Welcome to the

2006 CASIS Workshop

Lawrence Livermore National Laboratory
November 16-17, 2006

http://casis.llnl.gov

Sponsored by the LLNL Engineering Directorate
Center Director: S. Azevedo, Co-Director: R. Roberts

UCRL-MI-226006

C.A.S.I.S. Mission

To further the advancement of signal and image processing for the sciences by providing a means to…

- Develop an open **liaison** between Signal & Image Processing groups in industry, government, university and establish a transfer of technology

- Transfer timely **technical information** through the media of invited seminars, short courses, publications, technical presentations

- Keep a **close coordination** with all LLNL groups performing research and development related to the Signal & Imaging Sciences

- Establish a **reference library** with current publications (texts, software, journals, reports, etc.) related to the Signal & Imaging Sciences
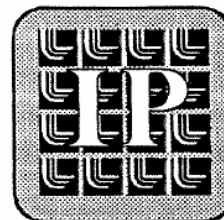
  and

- To **sponsor** an annual CASIS Workshop at LLNL in the Signal & Image Sciences

http://casis.llnl.gov

The fore-runner

IMAGE PROCESSING WORKSHOP

IP

April 21-22, 1987

Lawrence Livermore National Laboratory

Building 481, Nova Briefing Room

In co-operation with the EE/ME Imaging Thrust Areas
& the Weapons Agency Non-Destructive Testing Organization (WANTO)

A workshop for LLNL, EG&G, LANL, and Sandia personnel to share ideas
accomplishments, and areas of need in Image Processing.

Tuesday, April 21, 1987

Welcome by Dennis K. Fisher
Associate Director for Engineering
Lawrence Livermore National Laboratory

Keynote Address by James F. Morgan
Lawrence Livermore National Laboratory
"Imaging: Why?"
Current Uses of Imaging in the Nuclear Test Program

Hosted by: Jerome E. Krammen & Mark J. LaChapell

The CASIS web site…

Information about
2006 CASIS Workshop

Register on-line

Past proceedings and
many presentations

http://casis.llnl.gov

The CASIS Reference Library – B141

The CASIS Reference Library is in B141 1000-wing (East side) with a small reading area nearby.

Collection of signal and image processing books and materials

Videotapes and CASIS materials are available for checkout

Use the sign out sheet, and contact Paul Silveira (B141/R1022) to access the materials.

http://casis.llnl.gov

C.A.S.I.S. Staff

DIRECTOR:	**Steve Azevedo**
Co-DIRECTOR:	**Randy Roberts**
OPERATIONS MANAGER:	**Vickie Abreu**
ADMINISTRATIVE SUPPORT:	**Deana Eshpeter** **Dora DaRosa**
GRAPHIC DESIGNERS:	**Kathy McCullough** **Irene Chan** **Debbie Ortega**
WEB SITE:	**Kathy McCullough**
SPONSOR:	**Engineering Directorate** **Steve Patterson, AD** **Greg Suski, DAD S&T**

Center for Advanced Signal and Imaging Sciences

CASIS Workshop Session Chairs

Thursday, Nov 16

Analysis of Massive Datasets: *Chandrika Kamath*

Nondestructive Evaluation: *Harry Martz*

Imaging Methodology: *Mike Moran*

Friday, Nov 17

NIF Optics Inspection: *Laura Kegelmeyer*

*Model-based Signal Processing
  and Estimation:*   *Dave Chambers*

Image Processing & Analysis: *Dave Paglieroni*

Past CASIS Keynote Speakers

Year	Speaker	Title
1998	Dr. Anthony Devaney, Northeastern University	Diffraction Tomography
1998	Dr. Ronald Bracewell, Stanford University	Detection of Nonsolar Planets by Spinning Infrared
1999	Dr. Bernard Widrow, Stanford University	A Microphone Array for Hearing Aids
1999	Dr. Avi Kak, Purdue University	A Retrospective on Computer Vision Research
2000	Prof. Simon Haykin, McMaster University	Adaptive Systems for Signal Processing
2000	Dr. Christian Pichot, University of Nice	Subsurface Tomography Using Ultra-Wide Band Systems
2001	Dr. James Greenleaf, Mayo Foundation	Vibro-acoustography: Ultrasonic Imaging Without Speckle
2001	Prof. A. Paulraj, Stanford University	Multiple Input - Multiple Output (MIMO) Wireless: The New Frontier
2002	Dr. Alan Witten, University of Oklahoma	Expedition Adventure: Using Geophysics to Find Dinosaurs, Pirate Ships and Cavemen
2002	Dr. Leon Cohen, University of New York	Time-Frequency Description of Signals
2003	Dr. Thomas Budinger, UC Berkeley	Recent Advancements in Medical Imaging
2004	Prof. Alan Oppenheim, MIT	Things My Mother Never Told Me (About Signal Processing)
2004	Prof. James McClellan, Georgia Tech	Array Signal Processing for Locating Buried Objects and Tracking Moving Targets
2005	Prof. James Flanagan, Rutgers University	Natural Interfaces for Information Systems

# "U.S. Competitiveness and the Profession of Engineering," Dr. James Flanagan

IEEE Spectrum, May 2005

Tau Beta Pi "Bent", Fall 2006

- **Our last-year's CASIS keynote speaker wrote an article in the Fall 2006 issue of "The Bent", international magazine of Tau Beta Pi (circ. 90,000)**

- **We have reprinted it in your booklet**

- **Timely and important article that stresses:**
  - **"Knowledge creation"**
  - **Government-funded research that drives innovation**
  - **Industry-University Collaboration (and labs)**
  - **Attracting students into science and engineering**
  - **Enhanced public (& congressional) awareness of physical sciences**

- **Technical and scientific leadership depends on these elements**

- **We all play a part…**
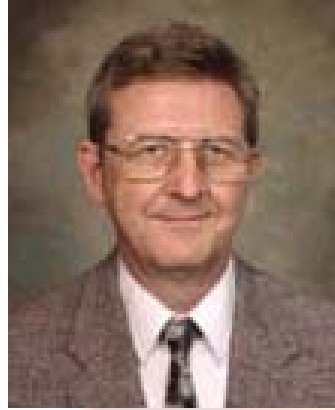
Welcome: Dr. R. Patterson
LLNL Associate Director for Engineering
2006 CASIS Workshop

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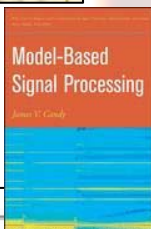
Welcome: **Dr. Edward I. Moses**
LLNL Associate Director for NIF
2006 CASIS Workshop

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Keynote Speaker: Dr. James V. Candy

Center for Advanced Signal and Image Sciences

Model-Based Signal Processing
James V. Candy

AROUND THE LAB

Signal processing expert begins European sabbatical

By Charlie Osolin

- **Biography**
  - B.S.E.E. from U. Cincinnati; M.S.E. & Ph.D. in EE from U. Florida
  - USAF Systems Engr from 1967-71
  - Researcher at LLNL since 1976; Chief Scientist for Engineering
  - Adjunct Prof. at SF State, U. Santa Clara, U. C. Berkeley Ext.
  - Adjunct Full-Professor at U. C. Santa Barbara

- **Awards**
  - Fellow of the IEEE and of the Acoustical Society of America (ASA)
  - Visiting Fellow at the University of Cambridge (Clare Hall College)
  - IEEE Distinguished Technical Achievement Award for "development of model-based signal processing in ocean acoustics."
  - IEEE Distinguished Lecturer for oceanic signal processing
  - Presented short courses & tutorials for IEEE, ASA and SPIE

- **Publications**
  - Published three manuscripts:
    - "Signal Processing: the Model-Based Approach," (McGraw-Hill,1986)
    - "Signal Processing: the Modern Approach," (McGraw-Hill,1988)
    - "Model-Based Signal Processing," (Wiley/IEEE Press, 2006)
  - >200 technical papers and book chapters
  - Associate Editor for Signal Processing of ASA (on-line)

- **Research Interests**
  - Bayesian estimation, identification, spatial estimation, signal and image processing
  - Array signal processing, nonlinear signal processing
  - Tomography, sonar/radar processing and biomedical applications

AGENDA
Signal and Image Sciences Workshop
Center for Advanced Signal and Image Sciences
Lawrence Livermore National Laboratory

THURSDAY, NOVEMBER 16, 2006   BUILDING 482 AUDITORIUM

8:00 AM	Registration and Continental Breakfast
8:45 AM	Opening Remarks, Introductions .... Stephen Azevedo, CASIS Director
8:55 AM	Welcome from Engineering and NIF .... Dr. Steven Patterson, AD Engineering, and Dr. Ed Moses, AD NIF
9:00 AM	Dr. James Candy, Keynote Speaker, Chief Scientist for Engineering, LLNL; Adjunct Professor, UC Santa Barbara
	A Bayesian Approach To Nonlinear Statistical Signal Processing

10:00AM	MORNING BREAK—Complimentary

Analysis of Massive Datasets
Session Chair: Chandrika Kamath

10:30 AM	Estimating Missing Features to Improve Multimedia Information Retrieval .... Nicole Love
10:45 AM	Analysis of Rayleigh-Taylor Instability: Bubble and Spike Count .... Abel Gezahegne
11:00 AM	Pattern Recognition for Massive, Messy Data .... Philip Kegelmeyer (Sandia)
11:15 AM	Visualization and Analysis of 2D and 3D Image Data with VisIt .... Mark Miller
11:30 AM	Visualization of Experimental and Numerical Data at the Sustained Spheromak Physics Experiment .... Carlos A. Romero-Talamás

11:45 AM	LUNCH BREAK—Complimentary

Nondestructive Evaluation
Session Chair: Harry Martz

1:00 PM	Morphological Algorithms for Non-Destructive Evaluation .... Siddharth Manay
1:15 PM	Super-Resolution Algorithms for Ultrasonic Nondestructive Evaluation Imagery .... Grace A. Clark
1:30 PM	Time Resolved Measurement of Transient Acoustic Waves Using a Frequency Domain Photoacoustic Microscopy System .... Oluwaseyi Balogun
1:45 PM	Micron Scale Resolution of Structural Features in Mesoscale Material Systems Using Laser Based Acoustic Microscopy .... Oluwaseyi Balogun
2:00 PM	Fusion of X-ray and Ultrasound Images for As-Built Modeling .... Grace A. Clark
2:15 PM	Surface Acoustic Wave Microscopy of Optics .... Michael J. Quarry

2:30 PM	AFTERNOON BREAK—Complimentary

Imaging Methodology
Session Chair: Mike Moran

3:00 PM	Performance Modeling of the NIF Neutron Imaging System .... Carlos A. Barrera
3:15 PM	Coherent Addition of Pulse for Energy (CAPE) Instrument and Data Fitting Model Study .... Michael Rushford
3:30 PM	Curvature Wavefront Sensing Using an Extra-Focal Image and an Intra-focal Image of a Bright Star .... Donald Phillion
3:45 PM	The Compact Compton Imager: A Spectroscopic, Large Field-of-View Gamma-Ray Camera .... Lucian Mihailescu
4:00 PM	Distributed Object Classification in an Imaging Sensor Network .... Leo Szumel (UC Davis)
4:15 PM	Virtual Geographic Routing .... Michael E. Goldsby (Sandia)

4:30 PM	ADJOURN

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Signal and Image Sciences Workshop
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FRIDAY, NOVEMBER 17, 2006   BUILDING 482 AUDITORIUM

8:00 AM	Registration and Continental Breakfast
8:50 AM	Opening Remarks, Introductions .... Randy Roberts, CASIS Co-Director
9:00 AM	Professor Sanjit K. Mitra, Keynote Speaker, Department of Electrical Engineering–Systems, University of Southern California
	Recent Research Results in Image and Video Processing
10:00AM	MORNING BREAK—Complimentary

NIF Optics Inspection
Session Chair: Laura Kegelmeyer

10:30 AM	NIF Optics Inspection Analysis	Laura Kegelmeyer
10:45 AM	NIF Optics Damage Inspection Systems	Alan Conder
11:00 AM	Parallel Image Processing for NIF Optics Inspection	Steve Glenn
11:15 AM	Performance Improvements in NIF Optics Inspection Software	Philip Fong
11:30 AM	Ultrasonic Shear Wave Imaging of Optic Features	Michael J. Quarry

11:45 AM	LUNCH BREAK—Complimentary

Model-Based Signal Processing and Estimation
Session Chair: David Chambers

1:00 PM	Detection of Seismic Events with Model-Based Signal Processing	Arthur Rodgers
1:15 PM	Model-Based Layer Estimation Using a Hybrid Genetic/Gradient Search Optimization Algorithm	David H. Chambers
1:30 PM	Introduction to Particle Swarm Optimization	Sean K. Lehman
1:45 PM	A Single-Layer Network of Unscented Kalman Filters Adaptively Fused by the Mixture-of-Experts Method	Eric Breitfeller
2:00 PM	Measurement Uncertainty for Automatic Alignment Algorithm	Abdul Awwal
2:15 PM	Spectral Analysis Options	Karl Nelson

2:30 PM	AFTERNOON BREAK—Complimentary

Image Processing and Analysis
Session Chair: Dave Paglieroni

3:00 PM	Review of the State of the Art in Image Registration	Judy Liebman
3:15 PM	Progressive Dense Correspondence with Applications to Video Analysis	Mark Duchaineau
3:30 PM	A Linear Consolidation Approach for Automatically Extracting Roads of Variable Widths from Overhead Images	Barry Y. Chen
3:45 PM	Algorithms for Fast, Robust Model-Based Polygon Detection	Siddharth Manay

4:00 PM	ADJOURN

Keynote Speaker: Dr. Sanjit Mitra

- **Biography**
  - B.S. Physics from Utkal Univ. (India); M.S. Radio Physics from University of Calcutta; M.S. & Ph.D. in EE from UC Berkeley (1962)
  - Asst. Prof at Cornell 1962-65; Bell Labs 1965-67
  - Professor of EE at UC Davis until 1977
  - Professor of EE at UC Santa Barbara until 2006
  - In 2006, he moved to Viterbi School of EE at U. Southern California

- **Awards**
  - 2006 IEEE Education Medal for "outstanding contributions to electrical engineering education"
  - 2005 SPIE Technology Achievement Award
  - 2005 University Medal of Slovak Technical Univ., Bratislava
  - Member of the National Academy of Engineering
  - 2002 EURASIP Technical Achievement Award
  - 2000 IEEE Millennium Medal
  - Fellow of IEEE, AAAS, SPIE; member of EURASIP
  - President of IEEE Circuits & Systems Society in 1986

- **Publications**
  - >600 technical papers; author or co-author of 12 books; 5 patents
  - "Digital Signal Processing: A Computer Based Approach", 3rd Ed., 2005, McGraw-Hill.

- **Research Interests**
  - Analog and digital signal processing and image processing
  - Engineering education

Center for Advanced Signal and Imaging Sciences