

Yoav Y. Schechner

Curriculum Vitae

Personal details

Name: Yoav Y. Schechner
Family: Married + Two children
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Academic Degrees

1999 Ph.D. in Electrical Engineering (Technion, Haifa, Israel).
1996 M.Sc. in Physics (Technion, Haifa, Israel).
1990 B.A. in Physics cum laude (Technion, Haifa, Israel).

Academic Appointments

2002–Present Senior Lecturer, Department of Electrical Engineering, Technion.
2000–2002 Research Scientist, Department of Computer Science, Columbia University.
1996–1999 Teaching assistant, Department of Electrical Engineering, Technion.
1994–1996 Teaching assistant, Faculty of Physics, Technion.

Professional Experience

2006–Present Consultant: Given-Imaging, Orbotech.
1990–1994 Meteorological officer, IDF.

Research Interests

Physics-based computer vision, Imaging, Cross-Modal Analysis. Influencing the sensing process to extract enhanced information about scenes. Computational analysis of the acquired data by accounting for processes of image formation.

Examples of past studies in this context include: illumination multiplexing; imaging through turbid (scattering) media e.g., haze and underwater; polarization imaging; high dynamic range imaging; audio-visual analysis; radiometric self-calibration; separation of semireflections and transparent layers; depth estimation based on defocus PSFs.

Teaching Experience

- 2002–Present Technion—Israel Institute of Technology –
Advanced course *Imaging Systems for Computer Vision*.
Undergraduate/graduate course *Electrooptic Systems*.
Undergraduate/graduate course *Image Processing and Analysis*.
Undergraduate course *Intr. to Digital Signal Processing*,
Supervision of undergraduate projects in the field of computer vision.
- 1994–1999 Technion — Israel Institute of Technology –
Undergraduate/graduate course *Image Processing and Analysis*.
Received the Award for Excellence in Teaching.
Instruction of undergraduate students in the electrooptics laboratory.
Instruction of undergraduate students in the physics laboratories (Faculty of Physics).

Public Professional Activities

Participation in organizing conferences

- 2001 Program Committee
IEEE Comp. Soc. Conf. on Computer Vision & Pattern Recognition (CVPR'01).
- 2003 Program Committee
IEEE International Conference on Computer Vision (ICCV'03).
- 2004 Organizer and Chair
CCIT Workshop about Innovations in Signal and Image Processing, March 2004.
- 2004 Program Committee.
IEEE Comp. Soc. Conf. on Computer Vision & Pattern Recognition (CVPR'04).
- 2004 Chairing session on Non-Acoustic Sensors
IEEE/MTS Oceans'04.
- 2005 Chairing session on Non-Acoustic Imaging
IEEE/MTS Oceans'05.
- 2005 Program Committee
IEEE International Conf. on Computer Vision (ICCV'05).
- 2005 Program Committee; Chairing special session on Polarization in Computer Vision
SPIE Conf. on Polarization Science and Remote Sensing II.
- 2005 Program Committee
IEEE Comp. Soc. Conf. on Computer Vision & Pattern Recognition (CVPR'05).
- 2006 Program Committee.
European Conf. on Computer Vision (ECCV'06).
- 2006 Program Committee
IEEE Comp. Soc. Conf. on Computer Vision & Pattern Recognition (CVPR'06).
- 2007 Program Committee.
IEEE BMG - Beyond Multiview Geometry Workshop (Adjacent to CVPR 2007).
- 2007 Organizer and Chair.
IEEE/ONR Scattering'2007: Int. Sympos. on Volumetric Scattering in Vision and Graphics
(Adjacent to CVPR 2007).
- 2007 Program Committee.
SPIE Conf. on Polarization Science and Remote Sensing III.

Reviewer for:

ISF Grants; NOAA Grant; IEEE Trans. on Pattern Recognition and Machine Intelligence; International Journal of Computer Vision; IEEE Trans. on Image Processing; Journal of the Optical Society of America A; Signal Processing; Journal of Electronic Imaging; Photogrammetric Engineering and Remote Sensing; Machine Vision and Applications; Integrative and Comparative Biology; IEEE International Conferences on Computer Vision (ICCV); IEEE Conferences on Computer Vision & Pattern Recognition (CVPR); International Conference on Pattern Recognition (ICPR); International Conference on Advances in Pattern Recognition (ICAPR); SIGGRAPH.

Membership in Professional Societies

IEEE, SPIE, MTS (Marine Technology Society), OES (Oceanic Engineering Society), OSA

Awards and Honors

1. Ray and Miriam Klein Research Award, 2006.
2. Harry Goldman Academic Lectureship - Canada, 2005.
3. Alon Fellowship, 2002-2005
4. Landau Fellowship - supported by the Taub Foundation, 2002-2004.
5. The Louis Morin Fellowship, 2000,2001.
6. The Award for Excellence in Teaching, from the Technion, 1999.
7. Otto Schwarz Foundation Excellence Award, 1999.
8. Israeli Ministry of Science (Eshkol) Distinction Fellowship, 1998-99.
9. Ollendorff Award for research in the field of image processing and analysis, 1998.
10. Gutwirth Special Distinction Fellowship, 1995.
11. Wolf Foundation Excellence Award for graduate students, 1994.
12. Invention Award, from the Chief Eng. Logistic Director (RALZA"D) Israeli Air Force, 1994.
13. Excellence Award from the President of the Technion, 1990.
14. Excellence Award from the Dean, 1989.
15. Excellence Award from the Dean, 1988.

Graduate Students

Completed Theses

- 2004 Mr. Nir Karpel, MSc., *Recovering underwater scenes using polarization analysis*.
- 2005 Ms. Einat Kidron, MSc., *Audio-visual cross-modal analysis*
(Secondary Adv.: Dr. Michael Elad).
- 2005 Ms. Sarit Shwartz, MSc., *Blind separation of high dimensional sources*.
- 2006 Mr. Saar Bobrov, MSc., *Image-based prediction of thermal imaging performance*.
- 2006 Mr. Anatoly Litvinov, MSc., *Image mosaicing in the presence of radiometric distortions*.
- 2006 Ms. Yael Erez, MSc., *Spatially varying frequency compounding of ultrasound images*.
(Secondary Adv.: Prof. Dan Adam);
- 2006 Mr. Yuval Averbuch, MSc. *Adaptive filtering of visibility degraded images*.

Theses in Progress

- Ms. Tali Treibitz, (towards PhD.) expected in 2009.
- Mr. Lihu D. Berman, (towards PhD.) expected in 2010.
- Mr. Yaron Diamant, (towards MSc.) expected in 2007.
- Mr. Zohar Barzilay, (towards MSc.) expected in 2007.
- Mr. Netanel Ratner, (towards MSc.) expected in 2007.
- Mr. Michael Kolomenkin, (towards MSc.) expected in 2007 (Primary Adv.: Dr. Ilan Shimshoni).
- Mr. Nir Maor, (towards MSc.) expected in 2007 (Primary Adv.: Prof. Arie Feuer).

Research Grants

2007–2008	Magneton (The Israel Ministry of Commerce), 1,381,559 NIS, Principal Investigators: Yoav Y. Schechner and Iscan-Robotics “Defect detection in automotive glass.”
2006–2009	Ministry of Science (Infrastructure Inter-institution Grant), 900,000 NIS, Principal Investigators: Yoav Y. Schechner, Aryeh Weiss, Ehud Rivlin, “Computer micro-vision.”
2005–2006	ElOp Ltd., 113,281 NIS. Principal Investigator: Yoav Y. Schechner, “Improvement of vision in haze.”
2005	GIF (The German-Israel Foundation), 30,000 Euro, Principal Investigator: Yoav Y. Schechner, “Quantitative image mosaics.”
2004–2007	ISF (The Israel Science Foundation), 162,000 NIS per year, in addition to \$ 50,000 of equipment (for building a new lab). Principal Investigator: Yoav Y. Schechner, “Computer vision in turbid media.”
2004–2005	Magneton (The Israel Ministry of Commerce), 1,021,564 NIS, Principal Investigators: Yoav Y. Schechner and El-Op Electrooptics Industries “Improving capabilities of long-range observations.”
2003–2005	BSF (The US-Israel Binational Science Foundation), \$ 59,984, Principal Investigators: Yoav Y. Schechner, Shree K. Nayar, Peter Belhumeur, “Coded vision and illumination.”
2003–2007	MAFA”T (Ministry of Defense), 330,000 NIS. Principal Investigator: Yoav Y. Schechner, “Compensation of haze in images.”
2002–2005	Alon Fellowship, \$ 29,000, in addition to salary.
2002–2004	NSF (USA), \$ 250,000, Principal Investigators: Rafael Piastun, Carol Cogswel and Yoav Y. Schechner, “High-speed 3D microscopy by hybrid optical-digital encoding and processing.”
2000–2002	The Morin Foundation, \$ 100,000 Principal Investigators: Yoav Y. Schechner and Shree K. Nayar, “Multidimensional image mosaics.”
1998–1999	The Eshkol Fund, Doctorate Fellowship.

PUBLICATIONS

Theses

1. Y. Y. Schechner, Advisor: Prof. J. Shamir “*Rotation phenomena in waves*,” M.Sc. Thesis in Physics, Technion (1996).
2. Y. Y. Schechner, Advisors: Dr. N. Kiryati and Prof. J. Shamir “*Analysis and reconstruction of complex scenes via optical cues*,” Ph.D Thesis in Electrical Engineering, Technion (1999).

Journal papers

1. Y. Y. Schechner and J. Shamir, “*Parameterization and orbital angular momentum of anisotropic dislocations*,” Journal of the Optical Society of America - A **13**, pp. 967-973 (1996).
2. Y. Y. Schechner, R. Piestun and J. Shamir, “*Wave propagation with rotating intensity distributions*,” Physical Review E. **54**, R50-R53 (1996).
3. R. Piestun, Y. Y. Schechner and J. Shamir, “*Self-imaging with finite energy*,” Optics Letters **22**, pp. 200-203 (1997).
4. Y. Y. Schechner, J. Shamir and N. Kiryati, “*Vision through semi-reflecting media: Polarization analysis*,” Optics Letters **24**, pp. 1088-1090 (1999).
5. R. Piestun, Y. Y. Schechner and J. Shamir, “*Propagation invariant wave-fields with finite energy*,” Journal of the Optical Society of America - A **17**, pp. 294-303 (2000).
6. Y. Y. Schechner, J. Shamir and N. Kiryati, “*Polarization and statistical analysis of scenes containing a semi-reflector*,” Journal of the Optical Society of America - A **17**, pp. 276-284 (2000).
7. Y. Y. Schechner, N. Kiryati and R. Basri, “*Separation of transparent layers using focus*,” International Journal of Computer Vision **39**, pp. 25-39 (2000).
8. Y. Y. Schechner and N. Kiryati, “*Depth from defocus vs. Stereo: How different really are they?*” International Journal of Computer Vision **39**, pp. 141-162 (2000).
9. Y. Y. Schechner and S. K. Nayar, “*Generalized mosaicing: Wide field of view multispectral imaging*,” IEEE Trans. Pattern Analysis & Machine Intelligence **24**, pp. 1334-1348 (2002).
10. Y. Y. Schechner and S. K. Nayar, “*Generalized mosaicing: High dynamic range in a wide field of view*,” International Journal of Computer Vision **53**/3, pp. 245-267 (2003).
11. Y. Y. Schechner, S. G. Narasimhan and S. K. Nayar, “*Polarization-based vision through haze*,” Applied Optics **42**/3, Special Feature on *Light on Color in the Open Air* pp. 511-525 (2003).
12. A. Litvinov and Y. Y. Schechner “*A radiometric framework for image mosaicking*,” Journal of the Optical Society of America - A **22**, pp. 839-848 (2005).
13. Y. Y. Schechner and S. K. Nayar, “*Generalized mosaicing: Polarization panorama*,” IEEE Trans. Pattern Analysis & Machine Intelligence **27**, pp. 631-636 (2005).
14. S. Shwartz, M. Zibulevsky and Y. Y. Schechner, “*Fast kernel entropy estimation and optimization*,” Signal Processing, Special Issue on *Information Theoretic Signal Processing* **85**/5, pp. 1045-1058 (2005).

15. Y. Y. Schechner and N. Karpel, "*Recovery of underwater visibility and structure by polarization analysis*," IEEE Journal of Oceanic Engineering **30**, pp. 570-587 (2005).
16. A. Greengard, Y. Y. Schechner and R. Piestun, "*Depth from diffracted rotation*," Optics Letters **31**, pp. 181-183 (2006).

Accepted:

17. E. Kidron, Y. Y. Schechner and M. Elad, "*Cross-modal localization via sparsity*," To be published in IEEE Trans. Signal Processing (2007).
18. Y. Y. Schechner, S. K. Nayar, and P. N. Belhumeur, "*Multiplexing for optimal lighting*," To be published in IEEE Trans. Pattern Analysis & Machine Intelligence (2007).
19. Y. Y. Schechner and Y. Averbuch, "*Regularized image recovery in scattering media*," To be published in IEEE Trans. Pattern Analysis & Machine Intelligence (2007).
20. S. Bobrov and Y. Y. Schechner, "*Image-based prediction of imaging and vision performance*," To be published in the Journal of the Optical Society of America - A (2007).

Patents

1. Y. Y. Schechner and S. K. Nayar "*Methods and apparatus for image mosaicing*," patent published Mar. 2004, Serial No. 312,891, Publication No. 20040056966.
2. S. K. Nayar and Y. Y. Schechner "*Method and apparatus for recording a sequence of images using a moving optical element*," patent published Feb. 2005, Serial No. 474,580, Publication No. 20050041113.
3. N. Karpel and Y. Y. Schechner "*Recovering underwater scenes using polarization analysis*," patent pending, filed Feb. 2005.
4. E. Namer, S. Shwartz and Y. Y. Schechner "*Skyleless Dehazing*," patent pending, filed Jan. 2006.
5. T. Treibitz and Y. Y. Schechner "*Recovering object visibility and structure in a scattering medium when using artificial illumination*," patent pending, filed May 2006.

Research Reports

1. Y. Diamant and Y. Y. Schechner, "*Separation of semi-reflected scenes using secondary reflections*," Tech. Rep. CCIT TR-523, March/2005.

Magazine papers

1. Y. Schechner, "*Northern exposure - a kayaking trek in Alaska*," The Nature of Things (Hebrew)-The Society for Research of Man and Surroundings **27**, pp. 24-47 (1998).
2. Y. Y. Schechner, "*Aurora Borealis*," Optics and Photonics News **9/9**, p. 72 (1998).
3. Y. Y. Schechner, "*The arc-family of the rainbow*," Optics and Photonics News **9/4**, p. 64 (1998).

Invited Talks

1. J. Shamir, R. Piestun and Y. Y. Schechner, “*Propagation-invariance and 3D light fields*,” ICO XVIII *Optics for the Next Millennium*, San Francisco (1999).
2. Y. Y. Schechner, N. Kiryati and J. Shamir, “*Multi-valued images and their separation*,” Multi Image Analysis Workshop, Schloss Dagstuhl, Germany (2001).
3. Y. Y. Schechner “*Multidimensional image sensing*,” Vision & Image Science Workshop, Schloss Dagstuhl, Germany (2002).
4. Y. Y. Schechner, “*Hybrid imaging: Recent advances in physics-based vision*,” German-Israeli Binational Workshop, Israel (2004).
5. Y. Y. Schechner, “*Underwater vision*,” German-Israeli Binational Workshop, Israel (2004).
6. Y. Y. Schechner, “*Efficient image-based relighting*,” Second Israel-UK Symposium on Computer Graphics, Israel (2004).
7. Y. Y. Schechner, “*Recovery of underwater visibility and structure by polarization analysis*,” MTS Underwater Imaging Workshop, Washington DC (2005).
8. Y. Y. Schechner, “*Control of active radiation to improve imaging*,” MTS Underwater Imaging Workshop, Boston (2006).

Refereed conference papers

1. Y. Y. Schechner, N. Kiryati and R. Basri, “*Separation of Transparent Layers Using Focus*,” Proc. IEEE ICCV - International Conference on Computer Vision, pp. 1061-1066 (1998).
2. Y. Y. Schechner and N. Kiryati, “*Depth from Defocus vs. Stereo: How Different Really are They?*” Proc. IAPR ICPR - International Conference on Pattern Recognition pp. 1784-1786 (1998).
3. Y. Y. Schechner, N. Kiryati and J. Shamir, “*Separation of Transparent Layers by Polarization Analysis*,” Proc. IAPR SCIA - Scandinavian Conference on Image Analysis, Vol-I, pp. 235-242 (1999).
4. Y. Y. Schechner and N. Kiryati, “*The Optimal Axial Interval in Estimating Depth from Defocus*,” Proc. IEEE ICCV - Int. Conference on Computer Vision, pp. 843-848 (1999).
5. Y. Y. Schechner, J. Shamir and N. Kiryati, “*Polarization-Based Decorrelation of Transparent Layers: The Inclination Angle of an Invisible Surface*,” Proc. IEEE ICCV - International Conference on Computer Vision, pp. 814-819 (1999).
6. J. Shamir, R. Piestun and Y. Y. Schechner, “*Propagation-Invariance and 3D Light Fields*,” ICO XVIII *Optics for the Next Millennium*, pp. 108-109, (1999) — **Invited**.
7. Y. Y. Schechner, N. Kiryati and J. Shamir, “*Multi-valued Images and Their Separation*,” Multi-Image Analysis, LNCS **2032**, pp. 129-141 (2001). **Invited**.
8. Y. Y. Schechner, N. Kiryati and J. Shamir, “*Blind Recovery of Transparent and Semireflected Scenes*,” Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. 1, pp. 38-43 (2000).
9. Y. Y. Schechner and S. K. Nayar, “*Generalized Mosaicing*,” Proc. IEEE ICCV - International Conference on Computer Vision, Vol. 1, pp. 17-24 (2001).

10. Y. Y. Schechner, S. G. Narasimhan and S. K. Nayar, "*Instant Dehazing of Images Using Polarization*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. 1, pp. 325-332 (2001).
11. Y. Y. Schechner, S. K. Nayar, and P. N. Belhumeur "*A Theory of Multiplexed Illumination*," Proc. IEEE ICCV - Int. Conference on Computer Vision, Vol. 2, pp. 808-815 (2003).
12. Y. Y. Schechner and S. K. Nayar "*Uncontrolled Modulation Imaging*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. II, pp. 197-204 (2004).
13. Y. Y. Schechner and N. Karpel "*Clear Underwater Vision*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. I, pp. 536-543 (2004).
14. S. Shwartz, M. Zibulevsky and Y. Y. Schechner "*ICA Using Kernel Entropy Estimation with NlogN Complexity*," Proc. ICA - International Conference on Independent Component Analysis and Blind Signal Separation, pp. 422-429 (2004).
15. A. Litvinov and Y. Y. Schechner "*Addressing Radiometric Nonidealities: A Unified Framework*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. II, pp. 52-59 (2005).
16. E. Kidron, Y. Y. Schechner and M. Elad, "*Pixels that Sound*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. I, pp. 88-96 (2005).
17. S. Shwartz, Y. Y. Schechner and M. Zibulevsky, "*Efficient Separation of Convolutional Image Mixtures*," Proc. ICA - International Conference on Independent Component Analysis and Blind Signal Separation, pp. 246-253 (2006).
18. T. Treibitz and Y. Y. Schechner, "*Instant 3Descatter*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition, Vol. II, pp. 1861-1868 (2006).
19. S. Shwartz, E. Namer and Y. Y. Schechner, "*Blind Haze Separation*," Proc. IEEE CVPR - Computer Vision and Pattern Recognition Vol. II, pp. 1984-1991 (2006).
20. Y. Erez, Y. Y. Schechner and D. Adam, "*Ultrasound Image Denoising by Spatially Varying Frequency Compounding*," Proc. DAGM Symposium, LNCS **4147**, pp. 1-10 (2006).

Other conference papers

1. Y. Y. Schechner and J. Shamir, "*Orbital angular momentum of anisotropic dislocations*," OSA Annual Meeting, p. 76 (1995).
2. R. Piestun, Y. Y. Schechner and J. Shamir, "*Generalized self-imaging in free space*," EOS Topical meeting on Diffractive Optics, pp. 128-129 (1997).
3. R. Piestun, Y. Y. Schechner and J. Shamir, "*Rotating waves and the generalized self-imaging effect*," OSA Annual Meeting, (1997).
4. Y. Y. Schechner, S. Nayar and P. Belhumeur "*Codes for multiplexing images and lighting*," Israeli Computer Vision Day, Herzliya (2003).
5. Y. Y. Schechner and S. K. Nayar, "*Polarization mosaicking: High dynamic range and polarization imaging in a wide field of view.*," Proc. SPIE **5158**: Polarization science and remote sensing, pp. 93-102 (2003).
6. N. Karpel and Y. Y. Schechner, "*Portable polarimetric underwater imaging system with a linear response*," Proc. SPIE **5432**: Polarization: Measurement, Analysis and Remote Sensing VI, pp. 106-115 (2004).

7. N. Karpel and Y. Y. Schechner, "*Overcoming turbidity in underwater imaging*," 1st Sympos. of the Israeli Assoc. Aquatic Sciences (2004).
8. Y. Y. Schechner, M. Elad and E. Kidron "*Pixels correlated to sound*," Israeli Computer Vision Day (2004).
9. Y. Y. Schechner, S. K. Nayar, P. N. Belhumeur and H. S. Peri "*Imaging in multiplexed illumination*," SPIE **5529**: Nonimaging Optics and Efficient Illumination Systems, pp. 198-205 (2004).
10. A. Greengard, Y. Y. Schechner and R. Piestun "*Depth from rotating point spread functions*," Proc. SPIE **5557**: Optical Information Systems II, pp. 106-115 (2004).
11. Y. Y. Schechner and N. Karpel, "*Recovering scenes by polarization analysis*," MTS/IEEE OCEANS, pp. 1255-1261 (2004).
12. Y. Y. Schechner and N. Karpel, "*Attenuating natural flicker patterns*," MTS/IEEE OCEANS, pp. 1262-1268 (2004).
13. E. Namer and Y. Y. Schechner, "*Advanced visibility improvement based on polarization filtered images*," Proc. SPIE **5888**: Polarization Science and Remote Sensing II, pp. 36-45 (2005).
14. Y. Y. Schechner and Y. Averbuch "*Distance dependent regularization*," Israeli Computer Vision Day (2005).
15. Y. Y. Schechner, "*Compensating haze in long range observations*," MilTech, pp. 63-70 (2006).
16. S. Bobrov and Y. Y. Schechner, "*Image-based prediction of thermal imaging performance*," Proc. SPIE **6395**: Electro-Optical and Infrared Systems: Technology and Applications III (2006).
17. Y. Erez, Y. Y. Schechner and D. Adam "*Acousticlean images*," Israeli Computer Vision Day (2006).