

Overall Research Objective

To build effective Virtual Reality Experiences by merging concepts from HCI, computer graphics, vision, and computational photography to advance interfaces and model acquisition processes.

Research Interests and Track Record

The focus of my research is on how to create effective usable 3D environments. Towards this endeavour I have covered a number of diverse topics during my postdoctoral research career; I have studied problems spanning Virtual Reality, Multi-modal/Human Computer Interaction, Visual Perception, Image Processing, and 3D modelling from photographs. All my research has been united by a user centric perspective, and designed to achieve the best possible human computer experience. My most recent significant contribution on 3D model recovery for the built environment/cultural heritage (Daedalus project EP/D069734/1) was published in ACM-SIGGRAPH 2008, and also featured in New Scientist, YouTube (> 43,000 hits), numerous technical news web sites, photography news sites, and local newspapers. This work has also been used to acquire 3D models for a dome-projected movie about the ancient Mayan Civilisation.

My research has been published in consistently high-ranking international conferences and journals: ACM-SIGGRAPH, ACM TOG, IEEE-VR, ACM-TAP, ACM-TOCHI, IEEE-TVCG. I served as a founder member and chairperson of the Manchester ACM-SIGGRAPH professional chapter through which I successfully attracted leading graphics practitioners to give talks, raising the international profile of graphics at Manchester. I have delivered courses at the premier international graphics conferences Eurographics, ACM-SIGGRAPH and Loughborough University. As Courses Chair for ACM-SIGGRAPH 2009 I lead the design of the core education curriculum for the conference. I am currently serving as General Submissions Chair for SIGGRAPH 2017.

Key Publications - REF Standard

1. **Journal:** A Perceptually Validated Model for Surface Depth Hallucination, *Mashhuda Glencross, Gregory J. Ward, Caroline Jay, Jun Liu, Francho Melendez and Roger Hubbard*, In Transactions on Graphics (ACM-SIGGRAPH), 27 (3), 59:1 - 59:8, 2008.

Five-year impact factor: 4.997 (highest in the ISI "Computer Science / Software Engineering" category).

2. **Conference:** Effective Cooperative Haptic Interaction over the Internet, *Mashhuda Glencross, Caroline Jay, Jeff Feasel, Luv Kohli, Mary Whitton, and Roger Hubbard*, In Proceedings of IEEE Virtual Reality, pp. 115 - 122, Charlotte, North Carolina, March 2007.

IEEE VR is the top venue for VR research - in 2007 the acceptance rate was 26/130 = 20%.

3. **Journal:** Modelling the Effects of Delayed Haptic and Visual Feedback in a Collaborative Virtual Environment, *Caroline Jay, Mashhuda Glencross and Roger Hubbard*, ACM Transactions on Computer Human Interaction (TOCHI), 14(2), 2007.

TOCHI is in the top 7.86% of Computer Science outlets - <http://citeseer.ist.psu.edu/impact.html>.

4. **Journal:** A Network Architecture Supporting Consistent Rich Behaviour in Collaborative Interactive Applications, *James Marsh, Mashhuda Glencross, Steve Pettifer, and Roger Hubbard*, In IEEE Transactions on Visualization and Computer Graphics, 12(3):405 - 416, May 2006.

Five year impact: 2.706, position 15 in the ISI "Computer Science / Software Engineering" category.

Positions and Appointments

I am R&D Director for Pismo Software through which I carry out research consulting services. Previously I was a lecturer in Computer Science at Loughborough University (UK) where I taught Advanced HCI, Computational Photography and Computer Graphics courses. I was also the Research Seminars Co-ordinator and chair of the Industrial Liaison Committee. Prior to this, I worked for ARM Ltd as a Graphics product manager. One of my key responsibilities at ARM was to educate people about ARM's graphics innovation at key international research conferences and trade shows. During my time at ARM, I also served as a visiting fellow at Loughborough University and was instrumental in designing and delivering a new MSc module on their Digital Imaging course. I have held several postdoctoral research contracts at The University of Manchester. As a research Fellow, I took a lead role on the EPSRC funded project (Daedalus) to acquire perceptually accurate 3D models of the built environments from photographs. This is especially valuable in architectural planning and visual impact assessment.

As a Research Associate, I worked on projects to facilitate human computer interaction processes in engineering and scientific visualisations applications. In particular, I designed, implemented and validated mechanisms to facilitate haptic (sense of touch) collaboration (EPSRC funded Collaborative Haptics project), built a software framework forming the basis of a tool to visualise oceanographic data (NERC funded Godiva project), and designed software to render complex mechanical CAD assemblies on a project to facilitate shared virtual prototyping (EU funded DIVIPRO project).

As a Research Assistant, I worked on a project to build a decision support system to aid decision makers in a Nuclear Emergency (EU funded RODOS). Prior to these, I was employed as a teaching assistant while studying part-time for my PhD.

2010 - Present	R&D Director at Pismo Software	Oxford
2011 - 2016	Lecturer	Loughborough University
2010 - 2011	Graphics Product Manager	ARM Ltd, Cambridge
2010 - 2010	Visiting Fellow	Loughborough University
2006 - 2010	Research Fellow	The University of Manchester
2000 - 2006	Research Associate	The University of Manchester
1999 - 2000	Research Assistant	The University of Manchester
1994 - 1999	Teaching Assistant	The University of Manchester

Education

I was attracted to Computer Science as a postgraduate after seeing a fly-through over a textured terrain on a Silicon Graphics workstation. This motivated me to change discipline and learn specifically about graphics. The University of Manchester School of Computer Science was well equipped with graphics technology and so was a good choice for my postgraduate studies. My PhD research was supported through a part-time teaching post at The University of Manchester.

1994 - 2000	PhD (part-time): A Framework for Physically-Based Modelling in Virtual Environments	The University of Manchester
1992 - 1993	MSc Computer Science	The University of Manchester
1989 - 1992	BSc Polymer Science and Technology	The University of Manchester

Key Research Grants

Full list of projects available at <http://pismoftware.co.uk/mashhuda/projects.htm>

I initiated, authored and took a lead role in managing the first eight funded grants listed below (2005 - 2016), and actively contributed to grants worth a total of over £1.5M). During the preparation of these bids, I carried out budget planning, proposed project timelines, deliverables and milestones. Prior to this, I assisted with the preparation of an earlier grant on which I was a named RA (2003 - 2006).

2014 - 2016	Principal Investigator - Smart Materials in Automotive - Study of materials for use in novel automotive applications - BMW (£120,000).
-------------	--

2013 – 2016	Principal Investigator – Tool Independent Materials – Study materials appearance transfer methods – (£60,000) DFKI/BMW.
2012 – 2015	Principal Investigator – Reflecting on Reflectance –Recovering material models from images. KiSP (£240,000)
2011 – 2012	Principal Investigator – Relight – Recovering Outdoor Sets for Movie Post Production – EPSRC-KTA (£74,551). Collaborators: The Foundry Visionmongers Ltd.
2010 – 2011	Principal Investigator – Recovering Surface Relief for Building Facades – Industrially funded project (£56,000). Collaborators: Activision Inc. Awarded to Pismo Software.
2006 – 2009	Research Co Investigator – Daedalus Project – EPSRC (£721,282) grant EP/D069734/1 Collaborators: Gregory Ward, Napper Architects and Warwick Digital Laboratory.
2006 – 2007	Principal Investigator – Psychophysics on HDR Displays – Industrially funded project (£25,000) Collaborators: Dolby Canada (Formerly BrightSide Technologies).
2005 – 2006	Co Investigator – Directed Attention – EPSRC (£55,216) grant EP/D036518/1 Collaborators: The University of Bristol.
2003 – 2006	Named RA – Collaborative Haptics – EPSRC (£221,006) grant GR/523087/01 Collaborators: Prof. Fred Brooks’ EVE Group, UNC-CH.

Teaching and Administration Experience

My most recent teaching and admin experience was at Loughborough University.

I was also responsible for the courses part of the ACM-SIGGRAPH education programme for 2009. Together with Dave Shreiner from Unity, we designed the core courses curriculum for the conference, and invited courses on exciting new topics. This core programme was also combined with juried content. I chaired the courses selection sub-committee overseeing the inclusion of juried material.

2010 – 2016	<p>Designed and lectured Computer Graphics to second year degree students.</p> <p>Designed and lectured Advanced HCI to final year degree students.</p> <p>Designed and lectured Computational Photography as part of the MSc in Digital Imaging.</p> <p>Personal tutoring, Final year, MSc and PhD project supervision and external examining duties.</p> <p>Research Seminars Co-ordinator and chair of the Industrial Liaison Committee.</p>
2006 – 2009	<p>Core curriculum for ACM-SIGGRAPH 2009.</p> <p>Co-supervision of MSc and PhD students and project management.</p> <p>Outreach activities via ACM-SIGGRAPH Chapter.</p>
1994 – 2000	<p>Lectured second year human computer interaction course to 200 students.</p> <p>Lectured first year professional issues course to over 200 students.</p> <p>Assisted with teaching of MSc level programming courses.</p> <p>Supervised third year projects in graphics.</p> <p>Taught second year algorithms tutorials and examples classes.</p> <p>Undertook laboratory management duties.</p> <p>Assisted with open days, applicant visits and undergraduate recruitment.</p>

Professional Development

I have attended a number of professional development courses, offered by the University of Manchester and Loughborough University, to develop transferable skills that are useful both for communicating research and also to facilitate transitioning into a teaching role.

The technical workshops attended at SIGGRAPH were part of the continued professional development programme at the conferences and involved specific practical sessions.

May 2012	Completed New Lecturers Course Units
November 2009	Work to the Strengths of your Personality Workshop.
October 2009	Creativity Workshop.
May 2009	Stand and Deliver (Vox Coaching).
March 2009	Managing Research Relationships (Vox Coaching).
November 2008	How to write Fellowship Applications.
February 2007	Communicating Science to the Public.
November 2006	Grantsmanship Course.
August 2006	Art for Graphics (SIGGRAPH Professional Development Workshop).
August 2004	Introduction to Maya (SIGGRAPH Professional Development Workshop).
August 2002	Shader Programming (SIGGRAPH Professional Development Workshop).
April 2001	Scientific Writing Course.
July 2000	Teaching Java Programming.
October 1998	Statistics for Scientists.
1996 – 1997	Thesis Writing Seminar Series.
January 1995	Introductory Counselling Skills.
1995 – 1996	Dynamical Systems and Chaos Theory (Department of Mathematics).
September 1994	Teaching Methods Course (Now called the New Academics Programme).

Esteem Indicators

2016 – 2017	General submissions chair for SIGGRAPH 2016 and 2017.
2011 – 2017	Member of ACM Europe Council.
2013 – 2016	Chair of ACM SIGGRAPH Professional and Student Chapters Committee
2011 – 2013	VC of ACM SIGGRAPH Professional and Student Chapters Committee.
2009 – Present	Nominations Committee ACM SIGGRAPH.
2009 – Present	Professional and Student Chapters Committee ACM SIGGRAPH
2008 – 2009	Courses Chair for ACM-SIGGRAPH 2009.
2008 – 2009	General submissions jury member for ACM-SIGGRAPH 2009.
2009 – 2013	Co-ordinator of the ACM-SIGGRAPH European Chapters Sub-Committee.
February 2009	Chair of the 21 st Century Researcher Conference at Manchester.
2006 – 2010	Founder / Chairperson of ACM-SIGGRAPH Manchester Professional Chapter.
August 2006	Organised and presented a full day course on Exploiting Perception in High-Fidelity Virtual Environments at the ACM-SIGGRAPH conference.
September 2005	Organised and presented a half-day tutorial on Interaction in Distributed Virtual Environments at the Eurographics conference.
2000 – Present	Reviewer for ACM-SIGGRAPH, SIGGRAPH Asia, IEEE-VR, ACM-TAP, IEEE

Transactions on Haptics, JVRB, GRAPP, and Presence and regularly serve on IPCs and conference committees (SIGGRAPH, GRAPP, Afrigraph, Graphite, TPCG, CVMP).

2000 – 2006

Developed two complete software frameworks, MAVERIK++ (a graphics software system) and the Collaborative Haptics Framework (a haptics software system).

Membership of Professional Bodies

2004 – Present

ACM/ ACM-SIGGRAPH member.

Invited Talks

I have been invited to give talks at a number of top international and national universities, and leading research labs.

August 2011	State of the Art of CG Research in Europe, SIGGRAPH Vancouver (BC, Canada).
August 2011	Relightable Buildings from Images, University of British Columbia (BC, Canada).
August 2011	Relightable Buildings from Images, Simon Fraser University (BC, Canada).
June 2011	Career Options for PhDs and Researchers, The University of Manchester (UK).
April 2011	Research Ideas for Postproduction, The Foundry (UK).
September 2010	Relightable Buildings from Images, Loughborough University (UK).
February 2010	WebGL: The Future of W3D, ARM, Cambridge (UK).
November 2009	Plausible Material Appearance from Images, Birmingham University (UK).
November 2009	Plausible Material Appearance from Images, Disney Tech Talk. Zurich.
October 2009	Bringing Pictures to Life: High Quality Imaging for All, Disney Black Rock (UK).
October 2009	Plausible Material Appearance from Images, UCL, London (UK).
August 2009	3D Digital Content from Images, Digital Domain, Los Angeles (USA).
August 2009	3D Digital Content from Images, USC-ICT, Los Angeles (USA).
August 2009	3D Digital Content from Images, Activision, Los Angeles (USA).
March 2009	Running a SIGGRAPH Chapter on a Shoestring, Bristol University (UK).
March 2007	Directing User Attention, University of North Carolina (USA).
October 2004	Haptically Enabled Virtual Environments, Bristol University (UK).
August 2004	A Framework for Haptic Rendering of Large-Scale Virtual Environments, University of North Carolina (USA).
August 2000	Distributed Interactive Virtual Prototyping in the Face of Network Latency, Boeing Corporation, Seattle (USA).

External Consultancy

March 2010 – Present

Consulting to Activision Inc, KiSP and Yulio Inc.

April 2008 – Dec 2009

Mayaskies project, 3D model acquisition for digital content creation for a dome projected movie - <http://mayaskies.net/>.

Movie Credits

April 2010

Tales of the Maya Skies, full dome planetarium show - <http://www.mayaskies.org/>.

Appendix 1

Full List of Publications

Journal Contributions

1. Woven Fabric Model Creation from a Single Image, *G. C. Guarnera, P. Hall, A. Chesnais, M. Glencross, to appear* in ACM Transactions on Graphics.
2. BRDF Representation and Acquisition, *D. Guarnera, G. C. Guarnera, A. Ghosh, C. Denk, and M. Glencross*, Computer Graphics Forum, 35: 625–650, 2016.
3. BSSRDF Estimation from Single Images, *Adolfo Munoz, Jose I. Echevarria, Francisco J. Seron, Jorge Lopez-Moreno, Mashhuda Glencross and Diego Gutierrez*, In The international journal of the Eurographics Association, 30(20), April 2011, pp.455-464.
4. A Perceptually Validated Model for Surface Depth Hallucination, *Mashhuda Glencross, Gregory J. Ward, Caroline Jay, Jun Liu, Francho Melendez and Roger Hubbard*, In Transactions on Graphics (ACM-SIGGRAPH), 27 (3), 59:1 – 59:8, 2008.
5. Using Haptic Cues to Aid Non-Visual Structure Recognition, *Caroline Jay, Robert Stevens, Roger Hubbard and Mashhuda Glencross*, ACM Transactions on Applied Perception, 5(2), 2008.
6. Modelling the Effects of Delayed Haptic and Visual Feedback in a Collaborative Virtual Environment, *Caroline Jay, Mashhuda Glencross and Roger Hubbard*, ACM Transactions on Computer Human Interaction (TOCHI), 14(2), 2007.
7. How People use Presentation to Search for a Link: Expanding the Understanding of Accessibility on the Web, *Caroline Jay, Robert Stevens, Mashhuda Glencross, Alan Chalmers, and Cathy Yang*, Universal Access in the Information Society, pp. 307 – 320, Springer, 2007.
8. A Network Architecture Supporting Consistent Rich Behaviour in Collaborative Interactive Applications, *James Marsh, Mashhuda Glencross, Steve Pettifer, and Roger Hubbard*, In IEEE Transactions on Visualization and Computer Graphics, 12(3):405 – 416, May 2006.
9. An Overview of Cluster Solutions for Immersive Displays, *Anthony Steed, Mashhuda Glencross and Allen Bierbaum*, In Presence: Teleoperators and Virtual Environments, Volume 12, Issue 4, August 2003.

Conference Contributions

10. Consistent Tool-Independent Virtual Material Appearance, *Dar'ya Guarnera, Giuseppe Claudio Guarnera, Cornelia Denk, and Mashhuda Glencross*, S&T Electronic Imaging 2017, Burlingame, California USA.
11. High-Resolution Relightable Buildings from Photographs, *Francho Melendez, Mashhuda Glencross, Gregory J. Ward and Roger J. Hubbard*, presented in SIGGRAPH talks, Vancouver, 2011.
12. Relightable Buildings from Images, *Francho Melendez, Mashhuda Glencross, Gregory J. Ward and Roger Hubbard*, In Eurographics: Special Area on Cultural Heritage, Llandudno, April 2011.
13. A Case Study Evaluation: Perceptually Accurate Textured Surface Models, *Gregory J. Ward and Mashhuda Glencross*, In the ACM Symposium on Applied Perception in Graphics and Visualization(APGV), Crete, September 2009.
14. Effective Cooperative Haptic Interaction over the Internet, *Mashhuda Glencross, Caroline Jay, Jeff Feasel, Luv Kohli, Mary Whitton, and Roger Hubbard*, In Proceedings of IEEE Virtual Reality, pp. 115 – 122, Charlotte, North Carolina, March 2007.

15. How People Use Presentation to Search for a Link: Expanding the Understanding of Accessibility on the Web, *Caroline Jay, Robert Stevens, Mashhuda Glencross, and Alan Chalmers*, In Proceedings of W4A, International Cross-Disciplinary Workshop on Web Accessibility, pages 113-120, Edinburgh, Scotland, ACM Press, May 2006.
16. Dynamic Primitive Caching for Haptic Rendering of Large-Scale Models, *Mashhuda Glencross, Roger Hubbard and Ben Lyons*, In IEEE worldHAPTICS First Joint Eurohaptics Conference and Symposium on Haptic Interfaces for Virtual Environments and Teleoperator Systems, pp. 517 – 518, Pisa, Italy, March 2005.
17. Minimising Latency and Maintaining Consistency in Distributed Virtual Prototyping, *James Marsh, Mashhuda Glencross, Steve Pettifer, Roger Hubbard, Jon Cook, and Sylvain Daubrenet*, In Proceedings of ACM-SIGGRAPH Conference on the Virtual Reality Continuum and its Applications in Industry (VRCAI04), pp. 386 – 389, Singapore, June 2004.
18. A Framework for Haptic Rendering of Large-Scale Virtual Environments, *Mashhuda Glencross and Roger Hubbard*, In SIGGRAPH Sketches and Applications Programme, Los Angeles, August 2004.
19. DIVIPRO: Distributed Interactive Virtual PROtotyping, *Mashhuda Glencross, James Marsh, Jon Cook, Sylvain Daubrenet, Steve Pettifer and Roger Hubbard*, In SIGGRAPH Sketches and Applications Programme, San Antonio, 2002.
20. WEAVE: Interaction and Visualization for Grid Enabled Environments using Commodity Hardware, *S.Pettifer, J. Marsh, M. Glencross, and J. M. Brooke*, In Proceedings of 1st All-Hands Meeting of the UK e-Science Programme, September 2002.
21. Iota: An Approach to Physically-Based Modelling in Virtual Environments, *Mashhuda Glencross, Toby Howard and Steve Pettifer*, IEEE Virtual Reality Conference, Yokohama, Japan, pp. 287-288, March 2001.
22. Managing the Complexity of Physically Based Modelling in Virtual Reality, *Mashhuda Glencross and Alan Murta*, Fourth international conference of Computer Graphics and Artificial Intelligence, Limoges, pp. 41-48, May 2000.
23. A Virtual Jacob's Ladder, *Mashhuda Glencross and Alan Murta*, Graphicon, Moscow, pp. 88-94, august 1999.
24. Multi-body Simulation in Virtual Environments, *Mashhuda Glencross and Alan Murta*, Simulation -- Past, Present and Future. 12th European Simulation Multiconference, edited by Richard Zobel and Dietmar Moeller, Manchester, England, pp. 590-594, June 1998.
25. Mirages, *Mashhuda Khote and Toby Howard*, Eurographics UK 15th Annual Conference, Norwich, England, pp. 223-235, March 1997.

Courses and Tutorials

26. Material Capture and Representation with Applications in Virtual Reality, *Giuseppe Claudio Guarnera, Abhijeet Ghosh, Ian Hall, Mashhuda Glencross and Dasha Guarnera*, SIGGRAPH short course, Los Angeles, July 2017.
27. Capturing and Representing BRDFs for Virtual Reality, *Dasha Guarnera, Giuseppe Claudio Guarnera, Abhijeet Ghosh, Ian Hall, and Mashhuda Glencross*, SIGGRAPH Asia short course, Macao, Dec 2016.
28. Computation & Cultural Heritage: Fundamentals and Applications: Special section on Simple Efficient Visualization of Heritage Objects, *Delivered by Mashhuda Glencross*, SIGGRAPH Full-Day course, New Orleans, August 2009.
29. Exploiting Perception in High-Fidelity Virtual Environments, *Mashhuda Glencross, Alan G. Chalmers, Ming C. Lin, Miguel A. Otaduy, and Diego Gutierrez*, SIGGRAPH Full-Day course, Boston, August 2006.
30. High Fidelity Collaborative Virtual Environments, *Mashhuda Glencross and Alan Chalmers*, Afrigraph Tutorial, Cape Town, January 2006.

31. Interaction in Distributed Virtual Environments, *Mashhuda Glencross, Miguel Otaduy, and Alan Chalmers*, Eurographics Tutorial, Dublin, August 2005.

Thesis

32. Doctoral Thesis: A Framework for Physically Based Modelling in Virtual Environments, *Mashhuda Glencross*, Department of Computer Science, University of Manchester, 2000.

33. Masters Thesis: Modelling Natural Meteorological Phenomena, *Mashhuda Khote*, Department of Computer Science, University of Manchester, 1993.

Appendix 2

Summary Sheet

The metrics summarising the contributions I have made to date are provided here for convenience. The page numbers beside the metric refer to where the information appears on my CV.

Postdoctoral research experience	17 years (pp 2)
Project lead role	6 years (pp 2)
Principal Investigator: Industrial and EPSRC	7 (pp 2 - 3)
Co Investigator: EPSRC funded grants	2 (pp 3)
Named Researcher: EPSRC funded grants	1 (pp 3)
Researcher: EU funded grants	3 (pp 3)
Teaching experience	6 years (pp 3)
MSc lecture courses	1 (pp 3)
Undergraduate lecture courses	6 (pp 3)
Third year projects supervised	24 (pp 3)
Postgraduate students co-supervised	5 (pp 3)
Continued Professional Development Training	18 (pp 4)
Membership of professional bodies	2 (pp 5)
Conference Programme committees	10 (pp 4)
Chairperson roles	6 (pp 4)
Software frameworks	2 (pp 5)
International invited talks	10 (pp 5)
National invited talks	9 (pp 5)
External consultancy	4 (pp 5)
Movie credits	1 (pp 5)
Journal Contributions	9 (pp 6)
Conference Contributions	16 (pp 6 - 7)
Conference courses and Tutorials	6 (pp 7 - 8)
Thesis	2 (pp 8)
Total publications	33 (pp 6 - 8)

Research Keywords

3D Scanning/Imaging/Reconstruction	Virtual Reality/Blended Environments
Image Processing	User Studies
Computational Photography	Human Computer Interaction
Visual Perception	User Interfaces
Texture Modelling/Synthesis	Multi-modal Interaction
Cultural Heritage	Physically-based Simulation