Robert Walker Sumner

Curriculum Vitae

Personal information

name	Robert Walker Sumner
citizenship	USA
birthdate	8 July 1975
address	Disney Research Zurich Clausiusstrasse 49 CH-8092 Zurich, Switzerland
phone	+41 44 632 73 78
fax	+41 44 632 15 16
email	sumner@disneyresearch.com
website	http://www.disneyresearch.com/

Education

2001–2005 **Ph.D. in Electrical Engineering and Computer Science**
Massachusetts Institute of Technology, Cambridge, Massachusetts
Computer Science and Artificial Intelligence Laboratory

1998–2001 **M.S. in Electrical Engineering and Computer Science**
Massachusetts Institute of Technology, Cambridge, Massachusetts
Laboratory for Computer Science

1994–1998 **B.S. in Computer Science**
Georgia Institute of Technology, Atlanta, Georgia
College of Computing

Ph.D. dissertation

title *Mesh Modification Using Deformation Gradients*

supervisor Jovan Popović

description I developed a differential specification of triangle mesh deformation that enabled two new applications in computer graphics: deformation transfer and mesh-based inverse kinematics.

awards MIT Sprowls Award Honorable Mention for Best Doctoral Thesis

Academic and professional experience

2008–present **Associate Director, Disney Research Zurich**
I lead a research group (two postdocs, three Ph.D. students) in animation and interactive graphics and assist with the overall lab management and interface between research and Disney's business units.

2005–2008 **Postdoctoral Researcher, ETH Zurich**
I led research projects focused on computer graphics in the Applied Geometry Group under Prof. Mark Pauly.

2002–2005 **Ph.D. Researcher, MIT Computer Science and Artificial Intelligence Laboratory**
My Ph.D. work focused on animation and geometric deformation, supervised by Prof. Jovan Popović.

Summer 1999, 2000, 2001 **Software Engineer, Pixar Animation Studios**
I worked in Pixar's Studio Tools group for three summers on the development of the animation software used to create Pixar's animated films.

1998–2002 **M.S. and Ph.D. Researcher, MIT Laboratory for Computer Science**
Under the supervision of Prof. Julie Dorsey in the Computer Graphics Group, I created a biologically motivated model of morphogenesis that can be used to add growth patterns to synthetic objects, increasing their visual realism.

1996–1998 **Research Assistant, Georgia Tech Animation Lab**
I worked with Prof. Jessica Hodgins and developed a simulation model of ground surfaces such as sand, mud, and snow that can be deformed by the impact of animated characters.

Summer 1996 **Research Assistant, New York University Media Research Lab**
I worked with Prof. Ken Perlin, helping to create a demonstration of autonomous character research for the Digital Bayou exhibit at SIGGRAPH 2006.

1994–1996 **Research Assistant, Georgia Tech Graphics, Visualization, and Usability Center**
I developed tools that address the needs of groups of scientists working on large, time-dependent scientific simulations.

Awards

2006 **Sprowls Award Honorable Mention for Best Doctoral Thesis** Massachusetts Institute of Technology

1998 **NSF Graduate Research Fellowship** Massachusetts Institute of Technology

1998 **SAIC Student Paper Competition** Georgia Institute of Technology

1998 **Michael A. J. Sweeney Best Student Paper Award** Canadian Human-Computer Communications Society

1998 **Sigma Xi Research Award** Georgia Institute of Technology

1998 **Outstanding Undergraduate Scholarship** Georgia Institute of Technology

1998 **Outstanding Rising Senior Award** Georgia Institute of Technology

1997 **Undergraduate Research Internship Program** Georgia Institute of Technology

1996 **Martin Marietta Scholarship** Georgia Institute of Technology

1994 **Florida Engineering Society Scholarship** Georgia Institute of Technology

1993 **Supercomputing Honors Program, Florida Delegate** Lawrence Livermore National Laboratory

Conference presentations and invited talks

November 2012 **Game Culture Innovation Brunch by Pro Helvetia** Lausanne, Switzerland
Innovation & Technology

July 2012 **House of Switzerland Creative Day at the 2012 Olympic Games** London, UK
Disney Research and Innovation In Entertainment

June 2012 **EXPRESSIVE Keynote (Computational Aesthetics, Sketch-Based Interfaces & Modeling, Non-Photorealistic Animation & Rendering)** Annecy, France
OverCoat: A Journey In Between Primary and Secondary Space

May 2012 **European Congress of Trauma & Emergency Surgery** Basel, Switzerland
Capturing, modeling, and animating the human face for special effects

November 2011 **Zurich Art School** Zurich, Switzerland
Disney Research and Innovation In Entertainment

July 2011 **La Journee Scientifique Lima Keynote** Lyon, France
Disney Research and Innovation In Entertainment

June 2011 **GameTeCH Switzerland, A Swissnex E3 Event** Los Angeles, California
Disney Research and Innovation in Entertainment

November 2010 **Motion in Games** Utrecht, The Netherlands
Visibility transition planning for dynamic camera control

June 2010 **Swissnex San Francisco** San Francisco, California
Disney Research Zurich: Not Your Father's Mickey Mouse

May 2010 **FMX2010** Stuttgart, Germany
New Technology for Classic Animation

March 2010 **X.DAYS Keynote** Interlaken, Switzerland
Disney Research and the Role of Technology in Entertainment Industry

October 2009 **Industrial Light and Magic** San Francisco, California
Visibility Transition Planning for Dynamic Camera Control

September 2009 **FANTOCHE Animation Festival** Baden, Switzerland
The ETH Game Programming Laboratory

March 2008 **Game Development in Computer Science Education** Miami, Florida
The ETH Game Programming Laboratory: A Capstone for Computer Science and Visual Computing

March 2006 **Tel Aviv University** Tel Aviv, Israel
Mesh Modification Using Deformation Gradients

March 2006 **Technion** Haifa, Israel
Mesh Modification Using Deformation Gradients

August 2005 **SIGGRAPH Paper Presentation** Los Angeles, California
Mesh-Based Inverse Kinematics

August 2005 **SIGGRAPH Paper Presentation** San Diego, California
Embedded Deformation for Shape Manipulation

April 2005 **ETH Zurich** Zurich, Switzerland
Mesh Modification Using Deformation Gradients

August 2004 **SIGGRAPH Paper Presentation** Los Angeles, California
Deformation Transfer for Triangle Meshes

June 1998 **Graphics Interface** Vancouver, Canada
Animating Sand Mud and Snow

May 1998 **GVU Brown Bag Series at Georgia Tech** Atlanta, Georgia
Animating Sand, Mud, and Snow

May 1996 **New York University** New York, New York
First steps in animation

Teaching

Spring 2012 **Game Programming Laboratory** Lecturer, ETH Zurich

Spring 2011 **Game Programming Laboratory** Lecturer, ETH Zurich

Spring 2010 **Game Programming Laboratory** Lecturer, ETH Zurich

Spring 2009 **Game Programming Laboratory** Lecturer, ETH Zurich

Fall 2008 **Introduction to Computer Graphics** Lecturer, ETH Zurich

Spring 2008 **Game Programming Laboratory** Lecturer, ETH Zurich

Fall 2007 **Introduction to Computer Graphics** Lecturer, ETH Zurich

Fall 2007 **Seminar on Advanced Topics in Computer Graphics** Student supervisor, ETH Zurich

Summer 2007 **Game Programming Laboratory** Lecturer, ETH Zurich

Winter 2006/07 **Introduction to Computer Graphics** Lecturer, ETH Zurich

Winter 2006/07 **Seminar on Advanced Topics in Computer Graphics** Student supervisor, ETH Zurich

Summer 2006 **Surface Representations and Geometric Modeling** Lecturer, ETH Zurich

Winter 2005/06 **Seminar on Real Time Graphics and Animation** Student supervisor, ETH Zurich

Winter 2005/06 **Graphische Datenverarbeitung 1** Assistant, ETH Zurich

Spring 2005 **Advanced Computer Graphics** Assistant, Massachusetts Institute of Technology

Spring 2004 **Advanced Computer Graphics** Assistant, Massachusetts Institute of Technology

Spring 2001 **Introduction to Computer Graphics** Assistant, Massachusetts Institute of Technology

Fall 1996 **Control and Concurrency** Assistant, Georgia Institute of Technology

Spring 1996 **Control and Concurrency** Assistant, Georgia Institute of Technology

Winter 1996 **Control and Concurrency** Assistant, Georgia Institute of Technology

Advising

2012–present **Fabian Hahn**, Ph.D. Supervision: *Physics-Based Character Animation*

2012–present **Antoinne Milliez**, Ph.D. Supervision: *Artist-Driven Painterly Animation*

2008–2012 **Johannes Schmid**, Ph.D. Supervision: *Expressive Depiction in Computer Animation*

2008–2012 **Gioacchino Noris**, Ph.D. Supervision: *Computational Tools for Hand-Drawn Animation*

2012 **Fabian Hahn**, Master Thesis: *Rig-Space Physics*

2011 **Stefan Geiger**, Master Thesis: *An Immersive 3D Augmented Reality Lens*

2011 **Martin Senn**, Master Thesis: *Paint Stroke Localization for 3D Painting*

2011 **Boris Dalstein**, Intern Project: *Animating Characters using Curved Bones and a Sketch-Based Interface*
2010 **Huw Bowles**, Master Thesis: *Efficient Real-Time Stereoscopic 3D Rendering*
2010 **Rafael Hostettler**, Bachelor Thesis: *Cement: Transformation from Linear Blend to Rigid Skinning*
2009 **Rahul Narain**, Internship: *Practical Physics for Interactive Running Animals*
2009 **Huw Bowles**, Internship: *Programmable Motion Effects*
2008 **Thomas Oskam**, Master Thesis: *Visibility Transition Planning for Real-Time Camera Control*
2008 **Floraine Grabler**, Master Thesis: *Automatic Generation of Tourist Maps*
2007 **Thomas Oskam**, Semester Thesis: *Reusable Game Camera for 3D Environments*
2007 **Lukas Novosad**, Semester Thesis: *Matrix Palette Skinning and Dual Quaternions*
2007 **Markus Liechti**, Semester Thesis: *Semantic Meshes*
2006 **Simone Riva**, Semester Thesis: *Numerical Optimization for Resolution-Independent Editing*
2006 **Johannes Schmid**, Semester Thesis: *Mesh segmentation*
2006 **Simone Croci**, Semester Thesis: *Pose Space Deformation Tool*
2006 **David Spuhler**, Master Thesis: *Rendering Motion Using Time Aggregate Objects*

Funded grant proposals

2013–2015 **Future Media Internet for Large Scale Content experimentation Phase 2**
EU FP7-2012-ICT-FI 284534

2011–2013 **Future Media Internet for Large Scale Content experimentation Phase 1**
EU FP7-2011-ICT-FI 603662

2006–2008 **Spatio-Temporal Registration of Depth Video**
SNF 200021-112122

Film credits

1999 **Toy Story 2** Animation Software Development

Publications

Stelian Coros, Bernhard Thomaszewski, Gioacchino Noris, Shinjiro Sueda, Moira Forberg, Robert W. Sumner, Wojciech Matusik, and Bernd Bickel. Computational design of mechanical characters. *To appear in ACM Transactions on Graphics (SIGGRAPH 2013)*, July 2013.

Gioacchino Noris, Alexander Hornung, Robert W. Sumner, Maryann Simmons, and Markus Gross. Topology-driven vectorization of clean line drawings. *ACM Transactions on Graphic*, 32(1):4:1–4:11, February 2013.

Katie Bassett, Ilya Baran, Johannes Schmid, Markus Gross, and Robert W. Sumner. Authoring and animating painterly characters. *To appear in ACM Transactions on Graphics*, 2013.

Amit Bermano, Bernd Bickel, Fabio Zünd, Derek Bradley, Ilya Baran, Derek Nowrouzezahrai, Olga Sorkine, Hanspeter Pfister, Robert W. Sumner, and Markus Gross. Facial performance enhancement using dynamic shape space analysis. *To appear in ACM Transactions on Graphics*, 2013.

Gioacchino Noris, Daniel Sýkora, Ariel Shamir, Stelian Coros, Brian Whited, Maryann Simmons, Alexander Hornung, Markus Gross, and Robert W. Sumner. Smart scribbles for sketch segmentation. *Computer Graphics Forum*, 31(8):2516–2527, December 2012.

Thabo Beeler, Bernd Bickel, Gioacchino Noris, Paul Beardsley, Steve Marschner, Robert W. Sumner, and Markus Gross. Coupled 3d reconstruction of sparse facial hair and skin. *ACM Transactions on Graphics (SIGGRAPH 2012)*, 31(4):117:1–117:10, July 2012.

Stelian Coros, Sebastian Martin, Bernhard Thomaszewski, Christian Schumacher, Robert Sumner, and Markus Gross. Deformable objects alive! *ACM Transactions on Graphics (SIGGRAPH 2012)*, 31(4):69:1–69:9, July 2012.

Fabian Hahn, Sebastian Martin, Bernhard Thomaszewski, Robert Sumner, Stelian Coros, and Markus Gross. Rig-space physics. *ACM Transactions on Graphics (SIGGRAPH 2012)*, 31(4):72:1–72:8, July 2012.

Huw Bowles, Kenny Mitchell, Robert W. Sumner, Jeremy Moore, and Markus Gross. Iterative image warping. *Computer Graphics Forum (Eurographics 2012)*, 31(2), May 2012.

S. Buckingham Shum, K. Aberer, A. Schmidt, S. Bishop, P. Lukowicz, S. Anderson, Y. Charalabidis, J. Domingue, S. Freitas, I. Dunwell, B. Edmonds, F. Grey, M. Haklay, M. Jelasity, A. Karpištšenko, J. Kohlhammer, J. Lewis, J. Pitt, R. Sumner, and D. Helbing. Towards a global participatory platform. *The European Physical Journal Special Topics*, 214(1):109–152, 2012.

Thomas Oskam, Alexander Hornung, Robert W. Sumner, and Markus Gross. Fast and stable color balancing for images and augmented reality. In *3D Imaging, Modeling, Processing, Visualization and Transmission (3DIMPVT), 2012 Second International Conference on*, pages 49–56, 2012.

M. Paolucci, D. Kossman, R. Conte, P. Lukowicz, P. Argyrakis, A. Blandford, G. Bonelli, S. Anderson, S. Freitas, B. Edmonds, N. Gilbert, M. Gross, J. Kohlhammer, P. Koumoutsakos, A. Krause, B.-O. Linnér, P. Slusallek, O. Sorkine, R.W. Sumner, and D. Helbing. Towards a living earth simulator. *The European Physical Journal Special Topics*, 214(1):77–108, 2012.

Christian Schumacher, Bernhard Thomaszewski, Stelian Coros, Sebastian Martin, Robert Sumner, and Markus Gross. Efficient simulation of example-based materials. In *Proceedings of the ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, SCA '12, pages 1–8, Aire-la-Ville, Switzerland, Switzerland, 2012. Eurographics Association.

Ilya Baran, Johannes Schmid, Thomas Siegrist, Markus Gross, and Robert W. Sumner. Mixed-order compositing for 3d paintings. *ACM Transactions on Graphics (SIGGRAPH Asia 2011)*, 30(6):132:1–132:6, December 2011.

Thabo Beeler, Fabian Hahn, Derek Bradley, Bernd Bickel, Paul Beardsley, Craig Gotsman, Robert W. Sumner, and Markus Gross. High-quality passive facial performance capture using anchor frames. *ACM Transactions on Graphics (SIGGRAPH 2011)*, 30(4):75:1–75:10, August 2011.

Johannes Schmid, Martin Sebastian Senn, Markus Gross, and Robert W. Sumner. Overcoat: an implicit canvas for 3d painting. *ACM Transactions on Graphics (SIGGRAPH 2011)*, 30(4):28:1–28:10, August 2011.

Gioacchino Noris, Daniel Sýkora, Stelian Coros, Brian Whited, Maryann Simmons, Alexander Hornung, Marcus Gross, and Robert W. Sumner. Temporal noise control for sketchy animation. In *Proceedings of International Symposium on Non-photorealistic Animation and Rendering*, pages 93–98, 2011.

Derek Nowrouzezahrai, Stefan Geiger, Kenny Mitchell, Robert Sumner, Wojciech Jarosz, and Markus Gross. Light factorization for mixed-frequency shadows in augmented reality. In *Proceedings of the 10th IEEE International Symposium on Mixed and Augmented Reality*, ISMAR '11, pages 173–179, Washington, DC, USA, 2011. IEEE Computer Society.

Thabo Beeler, Bernd Bickel, Paul Beardsley, Robert W. Sumner, and Markus Gross. High-quality single-shot capture of facial geometry. *ACM Transactions on Graphics (SIGGRAPH 2010)*, 29:40:1–40:9, July 2010.

Johannes Schmid, Robert W. Sumner, Huw Bowles, and Markus Gross. Programmable motion effects. *ACM Transactions on Graphics (SIGGRAPH 2010)*, 29:57:1–57:9, July 2010.

Markus Gross, Robert W. Sumner, and Nils Thürey. The design and development of computer games. In *The Design of Material, Organism, and Minds: Different Understandings of Design*, chapter 4, pages 39–51. Springer, 1 edition, 2010.

Brian Whited, Gioacchino Noris, Maryann Simmons, Robert W. Sumner, Markus Gross, and Jarek Rossignac. BetweenIT: An interactive tool for tight inbetweening. *Computer Graphics Forum*, 29(2):605–614, 2010.

Thomas Oskam, Robert W. Sumner, Nils Thuerey, and Markus Gross. Visibility transition planning for dynamic camera control. In *Proceedings of the 2009 ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, SCA '09, pages 55–65, New York, NY, USA, 2009. ACM.

Floraine Grabler, Maneesh Agrawala, Robert W. Sumner, and Mark Pauly. Automatic generation of tourist maps. *ACM Transactions on Graphics (SIGGRAPH 2008)*, 27(3):100:1–100:11, August 2008.

Michael Eigensatz, Robert W. Sumner, and Mark Pauly. Curvature-domain shape processing. *Computer Graphics Forum (Eurographics 2008)*, 27(2):241–250, 2008.

Hao Li, Robert W. Sumner, and Mark Pauly. Global correspondence optimization for non-rigid registration of depth scans. *Computer Graphics Forum (SGP 2008)*, 27(5):1421–1430, 2008.

Robert W. Sumner, Nils Thuerey, and Markus Gross. The eth game programming laboratory: a capstone for computer science and visual computing. In *Proceedings of the 3rd international conference on Game development in computer science education*, GDCSE '08, pages 46–50, New York, NY, USA, 2008. ACM.

Robert W. Sumner, Johannes Schmid, and Mark Pauly. Embedded deformation for shape manipulation. *ACM Transactions on Graphics (SIGGRAPH 2007)*, 26(3), July 2007.

Kevin G. Der, Robert W. Sumner, and Jovan Popović. Inverse kinematics for reduced deformable models. *ACM Transactions on Graphics (SIGGRAPH 2006)*, 25(3):1174–1179, July 2006.

Mario Botsch, Robert W. Sumner, Mark Pauly, and Markus Gross. Deformation transfer for detail-preserving surface editing. *Vision, Modeling & Visualization*, pages 357–364, 2006.

Robert W. Sumner. *Mesh modification using deformation gradients*. PhD thesis, Cambridge, MA, USA, 2006.

Robert W. Sumner, Matthias Zwicker, Craig Gotsman, and Jovan Popović. Mesh-based inverse kinematics. *ACM Transactions on Graphics (SIGGRAPH 2005)*, 24(3):488–495, July 2005.

Jessica K. Hodgins, James F. O'Brien, Nancy S. Pollard, Robert W. Sumner, Wayne L. Wooten, Gary Yngve, and Victor Zordan. Creating realistic motion. In *Moving Image Theory: Ecological Considerations*, chapter 3, pages 52–60. Southern Illinois University Press, 1 edition, 2005.

Robert W. Sumner and Jovan Popović. Deformation transfer for triangle meshes. *ACM Transactions on Graphics (SIGGRAPH 2005)*, 23(3):399–405, August 2004.

Robert W. Sumner, James F. O'Brien, and Jessica K. Hodgins. Animating sand, mud, and snow. *Computer Graphics Forum*, 18(1):17–26, 1999.

Robert W. Sumner, James O'Brien, and Jessica Hodgins. Animating sand, mud, and snow. In *Graphics Interface '98*, pages 125–132, June 1998.

Song Zou, William Ribarsky, Yves D. Jean, Jeremy Heiner, Karsten Schwan, Robert W. Sumner, and Onome Okuma. Collaboration and visual steering of simulations. In *Proceedings of SPIE: Visual Data Exploration and Analysis IV*, volume 3017, pages 274–285, March 1997.

Patent applications

March 2013 **Rig-Based Physics Simulation** US 13/843,856

March 2013 **Metabrushes for Digital Painting** US 13/797,823

March 2013 **Augmented Reality Device with Predefined Object Data** US 13/835,459

August 2012 **Coupled Reconstruction of Hair and Skin** US 13/588,841

June 2012 **Temporal Noise Control for Sketchy Animation** US 13/525,052

June 2012 **Augmented Reality Simulation Continuum** US 13/538,699

May 2012 **Techniques for Processing Reconstructed Three-Dimensional Image Data** US 13/474,625

May 2012 **Mixed-Order Compositing for Images Having Three-Dimensional Painiting Effects** US 13/475,617

March 2012 **Smart Scribbles for Sketch Segmentation** US 13/424,083

January 2012 **3D Drawing and Painting System with a 3D Scalar Field** US 13/353,249

November 2011 **High-Quality Passive Performance Capture Using Anchor Frames** US 13/287,774

July 2011 **Stereoscopic Rendering** US 13/007,968

June 2011 **Virtual Lens–Rendering for Augmented Reality Lens** US 13/173,134

January 2011 **Iterative reprojection of images** US 13/007,968

July 2010 **Vectorization of Line Drawings Using Global Topology and Storing in Hybrid Form** US 12/843,822

July 2010 **Visibility Transition Planning for Dynamic Camera Control** US 12/834,840

July 2010 **Automatic and Semi-Automatic Generation of Image Features Suggestive of Motion for Computer-Generated Images and Video** US 12/843,827

April 2010 **Computer Rendering Of Drawing-Tool Strokes** US 12/759,361

January 2010 **System and Method for Mesoscopic Geometry Modulation** US 12/689,170, 12/897,518; China 201110025032.3; India 107/DEL/2011, New Zealand 597973

January 2010 **System and Method for Invariant-Based Normal Estimation** US 12/689,172

Issued patents

January 2010 **System and Method for Mesoscopic Geometry Modulation** New Zealand 590583

Academic service

2013 **Symposium on Computer Animation** Program Chair

2013 **Computer-Aided Design and Computer Graphics** Program Committee

2013 **Shape Modeling International** Program Committee

2012 **Shape Modeling International** Program Committee

2011 **Symposium on Computer Animation** Program Committee

2010 **Pacific Graphcis** Program Committee

2010 **SIGGRAPH** Program Committee

2009 **Symposium on Geometry Processing** Program Committee

2009 **SIGGRAPH Asia** Sketches and Posters Program Committee

2009 **Pacific Graphics** Program Committee

2008 **Symposium on Computer Animation** ProgramCommittee

2007 **Pacific Graphics** Program Committee