

# Conference 6498 • Conv. Ctr. Room A4

Monday-Wednesday 29-31 January 2007 • Proceedings of SPIE Vol. 6498

## Computational Imaging V

Conference Chairs: **Charles A. Bouman**, Purdue Univ.; **Eric L. Miller**, Northeastern Univ.; **Ilya Pollak**, Purdue Univ.

Program Committee: **Samit K. Basu**, GE Global Research; **Thomas S. Denney, Jr.**, Auburn Univ.; **Peter C. Doerschuk**, Purdue Univ.; **Peyman Milanfar**, Univ. of California/Santa Cruz; **Joseph A. O'Sullivan**, Washington Univ. in St. Louis; **Zygmunt Pizlo**, Purdue Univ.; **Stanley J. Reeves**, Auburn Univ.; **Yongyi Yang**, Illinois Institute of Technology; **Yibin Zheng**

### Monday 29 January

#### SESSION 1

Conv. Ctr. Room A4 ..... Mon. 8:30 to 10:20 am

##### Medical Imaging I

Chair: **Eric L. Miller**, Northeastern Univ.

##### Keynote

8:30 am: **Progress in electrical impedance tomography**, D. Isaacson, J. C. Newell, G. Saunier, Rensselaer Polytechnic Institute ..... [6498-50]

9:00 am: **Analysis of reconstructions in full view fluorescence molecular tomography**, D. E. Hyde, Northeastern Univ. and Massachusetts General Hospital; A. Soubret, J. Dunham, T. Lasser, Massachusetts General Hospital; E. L. Miller, D. H. Brooks, Northeastern Univ.; V. Ntziachristos, Massachusetts General Hospital ..... [6498-01]

9:20 am: **Image reconstruction for small animal SPECT with two opposing half cones**, Y. Zheng, Univ. of Virginia; H. Li, The Univ. of Texas M.D. Anderson Cancer Ctr.; J. Wang, A. V. Stolin, J. Pole, M. B. Williams, Univ. of Virginia ..... [6498-02]

9:40 am: **Spatio-temporal reconstruction of dynamic gated cardiac SPECT**, Y. Yang, M. Jin, E. Gravier, Illinois Institute of Technology ..... [6498-03]

10:00 am: **Image reconstruction performance as a function of model complexity using information geometry: application to transmission tomographic imaging**, J. A. O'Sullivan, L. Xie, D. G. Politte, B. R. Whiting, Washington Univ. in St. Louis ..... [6498-04]

Coffee Break ..... 10:20 to 10:50 am

#### SESSION 2

Conv. Ctr. Room A4 ..... Mon. 10:50 am to 11:50 am

##### Mosaicing, Interpolation, Superresolution

Chair: **Mary L. Comer**, Purdue Univ.

10:50 am: **Creating panoramas on mobile phones**, J. J. Boutellier, O. J. Silvén, Oulun Yliopisto (Finland); M. Tico, M. Vehviläinen, Nokia Research Ctr. (Finland) ..... [6498-05]

11:10 am: **Multidimensional image enhancement from a set of unregistered differently exposed images**, P. Vandewalle, L. Meylan, S. E. Süssstrunk, École Polytechnique Fédérale de Lausanne (Switzerland) ..... [6498-06]

11:30 am: **Graph-based multiple panorama extraction from unordered image sets**, A. Sibirakov, M. Bober, Mitsubishi Electric ITE B.V. (United Kingdom) ..... [6498-07]

Lunch Break ..... 11:50 am to 1:40 pm

#### SESSION 3

Conv. Ctr. Room A4 ..... Mon. 1:40 to 3:20 pm

##### Segmentation and Shape Analysis

Chair: **Ilya Pollak**, Purdue Univ.

1:40 pm: **Multiscale multigranular image segmentation**, E. D. Kolaczyk, Boston Univ.; J. Ju, South Dakota State Univ.; S. Gopal, Boston Univ. [6498-09]

2:00 pm: **Riemannian metrics on landmark-based shape spaces: theory and applications**, M. Micheli, Brown Univ. .... [6498-10]

2:20 pm: **4D segmentation of cardiac data using active surfaces with spatiotemporal shape priors**, A. Abufadel, A. J. Yezzi, Jr., Georgia Institute of Technology; R. W. Schafer, Hewlett-Packard Labs. .... [6498-11]

2:40 pm: **Automated segmentation of alloy microstructures in serial section images**, J. Dumke, M. L. Comer, Purdue Univ. .... [6498-12]

3:00 pm: **Fast Mumford-Shah segmentation using image scale space bases**, C. V. Alvino, Univ. of Pennsylvania; A. J. Yezzi, Jr., Georgia Institute of Technology ..... [6498-13]

Coffee Break ..... 3:20 to 3:50 pm

#### SESSION 4

Conv. Ctr. Room A4 ..... Mon. 3:50 to 6:10 pm

##### Compression and Compressed Sensing

Chair: **Rebecca M. Willett**, Duke Univ.

3:50 pm: **A conformal approach to shape representation**, M. Feiszli, Brown Univ. .... [6498-14]

4:10 pm: **Efficient multispectral imaging using compressive sensing**, D. Takhar, J. N. Laska, K. F. Kelly, R. G. Baraniuk, Rice Univ. .... [6498-15]

4:30 pm: **Characterizing compression efficiency of sparse image representation techniques**, A. Zakhor, Univ. of California/Berkeley . [6498-16]

4:50 pm: **Variational methods for compressive sampling**, J. Romberg, Georgia Institute of Technology; F. Park, Univ. of Michigan; E. J. Candes, California Institute of Technology ..... [6498-17]

5:10 pm: **Compression of noisy Bayer pattern color filter array images**, A. V. Bazhyna, K. O. Egiazarian, Tampere Univ. of Technology (Finland); N. N. Ponomarenko, V. V. Lukin, National Aerospace Univ. (Ukraine) ..... [6498-18]

5:30 pm: **Multiscale reconstruction for computational spectral imaging**, R. M. Willett, Duke Univ. .... [6498-19]

5:50 pm: **Importance prioritized coding of aerial surveillance video using H.264**, D. Butler, H. Cheng, J. Cook, Sarnoff Corp. .... [6498-52]

**Tuesday 30 January**

**Awards and Plenary Presentation**  
**Marriott Ballroom 1-6 . . . . . 8:15 to 9:10 am**  
**Development and Plasticity in Visual Cortex**  
**Brian A. Wandell, Stanford Univ.**  
*See pg. 6 for details.*

**SESSION 5**

**Conv. Ctr. Room A4 . . . . . Tues. 9:30 to 11:50 am**  
**Hardware Systems for Imaging and Tomography**  
*Chair: Samit K. Basu, GE Global Research*

**Keynote**

- 9:30 am: **Why do GPUs work so well for acceleration of CT? (Invited Paper)**, K. D. Mueller, F. Xu, N. Neophytou, Stony Brook Univ. . . . . [6498-20]  
 10:00 am: **Hardware-accelerated deformable image registration for image-guided interventions**, R. Shekhar, O. Dandekar, Univ. of Maryland Medical Ctr. . . . . [6498-21]  
 Coffee Break . . . . . 10:20 to 10:50 am  
 10:50 am: **Tomographic image reconstruction using the cell broadband engine (CBE) general purpose hardware**, M. Kachelriess, M. Knaup, S. Steckmann, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); O. Bockenbach, Mercury Computer Systems GmbH (Germany) . . . . . [6498-22]  
 11:10 am: **Iterative reconstruction of cone-beam CT data on a cluster**, T. M. Benson, GE Global Research; J. Gregor, The Univ. of Tennessee . . . . [6498-23]  
 11:30 am: **Evolution of computer technology for fast cone-beam backprojection**, I. Goddard, A. Berman, Mercury Computer Systems, Inc.; O. Bockenbach, Mercury Computer Systems GmbH (Germany); F. P. Lauginiger, Mercury Computer Systems, Inc.; S. Schuberth, Mercury Computer Systems GmbH (Germany); S. Thieret, Mercury Computer Systems, Inc. . . . . [6498-51]  
 Lunch/Exhibition Break . . . . . 11:50 am to 1:40 pm

**SESSION 6**

**Conv. Ctr. Room A4 . . . . . Tues. 1:40 to 3:20 pm**  
**Restoration, Filtering, and Reconstruction**  
*Chair: Peyman Milanfar, Univ. of California/Santa Cruz*

- 1:40 pm: **Higher order bilateral filters and their applications**, H. Takeda, S. Farsiu, P. Milanfar, Univ. of California/Santa Cruz . . . . . [6498-24]  
 2:00 pm: **The use of levelable regularization functions for MRF restoration of SAR images while preserving reflectivity**, J. Darbon, EPITA (France); M. Sigelle, F. Tupin, École Nationale Supérieure des Télécommunications (France) . . . . . [6498-25]  
 2:20 pm: **Nonlocal evolutions for image regularization**, G. Gilboa, S. J. Osher, Univ. of California/Los Angeles . . . . . [6498-26]  
 2:40 pm: **Parametric point spread function modeling and reduction of stray light effects**, B. Bitlis, Purdue Univ.; P. A. Jansson, The Univ. of Arizona; J. P. Allebach, Purdue Univ. . . . . [6498-27]  
 3:00 pm: **An image decomposition model using the total variation and the infinity Laplacian**, L. A. Vese, C. Elion, Univ. of California/Los Angeles; J. Morel, École Normale Supérieure de Cachan (France) . . . . . [6498-28]  
 Coffee Break . . . . . 3:20 to 3:50 pm

**SESSION 7**

**Conv. Ctr. Room A4 . . . . . Tues. 3:50 to 4:50 pm**  
**Tracking, Recognition, and Scene Analysis**  
*Chair: Zygmunt Pizlo, Purdue Univ.*

- 3:50 pm: **Object tracking using joint-visible and thermal-infrared video sequences**, R. Péteri, O. Siler, E. Bichot, P. Courtellemont, Univ. de La Rochelle (France) . . . . . [6498-29]  
 4:10 pm: **Symmetry detection in 3D scenes**, T. Sawada, K. Sanik, Z. Pizlo, Purdue Univ. . . . . [6498-30]  
 4:30 pm: **Object recognition investigation using information-theoretic measures/metrics**, D. W. Reppinger, A. R. Pinkus, Air Force Research Lab.; J. A. Skipper, Wright State Univ. . . . . [6498-31]

**SESSION 8**

**Conv. Ctr. Room A4 . . . . . Tues. 4:50 to 5:30 pm**  
**Multigrid Methods**

*Chair: Charles A. Bouman, Purdue Univ.*

- 4:50 pm: **Multigrid optimal mass transport for image registration and morphing**, T. U. Rehman, A. R. Tannenbaum, Georgia Institute of Technology . . . . . [6498-32]  
 5:10 pm: **The effect of intergrid operators on multigrid convergence**, P. Navarrete Michelini, E. J. Coyle, Purdue Univ. . . . . [6498-33]

**Posters and Demonstrations-Tuesday**

**Demonstrations . . . . . 5:30 to 8:30 pm**

*A symposium-wide demonstration session will be open to attendees 5:30 to 8:30 pm Tuesday evening in Exhibit Hall 1. Demonstrators will provide interactive, hands-on demonstrations of a wide-range of products related to Electronic Imaging.*

**Posters . . . . . 5:30 to 7:00 pm**

*Posters will be placed on display after 10:00 am in Exhibit Hall 1. A poster session, with authors present at their posters, will be held Tuesday evening, 5:30 to 7:00 pm.*

- ✓ **A computational 3D microscope model for reconstruction of translucent neural stem cells in bright-field time-lapse microscopy**, J. H. Degerman, Chalmers Tekniska Högskola (Sweden); E. Winterfors, Univ. Pierre et Marie Curie (France); T. Gustavsson, Chalmers Tekniska Högskola (Sweden) . . . . . [6498-44]
- ✓ **Empirical performance evaluation of dissimilarity measures for use in urban structural damage detection**, Z. Chen, T. C. Hutchinson, Univ. of California/Irvine . . . . . [6498-45]
- ✓ **Superresolution single-particle Cryo-EM tomography of icosahedral virus using compressed sensing theory**, M. Kim, J. Choi, L. Yu, J. Ye, Korea Advanced Institute of Science and Technology (South Korea) [6498-46]
- ✓ **GPU-based visualization techniques for 3D microscopic imaging data**, Q. Wang, Y. Sun, J. P. Robinson, Purdue Univ. . . . . [6498-47]
- ✓ **GICEB: automatic segmentation algorithm for biomedical images**, Q. Wang, Y. Sun, Purdue Univ. . . . . [6498-48]

**SESSION 9**

**Conv. Ctr. Room A4 . . . . . Tues. 5:30 to 5:50 pm**  
**Imaging in Materials Science**

*Chair: Charles A. Bouman, Purdue Univ.*

- 5:30 pm: **Using transmission electron microscopy to quantify the spatial distribution of nanoparticles suspended in a film**, S. D. Newsam, E. Pernice, J. Jasinski, V. Leppert, Univ. of California/Merced . . . . . [6498-34]

# Conference 6498

## Wednesday 31 January

### Plenary Session

#### Marriott Ballroom 1-6 ..... 8:00 to 9:20 am

8:00 am: **More than a Poplar Plank: The Shape and Subtle Colors of the Masterpiece 'Mona Lisa' by Leonardo, Francois Blais, John Taylor, Luc Cournoyer, Michel Picard, Louis Borgeat, Guy Godin, J.-Angelo Beraldin, Marc Rioux**, National Research Council Canada; **Christian Lahanier, Bruno Mottin**, C.re de Recherche et de Restauration des Musées de France

8:40 am: **Space Exploration, Imaging Technology, and the Development of a Virtual Presence in Space, Eric M. DeJong**, Principal Investigator, Solar System Visualization (SSV) Project

See pg. 7 for details.

### SESSION 10

Conv. Ctr. Room A4 ..... Wed. 9:30 to 10:30 am

#### Reconstruction, inpainting, and Prediction

*Chair: Minh N. Do*, Univ. of Illinois at Urbana-Champaign

9:30 am: **Image inpainting based on energy minimization**, N. Kawai, T. Sato, N. Yokoya, Nara Institute of Science and Technology (Japan) ..... [6498-35]

9:50 am: **Signal reconstruction from a periodic nonuniform set of samples using H\_infinity optimization**, H. T. Nguyen, M. N. Do, Univ. of Illinois at Urbana-Champaign ..... [6498-36]

10:10 am: **A multiscale statistical model for time series forecasting**, W. Wang, Purdue Univ.; V. Portnoy, Jefferies & Co.; I. Pollak, Purdue Univ. [6498-54]

Coffee Break ..... 10:30 to 11:00 am

### SESSION 11

Conv. Ctr. Room A4 ..... Wed. 11:00 am to 12:00 pm

#### Medical Imaging II

*Chair: Thomas Talavage*, Purdue Univ.

11:00 am: **Simultaneous surface and volume registration using harmonic maps**, A. A. Joshi, D. W. Shattuck, Univ. of Southern California; P. Thompson, Univ. of California/Los Angeles; R. M. Leahy, Univ. of Southern California ..... [6498-49]

11:20 am: **Regional approach to event-related fMRI data analysis using hemodynamic response modeling**, L. Liu, A. Rao, T. Talavage, Purdue Univ. .... [6498-37]

11:40 am: **Fast joint estimation of magnitude, decay, and frequency from a single-shot MRI signal**, W. Tang, S. J. Reeves, Auburn Univ.; D. B. Twieg, The Univ. of Alabama/Birmingham ..... [6498-38]

Lunch/Exhibition Break ..... 12:00 to 1:30 pm

### SESSION 12

Conv. Ctr. Room A4 ..... Wed. 1:30 to 2:50 pm

#### Medical Imaging III

1:30 pm: **High-resolution image reconstruction for PET using detector response**, M. S. Tohme, J. Qi, Univ. of California/Davis ..... [6498-39]

1:50 pm: **Superresolution projection reconstruction MR imaging using FOCUSS (PR-FOCUSS)**, S. Tak, J. Ye, Korea Advanced Institute of Science & Technology (South Korea) ..... [6498-40]

2:10 pm: **Fast methods for tomographic reconstruction**, J. Thibault, GE Healthcare; Z. Yu, Purdue Univ.; K. Sauer, Univ. of Notre Dame; C. A. Bouman, Purdue Univ.; J. Hsieh, GE Healthcare ..... [6498-41]

2:30 pm: **Statistical modeling of the myosin lattice in vertebrate muscle**, C. Yoon, R. P. Millane, N. D. Blakeley, A. Goyal, Univ. of Canterbury (New Zealand) ..... [6498-53]

### SESSION 13

Conv. Ctr. Room A4 ..... Wed. 2:50 to 3:10 pm

#### Color Imaging

2:50 pm: **Training-based algorithm for moiré suppression in scanned halftone images**, H. Siddiqui, C. A. Bouman, Purdue Univ. .... [6498-55]