

Amit Agrawal

Research Scientist, Mitsubishi Electric Research Labs (MERL), 201 Broadway, Cambridge, MA, USA 02139
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RESEARCH INTERESTS Computer Vision, Image and Signal Processing, Computational Photography

EDUCATION **Ph.D.**, Electrical and Computer Engineering **Jan 2004 - May 2006**
University of Maryland, College Park, MD USA *GPA: 3.92/4.0*
Thesis: Scene Analysis under Variable Illumination using Gradient Domain Methods
Advisor: Prof. Rama Chellappa

- Major: Communications and Signal Processing
- Minor: Computer Engineering

M.S., Electrical and Computer Engineering **Aug 2001 - Dec 2003**
University of Maryland, College Park, MD USA *GPA: 3.92/4.0*

- Major: Communications and Signal Processing
- Minor: Computer Engineering

B.Tech., Electrical Engineering **July 1996 - May 2000**
Indian Institute of Technology (IIT), Kanpur *GPA: 9.2/10.0*

ACADEMIC AND
PROFESSIONAL
EXPERIENCE

Research Scientist **May 2008 - Present**
Mitsubishi Electric Research Labs (MERL), Cambridge, MA

Computational Photography, Coding and Modulation in Cameras, Object Recognition and Segmentation

Visiting Scientist **May 2006 - May 2008**
Mitsubishi Electric Research Labs (MERL), Cambridge, MA

Research Intern **July 2004 - Feb 2005**
Mitsubishi Electric Research Labs (MERL), Cambridge, MA
Mentor: Dr. Ramesh Raskar

Gradient Domain Algorithms for Scene Analysis, Flash/No-flash Photography, Gradient Camera, Real time implementation of Non-photo Realistic Camera, Photomosaics and Video tiles.

Graduate Research Assistant **Aug 2001 - May 2006**
University of Maryland, Advisor: Prof. Rama Chellappa

Structure from Motion for Static and Dynamic Scenes, 3D Modeling using Depth Priors, Surface Reconstruction from Gradient Fields.

Graduate Teaching Assistant **Aug 2001 - Dec 2001**
ECE Department, UMD

Undergraduate microelectronics design laboratory course.

DSP Software Engineer **Jun 2000 - Aug 2001**
Hughes Network Systems, MD, USA and Hughes Software Systems (HSS), India.

Embedded solution for Fax/Voice over IP network.

SIGGRAPH
PUBLICATIONS

- A. Agrawal, Y. Xu & R. Raskar, 'Invertible Motion Blur in Video', ACM Transactions on Graphics (**SIGGRAPH**) Vol. 28, Issue 3, Aug 2009
- D. Lanman, R. Raskar, A. Agrawal, & G. Taubin, 'Shield Fields: Modeling and Capturing 3D Occluders', ACM Transactions on Graphics (**SIGGRAPH Asia**), Vol. 27, Issue 5, Dec 2008
- R. Raskar, A. Agrawal, C. Wilson & A. Veeraraghavan, 'Glare Aware Photography: 4D Ray Sampling for Reducing Glare Effects of Camera Lenses', ACM Transactions

on Graphics (**SIGGRAPH**) Vol. 27, Issue 3, Aug 2008

- A. Veeraraghavan, R. Raskar, A. Agrawal, A. Mohan & J. Tumblin, ‘Dappled Photography: Mask Enhanced Cameras for Heterodyned Light Fields and Coded Aperture Refocusing’, ACM Transactions on Graphics (**SIGGRAPH**) Vol. 26, Issue 3, July 2007
- R. Raskar, A. Agrawal & J. Tumblin, ‘Coded Exposure Photography: Motion Deblurring using Fluttered Shutter’, ACM Transactions on Graphics (**SIGGRAPH**) Vol. 25, Issue 3, July 2006
- A. Agrawal, R. Raskar, S.K. Nayar & Y. Li, ‘Removing Photography Artifacts using Gradient Projection and Flash-Exposure Sampling’, ACM Transactions on Graphics (**SIGGRAPH**), Vol. 24, Issue 3, July 2005

OTHER JOURNAL
PUBLICATIONS

- A. Agrawal, Y. Sun, J. Barnwell & R. Raskar, ‘Vision Guided Robot System for Picking Objects by Casting Shadows’, International Journal of Robotics Research (IJRR) 2009
- A. Agrawal, R. Raskar & R. Chellappa, ‘Surface Reconstruction from Gradient Fields Via Gradient Transformation’, International Journal of Computer Vision (IJCV) 2009
- A. Agrawal & R. Chellappa, ‘Robust Ego-Motion Estimation and 3D Model Refinement using Surface Parallax’, IEEE Transactions on Image Processing, Vol. 15, No. 5, May 2006

SELECTED REFEREED
CONFERENCE
PUBLICATIONS

- A. Agrawal & R. Raskar, ‘Optimal Single Image Capture for Motion Deblurring’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2009
- A. Agrawal & Y. Xu, ‘Coded Exposure Deblurring: Optimized Codes for PSF Estimation and Invertibility’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2009
- D. Reddy, A. Agrawal & R. Chellappa, ‘Enforcing Integrability by Error Correction using L-1 Minimization’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2009
- J. Chang, R. Raskar & A. Agrawal, ‘3D Pose Estimation and Segmentation using Specular Cues’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2009
- A. Veeraraghavan, A. Agrawal, R. Raskar, A. Mohan & J. Tumblin, ‘Non Refractive Modulators for Capturing Scene Appearance and Depth’, IEEE Conference on Computer Vision and Pattern Recognition, (**CVPR**) 2008
- T. Koh, A. Agrawal, R. Raskar, S. Morgan, N. Miles & B.H. Gills, ‘Detecting and Segmenting Un-occluded Items by Actively Casting Shadows’, Asian Conference on Computer Vision (**ACCV**) 2007 (oral presentation)
- A. Agrawal & R. Raskar, ‘Resolving Objects at Higher Resolution from a Single Motion-Blurred Image’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2007 (oral presentation)
- A. Agrawal, R. Raskar & R. Chellappa, ‘Edge Suppression by Gradient Field Transformation using Cross-Projection Tensors’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2006
- A. Agrawal, R. Raskar & R. Chellappa, ‘What is the Range of Surface Reconstructions from a Gradient Field?’, European Conference on Computer Vision (**ECCV**) 2006 (oral presentation)
- A. Agrawal, R. Chellappa & R. Raskar, ‘An Algebraic Approach to Surface Reconstruction from Gradient Fields’, IEEE International Conference on Computer Vision (**ICCV**) 2005
- J. Tumblin, A. Agrawal & R. Raskar, ‘Why I want a Gradient Camera’, IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**) 2005
- A. Agrawal & R. Chellappa, ‘Moving Object Segmentation and Dynamic Scene Reconstruction using Two Frames’, IEEE **ICASSP** 2005. Winner of student paper contest (IMDSP category)
- A. Agrawal & R. Chellappa, ‘Fusing Depth and Video using Rao-Blackwellized Particle Filter’, First International Conference on Pattern Recognition and Machine

Intelligence (**PRMI**), 2005 (oral presentation)

- A. Agrawal & R. Chellappa, 'Robust Ego-Motion Estimation and 3D Model Refinement in Scenes with Varying Illumination', IEEE **MOTION** 2005 (oral presentation)
- A. Agrawal & R. Chellappa, 'Robust Ego-Motion Estimation and 3D Model Refinement using Depth Based Parallax Model', IEEE **ICIP**, 2004 (oral presentation)
- A. Agrawal & R. Chellappa, '3D Model Refinement using Surface-Parallax', IEEE **ICASSP**, 2004

OTHER
MISCELLANEOUS
PUBLICATIONS

- R. Raskar & A. Agrawal, 'Handling Motion in Surveillance using Coded Exposure Camera', IEEE Conference on Technologies for Homeland Security 2007
- R. Raskar, J. Tumblin, A. Mohan, A. Agrawal & Y. Li, 'Computational Photography', State of Art Report, Eurographics, 2006
- A. Agrawal, R. Meth & R. Chellappa, 'Hierarchical DEM Refinement using Surface Parallax', 24th Army Science Conference, Orlando FL, 2004
- A. Agrawal & C. Shekhar, 'Mapping Ground Video to Aerial DEMs', Advanced Decision Architectures, Collaborative Technology Alliances Conference 2003

PATENTS

- J. Tumblin, A. Agrawal & R. Raskar, 'Camera for directly generating a gradient image', U.S. Patent No. 7,038,185
- A. Agrawal & R. Raskar, 'Increasing Object Resolutions from a Motion-Blurred Image', U.S. Patent Application No. 20080062287
- R. Raskar & A. Agrawal, 'Method and Apparatus for Enhancing Flash and Ambient Images', U.S. Patent Application No. 20070024742
- R. Raskar, A. Agrawal, S.K. Nayar & Y. Li, 'Method and Apparatus for Acquiring HDR Flash Images', U.S. Patent Application No. 20070025717
- R. Raskar, A. Agrawal, S.K. Nayar & Y. Li, 'Method for Estimating Camera Settings Adaptively', U.S. Patent Application No. 20070025720
- R. Raskar, A. Agrawal & J. Tumblin, 'Method for deblurring images using optimized temporal coding patterns', U.S. Patent Application No. 20070258706
- 5+ other patent applications pending

TUTORIALS AND
COURSES

- A. Agrawal & R. Raskar, 'Differential Techniques for Analysis and Synthesis in Vision and Graphics', CVPR 2008
- A. Agrawal & R. Raskar, 'Gradient Domain Manipulation Techniques in Vision and Graphics', ICCV 2007

INVITED TALKS

- Coding and Modulation in Cameras: Computational Photography beyond Photo Manipulations, CMU VASC Seminar (Host: Srinivas Narasimhan), Mar 2008
- A Framework for Surface Reconstruction from Gradient Fields, Computer Graphics Group, MIT, Apr 2007

EXHIBITS, DEMOS,
TECH SHOWS

- 3D Sensing Technology for Cell Robot Manufacturing, Mitsubishi Electric Press Release, Tokyo, 2008
- Depth Edges in Real-Time using Multi-flash Camera, IEEE CVPR 2005
- Camera Non-photo, Collision Senses, Cambridge, MA, 2004

SELECTED PRESS &
MEDIA COVERAGE

- Computational Photography (Mar 2008), American Scientist
- Amplitude Masks for Extended Depth of Field (Nov 2007), Photonics
- Siggraph 2007 Review on Computational Photography (July 2007), Computer Graphics World, Japan
- Optical Heterodyning and Coded Aperture Camera (April 2007), Wired, Gizmodo, Engadget, DigiCamInfo, Daily Mail
- Flutter Shutter Camera (Jan 2007), Computer Graphics World (CG World Japan)
- Flutter Shutter Camera (Dec 2006), Industry News
- Flutter Shutter Camera (Aug 2006), DigitalCameraInfo, Engadget, Photographer, DP Review

PROFESSIONAL
ACTIVITIES

- ICCP 2010 Program Committee Member
- SIGGRAPH 2009 General Submissions Jury Member
- Reviewer: IEEE CVPR 2007-2009, IEEE ICCV 2007, ACCV 2007, SIGGRAPH 2007-2009, IEEE Transactions on Image Processing (2005-2007), Eurographics (2005-2008), IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI) (2006-2009), JVCI (2007-2008)
- Member of ACM & IEEE

HONORS AND AWARDS

- ICASSP 2005 Student Paper Contest Winner (IMDSP category)
- Award for Excellence in *PES* project at Hughes Software Systems, India
- Best trainee project award at Hughes Software Systems, India
- First prize in Inter-Collegiate Hardware Design Contest at *Techkriti* 2000 at IIT Kanpur
- All India Rank 272 in Joint Entrance Examination-1996 for IIT among $\approx 100,000$ participants
- Silver medal in National Talent Search Contest in Mathematics (1994 and 1995), Science (1995) and General Knowledge (1993 and 1995)