEE Transactions on Visualization and Computer graphics*, vol. 18, no. 8, pp. 1281–1289.

- Huamin Wang, James O'Brien and Ravi Ramamoorthi. 2011. **Data-driven elastic models for cloth: Modeling and measurement**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 30, no. 4, pp. 71:1–71:12.

- Huamin Wang, James O'Brien and Ravi Ramamoorthi. 2010. **Multi-resolution isotropic strain limiting**. *ACM Transactions on Graphics* (*SIGGRAPH Asia*), vol. 29, no. 6, pp. 156:1–156:10.

- Huamin Wang, Florian Hecht, Ravi Ramamoorthi and James O'Brien. 2010. **Example-based wrinkle synthesis for clothing animation**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 29, no. 4, pp. 107:1–107:8.

- Huamin Wang, Miao Liao, Qing Zhang, Ruigang Yang and Greg Turk. 2009. **Physically guided liquid surface modeling from videos**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 28, no. 3, pp. 90:1–90:11.

- Nicolas Ray, Bruno Levy, Huamin Wang, Greg Turk and Bruno Vallet. 2009. **Material-space texturing**. *Computer Graphics Forum*, vol. 28, no. 6, pp. 1659-1669.

- Huamin Wang, Yonatan Wexler, Eyal Ofek, and Hugues Hoppe. 2008. **Factoring repeated content within and among images**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 27, no. 3, pp. 14:1–14:10.

- Huamin Wang, Mingxuan Sun, and Ruigang Yang. 2007. **Space-time light field rendering**. *IEEE Transactions on Visualization and Computer graphics (TVCG)*, vol. 13, no. 4, pp. 697–710.

- Huamin Wang, Peter Mucha, and Greg Turk. 2005. **Water drops on surfaces**. *ACM Transactions on Graphics* (*SIGGRAPH*), vol. 24, no. 3, pp. 921–929.

Full-Length Conference Papers

- Rajaditya Mukherjee[†], Longhua Wu[†] and Huamin Wang. 2018. **Interactive two-way shape design of elastic bodies**. In *Proceedings of ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games* (*I3D*), Montreal, Quebec, Canada.

- Sheng Yang, Xiaowei He, Huamin Wang, Sheng Li, Guoping Wang, Enhua Wu and Kun Zhou. 2016. **Enriching SPH simulation by approximate capillary waves**. In *Proceedings of the 15th ACM SIGGRAPH/Eurographics Symposium on Computer Animation* (*SCA*), pp. 29–36, Zurich, Switzerland.

- Xiaowei He, Huamin Wang, Fengjun Zhang, Hongan Wang, Guoping Wang, Kun Zhou and Enhua Wu. 2015. **Simulation of fluid mixing with interface control**. In *Proceedings of the 14th ACM SIGGRAPH/Eurographics Symposium on Computer Animation* (*SCA*), pp. 129–135, Los Angeles, USA.

- Miao Liao, Qing Zhang, Huamin Wang, Ruigang Yang and Minglun Gong. 2009. **Modeling deformable objects from a single depth camera**. In *Proceedings of twelfth IEEE International Conference on Computer Vision* (*ICCV*), pp. 167-174, Kyoto, Japan. (oral presentation, 4% acceptance).

- Huamin Wang, Gavin Miller, and Greg Turk. 2007. **Solving general shallow wave equations on surfaces**. In *Proceedings of the 2007 ACM SIGGRAPH/Eurographics Symposium on Computer Animation* (*SCA*), pp. 229 – 238, San Diego, USA.

- Huamin Wang and Ruigang Yang. 2005. **Towards space-time light field rendering**. In *Proceedings of ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games* (*I3D*), pp. 125 – 132, Washington D.C., USA.

Book Chapters

- Ruigang Yang, Huamin Wang and Cha Zhang. 2010. **Dynamic view synthesis with an array of cameras**. Chapter 1 in *Computational Photography: Methods and Applications*. Editor: Rastislav Lukac, CRC Press.

Theses

- Huamin Wang. 2009. **Practical water animation using physics and image based methods**. Ph.D. thesis, Georgia Institute of Technology, Atlanta, USA.
- Huamin Wang. 2002. **Interactive rendering and geometric modeling in collaborative CAD systems**. B.Eng. thesis, Zhejiang University, Hangzhou, China.

Awards and Honors

Lowley Research award, College of Engineering, The Ohio State University 2017
NVIDIA Fellowship 2006
Challenging Cup undergraduate research competition, Second Prize, Zhejiang, China 2001
Innovation Scholarship, Zhejiang University, China 2001
Excellent Student Scholarship, Zhejiang University, China . . . . . 1999 - 2001
Freshman Scholarship, Zhejiang University, China 1998

Patents

- Gavin Miller and Huamin Wang. 2008. **System and Method for Simulating Shallow Wave Effects on Arbitrary Surfaces**. Pub. No.: WO/2008/091880. Pub. Date: 07/31/2008.
- Hugues Hoppe, Yonatan Wexler, Eyal Ofek and Huamin Wang. 2009. **Factoring Repeated Content Within and Among Images**. Pub. No.: WO/2009/102562, Pub. Date: 08/20/2009.

Invited Talks

- **Data Driven Approaches for Physically Based Animation and Visualization**. Zhejiang University, Hangzhou, China. August 2010.
- **Physics and Image-Based Animation of Natural Phenomena**. University of California at Berkeley, Berkeley, California, USA. May 2009.
- **Physics and Image-Based Animation of Natural Phenomena**. University of Kentucky, Lexington, Kentucky, USA. February 2009.
- **A Survey on Hair Modeling and Simulation**. Microsoft Research Asia, Beijing, China. September 2007.

- **High-Dimensional Texture Metamorphosis and Synthesis**. Carnegie Mellon University computer graphics research retreat, Pittsburgh, Pennsylvania, USA. November 2006.
- **General Shallow Wave Equations and its Visual Effects in Graphics Applications**. Adobe Systems Incorporated, San Jose, California, USA. July 2006.
- **Numerical Solutions to Physically Based Simulations**. Zhejiang University, Hangzhou, China. June 2005.
- **Simulating Water Drops on Surfaces by a Virtual Surface Method**. Carnegie Mellon University computer graphics research retreat, Pittsburgh, Pennsylvania, USA. November 2004.

Services

- **Associate Editor**
  - Computer Animation and Virtual Worlds

  Technical Paper Committee Co-chair
  - Computer Animation and Social Agents (CASA) 2017

  Technical Paper Committee Member
  - ACM SIGGRAPH 2014, ACM SIGGRAPH Asia 2015, ACM SIGGRAPH Asia 2018
  - Pacific Graphics 2010, 2014, 2015, 2016, 2017
  - ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D) 2012, 2013, 2014, 2018
  - Computer Animation and Social Agents (CASA) 2012, 2013
  - ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) 2012, 2013, 2014, 2015, 2016, 2017, 2018
  - Computer Aided Design and Computer Graphics (CAD & Graphics) 2013, 2017
- **Reviewer/Panelist**
  - *National Science Foundation (NSF)*
  - *ACM SIGGRAPH*
  - *ACM SIGGRAPH Asia*
  - *Eurographics*
  - *Computer Graphics International (CGF)*
  - *Eurographics Symposium on Rendering (EGSR)*
  - *ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA)*
  - *ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D)*
  - *Computer Graphics Forum (CGF)*
  - *Computer Animation and Social Agents (CASA)*
  - *IEEE Transactions on Visualization and Computer Graphics (TVCG)*
- **Member**
  - ACM member, since 2005
  - IEEE member, since 2006