

Conference 5207
Room:
Monday-Friday 4-8 August 2003
Proceedings of SPIE Vol. 5207

Wavelets X

Conference Chairs: **Michael A. Unser**, EPFL (Switzerland); **Akram Aldroubi**, Vanderbilt Univ.; **Andrew F. Laine**, Columbia Univ.

Program Committee: **Jean-Pierre Antoine**, Univ. Catholique de Louvain (Belgium); **Richard G. Baraniuk**, Rice Univ.; **John J. Benedetto**, Univ. of Maryland/College Park and MITRE Corp.; **Thierry Blu**, EPFL (Switzerland); **Emmanuel J. Candes**, California Institute of Technology; **Albert Cohen**, Univ. de Jussieu (France); **Ingrid Daubechies**, Princeton Univ.; **Ronald A. DeVore**, Univ. of South Carolina; **Minh N. Do**, Univ. of Illinois (Switzerland); **David L. Donoho**, Stanford Univ.; **Hans G. Feichtinger**, Univ. Wien (Austria); **Douglas P. Hardin**, Vanderbilt Univ.; **Jelena Kovacevic**, Lucent Technologies/Bell Labs.; **Jean-Marc Lina**, Univ. de Montréal (Canada); **Francois G. Meyer**, Univ. of Colorado/Boulder; **Yves Meyer**, ENS Cachan (France); **Robert D. Nowak**, Rice Univ.; **Naoki Saito**, **Thomas Strohmer**, Univ. of California/Davis; **Bruno Torresani**, Univ. de Provence (France); **Martin Vetterli**, Swiss Federal Institute of Technology (Switzerland); **Yehoshua Y. Zeevi**, Technion—Israel Institute of Technology (Israel)

Monday 4 August

Welcome Remarks

Room: Mon. 8:30 to 8:40 am
Michael A. Unser, EPFL (Switzerland)

Keynote Presentation 8:40 to 9:40 am

Keynote

Wavelets, approximation, and compression: beyond JPEG2000 (*Invited Paper*), M. Vetterli, EPFL (Switzerland) [5207-01]

SESSION 1: Denoising

Chair: **Naoki Saito**, Univ. of California/Davis

Room: Mon. 9:40 am to 12:10 pm

9:40 am: **Class of heavy-tailed multivariate non-Gaussian probability models for wavelet coefficients**, F. Shi, I. W. Selesnick, Polytechnic Univ. [5207-02]

10:00 am: **Iterative projective wavelet methods for denoising**, A. K. Fletcher, Univ. of California/Berkeley; V. K. Goyal, Digital Fountain; K. Ramchandran, Univ. of California/Berkeley [5207-03]

Coffee Break 10:20 to 10:50 am

10:50 am: **Interpolation and denoising of piecewise smooth signals by wavelet regularization**, H. Choi, R. G. Baraniuk, Rice Univ. [5207-04]

11:10 am: **Adaptive wavelet thresholding for multichannel signal estimation**, I. C. Atkinson, F. Kamalabadi, D. Jones, M. Do, Univ. of Illinois/Urbana-Champaign [5207-05]

11:30 am: **Estimation error bounds for frame denoising**, A. K. Fletcher, K. Ramchandran, Univ. of California/Berkeley [5207-06]

11:50 am: **Improved bearing estimation using wavelet denoising**, G. V. Anand, S. Ramani, Indian Institute of Science (India) [5207-07]

Lunch Break 12:10 to 1:30 pm

SESSION 2: Statistical Models

Chairs and Organizers: **Richard G. Baraniuk, Robert D. Nowak**, Rice Univ.

Room: Mon. 1:30 to 3:30 pm

1:30 pm: **Resolution enhancement and deconvolution with wavelet footprints** (*Invited Paper*), P. L. Dragotti, Imperial College (United Kingdom); M. Vetterli, EPFL (Switzerland) [5207-08]

1:50 pm: **Directional multiscale statistical modeling of images** (*Invited Paper*), M. N. Do, Univ. of Illinois/Urbana-Champaign [5207-09]

2:10 pm: **Geometric hidden Markov tree wavelet model** (*Invited Paper*), J. K. Romberg, M. Wakin, H. Choi, R. Baraniuk, Rice Univ. [5207-10]

2:30 pm: **Estimation risk of transform-averaged estimators** (*Invited Paper*), J. Liu, Xerox Palo Alto Research Ctr.; P. Moulin, Univ. of Illinois/Urbana-Champaign [5207-11]

2:50 pm: **Multiscale likelihood analysis and image reconstruction** (*Invited Paper*), R. M. Willett, R. D. Nowak, Rice Univ. [5207-12]

3:10 pm: **Adapting overcomplete wavelet models to natural images** (*Invited Paper*), P. Sallee, B. A. Olshausen, Univ. of California/Davis [5207-13]

Coffee Break 3:30 to 3:50 pm

Posters - Monday

Room: Mon. 3:50 to 5:30 pm

The following posters will be displayed all day Monday in Convention Center Room 6A. Authors will be present for the Wavelets conference poster session 3:50 to 5:30 pm.

A symposium-wide poster reception, with authors present at their posters, will be held from 5:30 to 7:00 pm. Light refreshments will be served. Further information for poster authors can be found on page xxx.

Unsupervised image segmentation using wavelet-domain hidden Markov models, G. Fan, Oklahoma State Univ. [5207-86]

Unsupervised image segmentation using multiscale fuzzy clustering, D. A. Karpushenko, Tomsk State Academy of Control Systems and Radioelectronics (Russia) [5207-87]

Biorthogonal wavelet filters for watermarking security, S. Marusic, D. Tay, G. Deng, La Trobe Univ. (Australia) [5207-88]

Wavelet analysis in the studies of scales of variability in the series of empirical meteorological data, A. V. Khokhlova, V. N. Ivanov, A. M. Sterin, Russian Research Institute for Hydrometeorological Information (Russia) [5207-89]

Characterization of complex nonlinear regimes using global wavelet spectrum analysis, A. Zanandrea, Instituto Tecnológico de Aeronáutica (Brazil); R. R. Rosa, F. M. Ramos, Instituto Nacional de Pesquisas Espaciais (Brazil) [5207-90]

Wavelet-based method to measure and classify slight deviations of amplitude and phase in power systems, X. Chen, China Electric Power Research Institute (China) [5207-91]

Damage in plates, S. Wimmer, V. DeGiorgi, Naval Research Lab. [5207-92]

Wavelet-aided pavement distress image processing, J. Zhou, P. S. Huang, F. Chiang, Stony Brook Univ. [5207-93]

Wavelet-based methods in fast Z-Pinch research, B. B. Afeyan, K. Won, Polymath Research Inc. [5207-94]

Application of wavelet analysis on strip noise removing from satellite images, F. Chen, D. Xia, Nanjing Univ. of Science and Technology (China) [5207-95]

Analog 2D video processing and its application to wavelet filter banks, M. S. Moore, B. Amrine, J. Langan,

Computational Sensors Corp. [5207-96]

Novel signal shape descriptors through wavelet transforms and dimensionality reduction, N. P. Hughes, L. Tarassenko, Univ. of Oxford (United Kingdom) [5207-97]

Local discriminant wavelet packet basis for texture classification, N. Rajpoot, Univ. of Warwick (United Kingdom) [5207-98]

Orthonormal bases and tilings of the time-frequency plane for music processing, J. M. Vuletich, Univ. de Buenos Aires (Argentina) [5207-99]

Speech hearing connection, D. J. Nelson, U.S. Dept. of Defense; S. Umesh, Indian Institute of Technology (India); L. Cohen, Hunter College/CUNY [5207-101]

Multiresolution-fractal feature extraction and tumor detection: analytical modeling and implementation, K. M. Iftekhharuddin, C. Parra, Univ. of Memphis [5207-102]

Removing divergences in the negative moments of the multi-fractal partition function with the wavelet transformation, Z. R. Struzik, Ctr. voor Wiskunde en Informatica (Netherlands) [5207-103]

2-microlocal formalism, S. Seuret, J. Levy Vehel, INRIA Rocquencourt (France) [5207-104]

Non-orthogonal wavelet bases for \mathbb{R}^n , A. Avudainayagam, Indian Institute of Technology (India) [5207-105]

Adaptive integer to integer wavelet transforms using update lifting, G. C. K. Abhayaratne, G. Piella, Ctr. for Mathematics and Computer Science (Netherlands); B. Pesquet-Popescu, École Nationale Supérieure des Télécommunications (France); H. Heijmans, Ctr. for Mathematics and Computer Science (Netherlands) [5207-106]

Wavelets analysis for the fast integration and derivation, A. Gandelli, Politecnico di Milano (Italy); A. Ageyev, Seversk Institute of Technology (Russia) [5207-107]

Quasi-wavelet algorithm for second kind boundary integral equations, H. Chen, S. Peng, Institute of Automation (China) [5207-108]

Efficient coding for 3D shape data considering normal vectors on the surface model, T. Kajita, K. Kasai, Y. Saito, K. Fukuda, A. Kawanaka, Sophia Univ. (Japan) [5207-109]

Choice of wavelet in image compression applications, K. R. Namuduri, Wichita State Univ. [5207-110]

Wavelet variance components in image space for spatio-temporal neuro-imaging data, J. Aston, National Institute of Statistical Sciences and U.S. Census Bureau; F. Turkheimer, V. Cunningham, Imperial College (United Kingdom); R. Gunn, McGill Univ. (Canada) [5207-111]

Parameter estimation of locally stationary wavelet processes, A. Johnson III, C. Li, Univ. of Pittsburgh [5207-113]

Position dependent linear multiresolutions and applications, J. Baccou, J. Liandrat, Univ. à Marseille (France) [5207-114]

Translation invariant approach to sampling theorem, Q. Wang, Southeast Univ. (China) and Harvard Univ. [5207-115]

Design-adapted wavelet estimator for two-dimensional tensor product irregular designs, V. A. Delouille, Katholieke Univ. Leuven (Belgium) and Rice Univ. (Belgium); J. Simoens, R. von Sachs, Katholieke Univ. Leuven (Belgium) [5207-116]

Local regularity-based interpolation, P. Legrand, Institut de Recherche en Communications et Cybernétique de Nantes (France) and LCPC (France); J. Levy-Vehel, Institut de Recherche en Communications et Cybernétique de Nantes (France) and INRIA (France) [5207-117]

Optical wavelet packet transform and best basis selecting by an volume holographic opto-electronic hybrid system, D. Cai, Y. Yan, G. Jin, M. Wu, Q. He, Tsinghua Univ. (China) [5207-118]

Wavelet-based adaptive optics, K. J. Jones, Rice Univ. [5207-119]

Ultrafast multiwavelet analysis using phase-encoded fringe-adjusted JTC, A. R. Alsamman, Univ. of New Orleans [5207-120]

Projection operators on piecewise polynomial spaces, A. Cammilleri, E. Serrano, Univ. de Buenos Aires (Argentina) and Univ. Nacional de San Martín (Argentina) [5207-121]

Self-similar and multi-scaling functions of dimension r , M. Fabio, E. Serrano, Univ. de Buenos Aires (Argentina) and Univ. Nacional de San Martín (Argentina) [5207-122]

Tuesday 5 August

Keynote Presentation 8:00 to 9:00 am

Keynote

Wavelets and approximation theory (*Invited Paper*), R. A. DeVore, Univ. of South Carolina [5207-14]

SESSION 3: Approximation Theory

Chairs: **Ronald A. DeVore**, Univ. of South Carolina; **Thierry Blu**, EPFL (Switzerland)

Room: Tues. 9:00 to 10:40 am

9:00 am: **Harmonic spline series representation of scaling functions** (*Invited Paper*), T. Blu, M. Unser, EPFL (Switzerland) [5207-15]

9:20 am: **Global method for reversible integer wavelet algorithms** (*Invited Paper*), G. Plonka, Gerhard-Mercator-Univ. Duisburg (Germany) [5207-16]

9:40 am: **Multivariate nonlinear approximation** (*Invited Paper*), S. Dekel, RealTimeImage (Israel) and Tel-Aviv university (Israel) [5207-17]

10:00 am: **Wavelet denoising of functional MRI images** (*Invited Paper*), B. J. Lucier, Purdue Univ. [5207-18]

10:20 am: **Fractional wavelets, derivatives, and Besov spaces**, M. A. Unser, T. Blu, EPFL (Switzerland) [5207-19]

Coffee Break 10:40 to 11:00 am

SESSION 4: Novel Applications

Chair: **Jelena Kovacevic**, Lucent Technologies/Bell Labs.

Room: Tues. 11:00 am to 12:20 pm

11:00 am: **Orthogonal wavelets on triangulations** (*Invited Paper*), D. P. Hardin, Vanderbilt Univ. [5207-20]

11:20 am: **Multiwavelet-like bases for high quality image interpolation** (*Invited Paper*), K. Ichige, Yokohama National Univ. (Japan); T. Blu, M. Unser, EPFL (Switzerland) [5207-21]

11:40 am: **Simple algorithm to compute the global support of refinable function vectors** (*Invited Paper*), G. Plonka, Gerhard-Mercator-Univ. Duisburg (Germany) [5207-22]

12:00 pm: **Multi-filter banks associated with balanced multi-wavelets of dimension of three**, J. Lian, Prairie View A&M Univ. [5207-23]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 5: Continuous Wavelet Transform and Applications

Chairs and Organizers: **Jean-Pierre Antoine**, Univ. Catholique de Louvain (Belgium); **Bruno Torrèsani**, Univ. de Provence (France)

Room: Tues. 2:00 to 3:40 pm

2:00 pm: **Variations on Hough-wavelet transforms for time-frequency chirp detection** (*Invited Paper*), B. Torrèsani, M. Morvidone, Univ. de Provence (France) [5207-24]

2:20 pm: **Angular multiselectivity analysis of images** (*Invited Paper*), J. Antoine, L. Jacques, Univ. Catholique de Louvain (Belgium) [5207-25]

2:40 pm: **Gabor wavelets on the sphere** (*Invited Paper*), L. Demanet, California Institute of Technology; P. Vandergheynst, EPFL (Switzerland) [5207-26]

3:00 pm: **Approximation with highly redundant dictionaries** (*Invited Paper*), R. Gribonval, IRISA/INRIA (France) [5207-28]

3:20 pm: **Very low bit rate image coding using redundant dictionaries** (*Invited Paper*), P. Vandergheynst, L. Peotta, L. Granai, EPFL (Switzerland) [5207-28]

Coffee Break 3:40 to 4:00 pm

SESSION 6: Multiwavelets

Chair: **Douglas P. Hardin**, Vanderbilt Univ.

Room: Tues. 4:00 to 5:40 pm

4:00 pm: **Multifractional splines: application to seismic imaging**, F. J. Herrmann, Univ. of British Columbia (Canada) [5207-29]

4:20 pm: **Wavelet packets for error control coding**, E. Sakk, U.S. Dept. of Agriculture and Cornell Univ.; S. B. Wicker, Cornell Univ. [5207-30]

4:40 pm: **Three-dimensional audio localization using wavelet-domain convolution**, P. F. Hubbard, Argonne National Lab.; K. L. Umland, M. C. Pereyra, T. P. Caudell, Univ. of New Mexico [5207-31]

5:00 pm: **Enabling time-frequency agility: wavelet packet modulation in practice**, E. H. Kjeldsen, Scientific Research Corp.; A. R. Lindsey, Air Force Research Lab. [5207-32]

5:20 pm: **Wavelets for the cochlea**, M. Reimann, Univ. Bern (Switzerland) [5207-33]

Wednesday 6 August

SESSION 7: Sparsity, Sparse Representations, and Blind Sources Separation

Chair and Organizer: **Yehoshua Y. Zeevi**, Technion—Israel Institute of Technology (Israel)

Room: Wed. 8:30 am to 12:20 pm

8:30 am: **Separation of transmitted and reflected images using Sparse ICA** (*Invited Paper*), M. M. Bronstein, A. M. Bronstein, M. Zibulevsky, Y. Y. Zeevi, Technion—Israel Institute of Technology (Israel) [5207-34]

8:50 am: **Piecewise linear source separation** (*Invited Paper*), R. Gribonval, IRISA/INRIA (France) [5207-35]

9:10 am: **Sparse representation in speech signal processing** (*Invited Paper*), T. Lee, Univ. of California/San Diego [5207-36]

9:30 am: **Recovery of constituent spectra using non-negative matrix factorization** (*Invited Paper*), P. Sajda, S. Du, Columbia Univ.; L. C. Parra, Sarnoff Corp. [5207-37]

9:50 am: **Application of wavelets in blind source separation** (*Invited Paper*), P. Kisilev, M. Zibulevsky, Y. Y. Zeevi, Technion—Israel Institute of Technology (Israel) [5207-38]

Coffee Break 10:10 to 10:40 am

10:40 am: **Source adaptive blind source separation: Gaussian models and sparsity** (*Invited Paper*), D. A. Pham, Ctr. National de Recherche Scientifique (France) and CNRS; J. Cardoso, École Nationale Supérieure des

Télécommunications (France) [5207-39]

11:00 am: **New stochastic model of speech signal** (*Invited Paper*), R. V. Balan, J. Rosca, S. Rickard, Siemens Corporate Research, Inc. [5207-40]

11:20 am: **Learning non-negative sparse representations** (*Invited Paper*), P. O. Hoyer, Howard Hughes Medical Institute and New York Univ. [5207-41]

11:40 am: **Blind separation of sparse sources with relative Newton method** (*Invited Paper*), M. Zibulevsky, Technion—Israel Institute of Technology (Israel) [5207-42]

12:00 pm: **Wavelet domain blind image separation**, M. Ichir, A. Mohammad-Djafari, École Supérieure d'Électricité (France) [5207-43]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 8: Frames and Gabor Analysis

Chairs and Organizers: **Hans G. Feichtinger**, Univ. Wien (Austria); **Thomas Strohmer**, Univ. of California/Davis

Room: Wed. 2:00 to 5:30 pm

2:00 pm: **Frames, discrete geometry, and spread spectrum communications** (*Invited Paper*), T. Strohmer, Univ. of California/Davis [5207-44]

2:20 pm: **Physical interpretation for finite tight frames** (*Invited Paper*), P. G. Casazza, Univ. of Missouri/Columbia [5207-45]

2:40 pm: **Redundancy of frames** (*Invited Paper*), R. V. Balan, Siemens Corporate Research, Inc.; Z. Landau, Univ. of California/Berkeley [5207-46]

3:00 pm: **Non-uniform Gabor bases** (*Invited Paper*), Y. Wang, Georgia Institute of Technology [5207-47]

Coffee Break 3:20 to 3:50 pm

3:50 pm: **Gabor multipliers with varying lattices** (*Invited Paper*), H. G. Feichtinger, Univ. Wien (Austria) [5207-48]

4:10 pm: **Duality property for unique Gabor duals for subspace Gabor frames** (*Invited Paper*), D. Han, Univ. of Central Florida [5207-49]

4:30 pm: **Density of multidimensional wavelets** (*Invited Paper*), G. Kutyniok, Univ. Paderborn (Germany); C. Heil, Georgia Institute of Technology [5207-50]

4:50 pm: **Wavelet frames on irregular grids and in multi-dimension** (*Invited Paper*), A. Aldroubi, Vanderbilt Univ.; C. A. Cabrelli, U. Molter, Univ. de Buenos Aires (Argentina) [5207-122]

5:10 pm: **Best adapted shift invariant space**, C. A. Cabrelli, Univ. de Buenos Aires (Argentina); A. Aldroubi, D. P. Hardin, Vanderbilt Univ.; U. Molter, Univ. de Buenos Aires (Argentina) [5207-51]

Thursday 7 August

SESSION 9: Medical Imaging

Chair and Organizer: **Francois G. Meyer**, Univ. of Colorado/Boulder

Room: Thurs. 8:30 to 11:20 am

8:30 am: **Wavelet-based multiple hypotheses testing approach for activation maps estimation** (*Invited Paper*), J. M. Fadili, Ecole Nationale Supérieure d'Ingenieurs de Caen and Ctr. de Recherche (France); E. T. Bullmore, Univ. of Cambridge (United Kingdom) [5207-52]

8:50 am: **Wavelets versus resels in the context of fMRI: establishing the link with SPM** (*Invited Paper*), D. Van De Ville, T. Blu, M. Unser, EPFL (Switzerland) [5207-53]

9:10 am: **Features selection for clustering of fMRI data** (*Invited Paper*), F. G. Meyer, J. Chinrungrueng, Univ. of Colorado [5207-54]

9:30 am: **Applications of wavelets in morphometric analysis of medical images** (*Invited Paper*), C. Davatzikos, Univ. of Pennsylvania [5207-55]

9:50 am: **Wavelet decomposition on the sphere** (*Invited Paper*), D. Potts, Univ. zu Lübeck (Germany) [5207-56]

10:10 am: **Integrated wavelets for medical image analysis** (*Invited Paper*), P. Heinlein, W. Schneider, IMAGETOOL GmbH (Germany) [5207-57]

Coffee Break 10:30 to 11:00 am

11:00 am: **Multiresolution phase estimates for doppler ultrasound imaging**, D. M. Healy, Univ. of Maryland [5207-58]

SESSION 10: Complex Wavelets

Chair and Organizer: Jean-Marc Lina, Univ. de Montréal (Canada)

Room: Thurs. 11:20 am to 12:20 pm

11:20 am: **Image sharpening via image denoising in the complex wavelet domain** (*Invited Paper*), I. W. Selesnick, S. Cai, L. Sendur, Polytechnic Univ. [5207-59]

11:40 am: **New family of complex rotation-covariant multiresolution bases in 2D** (*Invited Paper*), B. Forster, T. Blu, M. Unser, EPFL (Switzerland) [5207-60]

12:00 pm: **Natural image modeling using complex wavelets** (*Invited Paper*), A. Jalobeanu, NASA Ames Research Ctr.; J. Zerubia, INRIA (France); L. Blanc-Feraud, Univ. de Nice Sophia-Antipolis (France) [5207-61]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 11: Compression

Chair: Martin Vetterli, EPFL (Switzerland)

Room: Thurs. 2:00 to 3:40 pm

2:00 pm: **New local sine transform without overlaps: a combination of computational harmonic analysis and PDE**, N. Saito, J. Remy, Univ. of California/Davis [5207-62]

2:20 pm: **Geometric methods for wavelet-based image compression**, M. B. Wakin, J. K. Romberg, H. Choi, R. G. Baraniuk, Rice Univ. [5207-63]

2:40 pm: **Matching pursuit analysis of hyperspectral imagery**, L. Alparone, F. Argenti, M. Dionisio, Univ. degli Studi di Firenze (Italy) [5207-64]

3:00 pm: **TBB (true best base) searching method and its applications**, H. Chen, T. Olson, Lockheed Martin Missiles and Fire Control [5207-65]

3:20 pm: **High-bit-rate approximation**, V. Bach, Univ. Mainz (Germany); S. Grottko, Technische Univ. Berlin (Germany); K. Jung, Algo Vision Luratech (Germany); T. Richter, J. Sablatnig, R. Seiler, M. Wilke, Technische Univ. Berlin (Germany) [5207-66]

Coffee Break 3:40 to 4:00 pm

SESSION 12: Inverse Problems

Chair: Michael A. Unser, Swiss Federal Institute of Technology (Switzerland)

Room: Thurs. 4:00 to 5:00 pm

4:00 pm: **Transform methods in image processing: restoration, resampling, compression, target location**, L. P. Yaroslavsky, Tel Aviv Univ. (Israel) [5207-67]

4:20 pm: **Non-linear Fresnelet approximation for interference term suppression in digital holography**, M.

Liebling, T. Blu, M. Unser, EPFL (Switzerland) [5207-68]

4:40 pm: **New technique for the extrapolation of band-limited signals**, K. Drouiche, Univ. de Cergy Pontoise (France); D. Kateb, Univ. de Compiegne (France) [5207-70]

Friday 8 August

Keynote Presentation 8:30 to 9:30 am

Keynote

Geometric multiscale analysis and its applications (*Invited Paper*), D. L. Donoho, Stanford Univ. [5207-71]

SESSION 13: Curvelets and Directional Representations

Chairs and Organizers: **Emmanuel J. Candes**, California Institute of Technology; **Minh N. Do**, Univ. of Illinois/Urbana-Champaign

Room: Fri. 9:30 am to 12:10 pm

9:30 am: **Geometric multiscale transforms, minimum total variation synthesis rules, algorithms, and applications to image processing** (*Invited Paper*), E. J. Candes, California Institute of Technology [5207-121]

9:55 am: **Contourlets: a computational framework for directional multiscale image representation** (*Invited Paper*), M. N. Do, Univ. of Illinois/Urbana-Champaign [5207-72]

Coffee Break 10:20 to 10:50 am

10:50 am: **Image restoration by the curvelet transform** (*Invited Paper*), J. Starck, CEA Saclay (France) [5207-73]

11:10 am: **Discrete directional wavelet bases and frames: analysis and applications** (*Invited Paper*), P. L. Dragotti, Imperial College (United Kingdom); M. Vetterli, V. Velisavljevic, B. Beferull-Lozano, EPFL (Switzerland) [5207-74]

11:30 am: **Multiscale statistical modeling for directionally sensitive features** (*Invited Paper*), X. Huo, Georgia Institute of Technology [5207-75]

11:50 am: **Video denoising using 2D and 3D dual-tree complex wavelet transforms** (*Invited Paper*), I. W. Selesnick, K. Y. Li, Polytechnic Univ. [5207-76]

Lunch Break 12:10 to 1:30 pm

SESSION 14: Wavelet Design

Chair: **Akram Aldroubi**, Vanderbilt Univ.

Room: Fri. 1:30 to 3:10 pm

1:30 pm: **Anisotropic 2D wavelet packets and rectangular tiling: theory and algorithms**, D. Xu, M. N. Do, Univ. of Illinois/Urbana-Champaign [5207-77]

1:50 pm: **Non-separable radial frame multiresolution analysis in multidimensions**, M. Papadakis, G. Gogoshin, I. A. Kakadiaris, D. J. Kouri, Univ. of Houston; D. K. Hoffman, Iowa State Univ. [5207-78]

2:10 pm: **New design of orthogonal FIR filter banks using the Cayley transform**, J. Zhou, M. N. Do, Univ. of Illinois/Urbana-Champaign; J. Kovacevic, xWaveforms [5207-79]

2:30 pm: **Detection of image singularities using more regular wavelets**, G. Lemaire, Univ. de Mons Hainaut (Belgium); K. Drouiche, Univ. de Cergy Pontoise (France); J. DeConinck, Univ. de Mons Hainaut (Belgium) [5207-80]

2:50 pm: **Finer directional wavelet transform**, Y. Lu, M. N. Do, Univ. of Illinois/Urbana-Champaign [5207-81]

Coffee Break 3:10 to 3:40 pm

SESSION 15: Multi-scale Image Processing

Chair: **Andrew F. Laine**, Columbia Univ.

Room:Fri. 3:40 to 5:00 pm

3:40 pm: **Application of multiresolution wavelet pyramids and gradient search based on mutual information to sub-pixel registration of multisensor satellite imagery**, I. Zavorin, J. Le Moigne, NASA Goddard Space Flight Ctr. [5207-82]

4:00 pm: **Interband structure modeling for oversampled multiresolution analysis-based Pan-sharpening of very high resolution multispectral images**, A. Garzelli, Univ. degli Studi di Siena (Italy); B. Aiazzi, Consiglio Nazionale delle Ricerche (Italy); L. Alparone, Univ. degli Studi di Firenze (Italy); S. Baronti, Consiglio Nazionale delle Ricerche (Italy) [5207-83]

4:20 pm: **Image registration using threefold orthogonal wavelets**, S. Gefen, O. Tretiak, J. Nissanov, Drexel Univ. [5207-84]

4:40 pm: **Nonseparable multiwavelet for edge detection**, A. M. Ruedin, Univ. de Buenos Aires (Argentina) [5207-85]