

# Rui Wang

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## RESEARCH INTERESTS

My research focuses on photorealistic image synthesis, including global illumination algorithms, real-time and GPU-based rendering, sampling and filtering, and precomputed light transport. I am also interested in 3D scanning, image-based modeling, and general-purpose computation on the GPU.

## PROFESSIONAL EXPERIENCE

- 09/06–present     **Assistant Professor**  
Department of Computer Science  
University of Massachusetts Amherst
- 06/05–03/06     **Research Intern**  
Intel Research Lab  
Santa Clara, CA
- 08/01–08/06     **Research Assistant**  
Department of Computer Science  
University of Virginia
- 08/01–08/02     **Teaching Assistant**  
Department of Computer Science  
University of Virginia
- 04/00–05/01     **Research Intern**  
ArcSoft China, Hangzhou, China

## EDUCATION

- 05/03–08/06     **University of Virginia**, Charlottesville, VA  
Ph.D. in Computer Science  
Advisor: Dr. David Luebke  
Thesis: *“Interactive Rendering of Realistic Illumination Models using Wavelet-Based Precomputation”*
- 08/01–05/03     **University of Virginia**, Charlottesville, VA  
M.S. in Computer Science
- 08/97–05/01     **Zhejiang University**, Hangzhou, China  
B.S. in Computer Science

## RESEARCH PUBLICATIONS

### Journal Publications<sup>1</sup>

- [1] Kun Xu, Li-Qian Ma, Bo Ren, Rui Wang, and Shi-Min Hu, “Interactive Hair Rendering and Appearance Editing under Environment Lighting”, ***ACM Transactions on Graphics*** 30(5), [Proceedings of ACM SIGGRAPH Asia 2011, Acceptance rate: 19%], to appear.
- [2] Li-Yi Wei and Rui Wang, “Differential Domain Analysis for Non-Uniform Sampling”, ***ACM Transactions on Graphics*** 30(4), [Proceedings of ACM SIGGRAPH 2011, Acceptance rate: 19%], 2011, pp. 50:1–10.
- [3] John C. Bowers, Jonathan Leahey, and Rui Wang, “A Ray Tracing Approach to Diffusion Curves”, ***Computer Graphics Forum*** 30(4), [Proceedings of Eurographics Symposium on Rendering (EGSR) 2011, Acceptance rate: 39%], 2011, pp. 1345–1352.
- [4] David Maletz and Rui Wang, “Importance Point Projection for GPU-based Final Gathering”, ***Computer Graphics Forum*** 30(4), [Proceedings of Eurographics Symposium on Rendering (EGSR) 2011, Acceptance rate: 39%], 2011, pp. 1327–1336.
- [5] Peter Djeu, Warren Hunt, Rui Wang, Ikrima Elhassan, Gordon Stoll, and William R. Mark, “Razor: An Architecture for Dynamic Multiresolution Ray Tracing”, ***ACM Transactions on Graphics*** 30(5), 2011, to appear. (The previous technical report version of this paper has been cited **45** times).
- [6] Jurgen Laurijssen, Rui Wang, Ares Lagae, and Philip Dutre, “Precomputed Gathering of Multi-Bounce Glossy Reflections”, ***Computer Graphics Forum***, 2011, to appear.
- [7] John C. Bowers, Rui Wang, Li-Yi Wei, David Maletz, “Parallel Poisson Disk Sampling with Spectrum Analysis on Surfaces”, ***ACM Transactions on Graphics*** 29(5), [Proceedings of ACM SIGGRAPH Asia 2010, Acceptance rate: 18%], 2010, pp. 166:1–10. (Cited **11** times).
- [8] Jurgen Laurijssen, Rui Wang, Philip Dutre, and Benedict J. Brown, “Fast Estimation and Rendering of Indirect Highlights”, ***Computer Graphics Forum*** 29(4) [Proceedings of Eurographics Symposium on Rendering (EGSR) 2010, Acceptance rate: 39%], 2010, pp. 1305–1313.
- [9] Xuan Yu, Rui Wang, Jingyi Yu, “Real-time Depth of Field Rendering via Dynamic Light Field Generation and Filtering”, ***Computer Graphics Forum*** 29(7), [Proceedings of Pacific Graphics (PG) 2010, Acceptance rate: 17%], 2010, pp. 2099–2107.
- [10] Rui Wang, Rui Wang, Kun Zhou, Minghao Pan, Hujun Bao, “An Efficient GPU-based Approach for Interactive Global Illumination”, ***ACM Transactions on Graphics*** 28(3), [Proceedings of ACM SIGGRAPH 2009, Acceptance rate: 18%], 2009, pp. 91:1–8. (Cited **42** times).

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<sup>1</sup> In computer graphics, a number of conference proceedings are now published as special issues of associated journals. For example, the ACM SIGGRAPH proceedings are published as a special issue of the ACM Transactions on Graphics (TOG), a leading journal in graphics. Similarly, the proceedings of Eurographics, Eurographics Symposium on Rendering, and Pacific Graphics are published as special issues in the journal Computer Graphics Forum (CGF). Therefore, for these publications, I have included information about the associated conference and the acceptance rate. All papers listed are fully reviewed, revised via a shepherding process, and are considered terminal publications. I have also included Google Scholar citation counts for selected papers.

- [11] Rui Wang, Oskar Akerlund, “Bidirectional Importance Sampling for Unstructured Direct Illumination”, ***Computer Graphics Forum*** 28(2), [*Proceedings of Eurographics 2009*, Acceptance rate: 23%], 2009, pp. 269–278.
- [12] Ewen Cheslack-Postava, Rui Wang, Oskar Akerlund, Fabio Pellacini, “Fast, Realistic Lighting and Material Design using Nonlinear Cut Approximation”, ***ACM Transactions on Graphics*** 27(5), [*Proceedings of ACM SIGGRAPH Asia 2008*, Acceptance rate: 18%], 2008, pp. 128:1–10. (Cited **20** times).
- [13] Xuan Yu, Rui Wang, Jingyi Yu, “Interactive Glossy Reflections using GPU-based Ray Tracing with Adaptive LOD”, ***Computer Graphics Forum*** 27(7), [*Proceedings of Pacific Graphics (PG) 2008*, Acceptance rate: 18%], 2008, pp. 1987–1996.
- [14] Rui Wang, Ewen Cheslack-Postava, Rui Wang, David Luebke, Qianyong Chen, Wei Hua, Qunsheng Peng, Hujun Bao, “Real-time Editing and Relighting of Homogeneous Translucent Materials”, ***The Visual Computer Journal*** 24(7-9), [*Proceedings of Computer Graphics International (CGI) 2008*, Acceptance rate: 18%], 2008, pp. 565–575. (Cited **8** times).
- [15] Rui Wang, John Tran, David Luebke, “All-Frequency Relighting of Glossy Objects”, ***ACM Transactions on Graphics*** 25(2), 2006, pp. 293–318. (Cited **34** times).
- [16] Nolan Goodnight, Rui Wang, Greg Humphreys, “Computation on Programmable Graphics Hardware”, ***IEEE Computer Graphics and Applications*** 25(5), 2005, pp. 12–15. (Cited **36** times).
- [17] Rui Wang, John Tran, David Luebke, “All-Frequency Interactive Relighting of Translucent Objects with Single and Multiple Scattering”, ***ACM Transactions on Graphics*** 24(3), [*Proceedings of ACM SIGGRAPH 2005*, Acceptance rate: 21%], 2005, pp. 1202–1207. (Cited **73** times).

### **Refereed Conference Publications**

- [18] Richard B. Foster, Rui Wang, Sridhar Mahadevan, “A GPU-based Approximate SVD Algorithm”, *Proceedings of the 9<sup>th</sup> Intl. Conf. on Parallel Processing and Applied Mathematics (PPAM) 2011*, to appear on Springer Lecture Notes in Computer Science (LNCS).
- [19] Oskar Akerlund, Mattias Unger, Rui Wang, “Precomputed Visibility Cuts for Interactive Re-lighting with Dynamic BRDFs”, In *Proceedings of Pacific Graphics (PG) 2007*, pp. 161–171. [Acceptance rate: 22%]. (Cited **13** times).
- [20] Rui Wang, Jiajun Zhu, Greg Humphreys, “Precomputed Radiance Transfer for Real-time Indirect Lighting using a Spectral Mesh Basis”, In *Proceedings of Eurographics Symposium on Rendering (EGSR) 2007*, pp. 13–22. [Acceptance rate: 35%]. (Cited **10** times).
- [21] Jiajun Zhu, Greg Humphreys, David Koller, Skip Steuart, Rui Wang, “Fast Omni-directional 3D Scene Acquisition with an Array of Stereo Cameras”, *Proceedings of IEEE Intl. Conf. on 3-D Digital Imaging and Modeling (3DIM) 2007*, pp. 217–224. [Acceptance rate: 38%].

- [22] Rui Wang, Ren Ng, David Luebke, Greg Humphreys, “Efficient Wavelet Rotation for Environment Map Rendering”, In *Proceedings of Eurographics Symposium on Rendering (EGSR) 2006*, pp. 173–182. [Acceptance rate: 36%]. (Cited **35** times).
- [23] Rui Wang, John Tran, David Luebke, “All-Frequency Relighting of Non-Diffuse Objects using Separable BRDF Approximation”, In *Proceedings of Eurographics Symposium on Rendering (EGSR) 2004*, pp. 345–354. [Acceptance rate: 39%]. (Cited **76** times).
- [24] Rui Wang and David Luebke, “Efficient Reconstruction of Indoor Scenes with Color”, In *Proceedings of Intl. Conf. on 3-D Digital Imaging and Modeling (3DIM) 2003*, pp. 402–409. [Acceptance rate: 40%]. (Cited **7** times).
- [25] Nolan Goodnight, Rui Wang, Cliff Woolley and Greg Humphreys, “Interactive Time Dependent Tone Mapping using Programmable Graphics Hardware”, In *Proceedings of Eurographics Symposium on Rendering (EGSR) 2003*, pp. 26–37. [Acceptance rate: 37%]. (Cited **62** times).

### **Refereed Posters**

- [26] Richard B. Foster and Rui Wang, “Hierarchical Upsampling for Fast Image-based Depth Estimation”, *ACM SIGGRAPH 2011*, refereed poster.
- [27] Hong Yuan and Rui Wang, “Dynamic Scene Relighting using Precomputed Visibility Cuts and Multi-level Shadow Grids”, *ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D) 2009*, refereed poster.
- [28] Tenghui Zhu, Rui Wang, David Luebke, “A GPU-Accelerated Render Cache”, In *Proceedings of Pacific Graphics (PG) 2005*, refereed short paper.

### **Unrefereed Technical Reports**<sup>2</sup>

- Yahan Zhou and Rui Wang, “A Computational Algorithm for Creating Geometry Dissection Puzzles”, *UMass Technical Report UM-CS-2011-028*, 2011.
- Richard B. Foster, Rui Wang, and Rod Grupen, “A Mobile Robot for Autonomous Scene Capture and Rendering”, *UMass Technical Report UM-CS-2011-019*, 2011.
- Hamed Soroush, Rui Wang, Brian Levine, and Mark Corner, “Digital Image Enhancement using a Vehicular Image Capturing Platform”, *UMass Technical Report UM-CS-2011-002*, 2011.
- Richard B. Foster and Rui Wang, “Discontinuity Preserving Multi-View Synthesis”, *UMass Technical Report UM-CS-2009-054*, 2010.
- David Maletz, John C. Bowers, and Rui Wang, “Reflectance Filtering for Interactive Global Illumination in Semi-Glossy Scenes”, *UMass Technical Report UM-CS-2009-057*, 2009.

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<sup>2</sup> Technical reports that later became refereed publications are not included here.

## HONORS AND AWARDS

- ACM Recognition of Service Award (for service contributions to ACM I3D 2011), 2011
- National Science Foundation CAREER Award, 2008.
- UMass Faculty Research Grant (FRG) Award, 2008.
- Winner of UVA's 2003 Rendering Competition, University of Virginia, 2003
- Outstanding Graduation Thesis Award, Zhejiang University, China, 2001
- Graduated with University Distinction, Zhejiang University, China, 2001
- Baoshan Steel Corporation Fellowship, Zhejiang University, China, 2000
- Eastcom Corporation Fellowship, Zhejiang University, China, 1999

## RESEARCH FUNDING

- Rui Wang (PI), Research Gift Fund, Robert Bosch Research, 2011–2012, \$50,000.
- Rui Wang (co-PI), with Sridhar Mahadevan (PI), "*Manifold Alignment of High-Dimensional Data Sets*", National Science Foundation CCF-1025120, 2010–2013, \$499,909.
- Rui Wang (PI), "*CAREER: Nonlinear Processing of Light Transport Data for Realistic Computer Imagery*", National Science Foundation CCF-0746577, 2008–2013, \$400,000.
- Rui Wang (PI), UMass Faculty Research Grant (FRG) award, "*Real-time Image Synthesis using Pre-captured Illumination Datasets*", 2008–2009, \$15,000.
- Rui Wang (PI), NVIDIA Faculty Partnership, graphics hardware support, 2008–present.

## INVITED TALKS

- "*Parallel Poisson Disk Sampling with Spectrum Analysis on Surfaces*"  
May 26, 2011 University of Konstanz, Konstanz, Germany  
Mar 1, 2011 Department of Math, UMass Amherst, MA  
Dec 10, 2010 Georgia Institute of Technology, Atlanta, GA  
Oct 20, 2010 Zhejiang University, Hangzhou, China
- "*Interactive Global Illumination using Points*"  
Oct 13, 2010 ChinaGraph, Nanjing, China (**Invited Keynote**)  
Dec 20, 2010 KAIST, Daejeon, South Korea
- "*Efficient and Realistic Rendering using A Nonlinear Cut Representation*"  
Jul 14, 2009 Microsoft Research Asia, Beijing, China  
Jul 22, 2009 Zhejiang University, Hangzhou, China  
Jul 28, 2009 Tsinghua University, Beijing, China
- "*Fast, Realistic Illumination using Nonlinear Piecewise Constants*"  
Oct 31, 2008 Williams College, MA  
May 7, 2008 MIT, Cambridge, MA  
May 8, 2008 Harvard University, Cambridge, MA

- *“Interactive Rendering of Realistic Illumination Models”*  
Oct 2, 2006 University of Delaware, Newark, DE  
May 24, 2006 Stony Brook University, Stony Brook, NY
- *“Precomputed Radiance Transport”*  
May 3, 2005 CS 647 Guest Lecture, University of Virginia, Charlottesville, VA
- *“Efficient Reconstruction of Indoor Scenes with Color”*  
June 5, 2003 University of North Carolina at Chapel Hill, Chapel Hill, NC

## TEACHING EXPERIENCE

### *Assistant Professor*

### *University of Massachusetts Amherst, MA*

- S 2011 CMPSCI 474: *Image Synthesis*  
Revised from CMPSCI 491K. Semi-required course of the RVG track.
- F 2010 CMPSCI 473: *Introduction to Computer Graphics*
- S 2010 CMPSCI 187: *Programming with Data Structures*  
Undergraduate core course. Completely redesigned with new lectures, programming assignments, and exams.
- F 2009 CMPSCI 473: *Introduction to Computer Graphics*  
Revised from 591B. Required course of the *Robotics, Vision, and Graphics* (RVG) track.
- S 2009 CMPSCI 691AD: *General Purpose Computation on the GPU*.  
New graduate course.
- F 2008 CMPSCI 691AC: *Computational Photography*  
New graduate course.
- F 2008 CMPSCI 473/673: *Introduction to Computer Graphics*
- S 2008 CMPSCI 491K/691MM: *Advanced Image Synthesis*  
New undergraduate course.
- F 2007 CMPSCI 591B: *Introduction to Computer Graphics*  
Revised from the previous semester with new lectures, assignments, and exams.
- S 2007 CMPSCI 591B: *Introduction to Computer Graphics*  
New undergraduate course.

## ADVISING

- ***PhD Students***  
Zhaoliang Lun (entered in Fall 2011)  
Haibin Huang (entered in Fall 2011)  
Yahan Zhou (entered in Fall 2010)  
John C. Bowers (entered in Fall 2009)

- **Master Students**

Richard B. Foster	(graduated in Spring 2011, now at United Technologies, Hartford, MA)
David Maletz	(graduated in Fall 2010, now an independent game developer)
Hong Yuan	(graduated in Fall 2009, now at Disney Interactive Studios, Austin, TX)
Oskar Akerlund	(exchange student from Linköping Univ., completed MS at UMass in 2008)
Mattias Unger	(exchange student from Linköping Univ., completed MS at UMass in 2008)
  
- **Other Graduate Students**

Jurgen Laurijssen	(visiting student in Fall 2009, K.U. Leuven, Belgium)
Gu Ye	(visiting student in Fall 2008, Zhejiang University, China)
Yannan Shen	(independent study, MS, Math)
  
- **Undergraduate Students**

Walter Stumpf	(summer REU and independent study in 2011)
Stephen Giguere	(summer REU in 2011)
Jonathan Leahey	(summer REU in 2010)
Jim Gummeson	(summer REU in 2010)
Andrew Chan	(independent study in 2011)
Matthew Meehan	(independent study in 2008)
William Baumann	(independent study in 2007)
  
- **Committee Members**

Jurgen Laurijssen	(PhD, external member, K.U. Leuven, Belgium)
Tian Xia	(PhD, external member, Univ. of Illinois Urbana-Champaign)
Yu-Chi Lai	(PhD, external member, Univ. of Wisconsin-Madison)
Audrey Lee	(PhD, UMass Amherst)
Mark McCartin-Lim	(Synthesis Project, UMass Amherst)
Hamed Soroush	(Synthesis Project, UMass Amherst)
Marwan Mattar	(Synthesis Project, UMass Amherst)
Richard B. Foster	(Synthesis Project, UMass Amherst)
Christopher Giroir	(Masters, CS, UMass Amherst)
Sripati Sah	(Masters, MIE, UMass Amherst)

## EXTERNAL SERVICE

- **Conference and Program Chairs**
  - Papers Co-Chair, ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D) 2012
  - General Co-Chair, ACM SIGGRAPH Symposium on Interactive 3D Graphics and Games (I3D) 2011
  
- **Session Chairs at Conferences**
  - Eurographics Symposium on Rendering (EGSR) 2011, chaired Paper Session “*Accelerating Global Illumination*”

ACM I3D 2010, chaired the Poster Session, and Paper Session “*Shadows and Transparency*”  
Pacific Graphics 2007, chaired Paper Session “*Rendering I*”

- **Technical Program Committees**

SIGGRAPH Asia 2009

Eurographics Symposium on Rendering (EGSR) 2009, 2010, 2011

Pacific Graphics (PG) 2007, 2009, 2010, 2011

ProCams Workshop 2009

- **Journal/Conference Paper Reviewing**

ACM SIGGRAPH 2005–2011

ACM SIGGRAPH Asia 2008–2011

Eurographics 2005–2009

Eurographics Symposium on Rendering (EGSR) 2005–2011

Pacific Graphics (PG) 2006–2011

ACM Transactions on Graphics (TOG)

IEEE Transactions on Visualization and Computer Graphics (TVCG)

Journal of Visual Communication and Image Representation (JVCIP)

IEEE Visualization

- **Panelist**

National Science Foundation, 2007

National Science Foundation, 2008

## DEPARTMENTAL SERVICE

- **Committee Member**

Undergraduate Program Committee (Faculty-in-charge for the CS minor program) (2010–2011)

Undergraduate Program Committee (2009–2010)

Graduate Program Committee (2008–2009)

Personnel Committee (2007–2008)

Graduate Admissions Committee (2006–2007, 2007–2008)

Curriculum Committee (2006–2007)

- **Speaker**

ACM Chapter Meeting, Fall 2010

Undergraduate First Friday Meeting, Fall 2006, Spring 2011

Systems Lunch, Fall 2007

CMPSCI 191A (RAP) Seminar, Fall 2006, Fall 2007, Fall 2008

Professionalism Seminar, Fall 2006