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13. ABSTRACT *(Maximum 200 words)*

A conference on Naval Signal and Image Processing was held on Tuesday December 2, Wednesday, December 3, and Thursday December 4, 1997 at the Arlington Hilton Hotel in Arlington, Virginia. The meeting was by invitation only and consisted of investigators in the ONR Signal and Image Analysis Program, Navy personnel who have an interest in signal and image processing, as well as other government agency personnel and qualified researchers involved in signal and image analysis. The conference provided an opportunity for technical interaction between academic researchers and Naval scientists and engineers who incorporate signal and image processing algorithms into military systems. In addition, the conference provided a forum to discuss and plan future directions for the ONR Signal and Image Analysis Program as well as informal recommendations to the Program Officer.

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Naval Signal and Image Analysis Conference Report

February 26, 1998

0.1 Conference

A conference on Naval Signal and Image Processing was held on Tuesday December 2, Wednesday, December 3, and Thursday December 4, 1997 at the Arlington Hilton Hotel in Arlington, Virginia. The meeting was by invitation only and consisted of investigators in the ONR Signal and Image Analysis Program, Navy personell who have an interest in signal and image processing, as well as other government agency personell and qualified researchers involved in signal and image analysis. The conference provided an opportunity for technical interaction between academic researchers and Naval scientists and engineers who incorporate signal and image processing algorithms into military systems. In addition, the conference provided a forum to discuss and plan future directions for the ONR Signal and Image Analysis Program as well as informal recommendations to the Program Officer.

A listing of the conference attendees and a listing of the conference presentations is attached. Several breaks were included between talks to encourage interaction and discussion among the attendees.

0.1.1 Conference Program

The conference was opened with a talk by Dr. Neil Gerr who discussed the administrative changes taking place in the Office of Naval Research as they pertain to the support of science programs. In the upcoming fiscal year the Signal and Image Analysis and the Sensor Processing programs will change to EO/IR Sensor Processing and RF Sensor Processing respectively. The EO/IR Sensor Processing program will be headed by J. Buss and has been given the task to detect, classify/identify and localize air, sea-surface and ground targets by improved signal/array processing methodologies. The emphasis is on RF sensors that operate between 10MHz and 100GHz. The RF Sensor Processing, headed by William Miceli has been given the task to detect, classify/identify and localize air, sea-surface and ground targets by improving the performance of the signal and image processing techniques associated with electro-optic sensors (passive and active) that operate from the visible through longwave infrared bands. Signal Analysis programs will be moved to the RF Sensors Processing program and Image Analysis will be moved to the EO/IR Sensors Program. The programs of EM Propagation and Interactions, Target Tracking and Sensor Fusion, and Communications and Networking will remain the same. A strong emphasis for the next year

will be ONR's Advanced Multifunction RF Systems (AMRFS) Initiative for enhanced management of RF resources. The purpose of this initiative is to combine the function of many systems using shared antennae resources and electronic subsystems for the reduction of platform RCS and enhanced capabilities. As a final note, the overall program funding has been reduced and a continued reduction should be expected.

This was followed by a presentation from Marina Burgstahler who discussed the areas of signal and image processing development that the Navy needs to fulfill its future needs. The presentation indicated that many of the anticipated areas of operation will be far more challenging with respect to signal processing than current methods can handle. Also, simple extension to the existing traditional methods may not provide a solution. Instead, new approaches based on more modern theories for signal processing may provide improvements. Later in the conference, a presentation was given by Dr. Hoolan from NSWC/Dahlgren on applications of signal and image processing used by the Marine Corps.

The presentations were approximately 20-25 minutes long followed by 5-10 minutes of questions and discussion. Points of interest were then revisited by interested academic and government researchers through informal discussions during periodic breaks scheduled throughout the presentation schedule. Several speakers addressed the use of Time-Frequency transforms in signal and image processing. These talks presented application of time frequency analysis to radar and image detection theory, wide-band signal design, wide-band system design, adaptive detection and classification and chirp detection. A review of some current time-frequency transforms and a new transform which is an extension of the fractional Fourier transform was also presented. Several presentations were given on the use of subspace methods which included an overview of current theories as well as application to radar signal processing, jamming suppression and target tracking. The areas of statistical signal processing, estimation and modeling were treated in several presentation which covered problems in modeling for radar signal processing, uncertain propagation conditions for radar, Hidden Markov models, mixture modeling for adaptive compression, transient signal classification, time varying spectral estimation and the use of Alpha-stable distributions. Two presentations presented new approaches to synthetic aperture radar for improved image quality, detection and classification along with a talk on sonar imaging using laser line scan sensors. Presentations on processing of video images for object detection and an application using neural networks

for image analysis were also given.

0.2 Attendance List

0.2.1 ONR Conference Organizers

Name	Organization
Burgstahler, Marina	Office of Naval Research
Gerr, Dr. Neil	Office of Naval Research
Harned, Nancy	Office of Naval Research

0.2.2 Government

Name	Organization
Bachman, Chip	Naval Research Laboratory
Carpenter, Dr. Bob	NUWC/Newport
Chan, Francis	NAVSEA
Chen, Dr. Victor	Naval research Laboratory
Holland, Dr. Orgal	NSWC/Dahlgren
Holyer, Dr. Ron	Naval Research Laboratory
Kelly, Dr. Jim	NUWC/Newport
Lake, Dr. Doug	Army Research Laboratory
Lee, Dr. Nigel	NUWC/Newport
Madan, Rabinder	Office of Naval Research
Marchette, Dave	NSWC/Dahlgren
Nevis, Dr. Andrew	NSWC/Panama City
Poston, Dr. Wendy	NSWC/Dahlgren
Rodriguez, Serafin P.	Naval Research laboratory
Rohrbaugh, Dr.	NSWC/Bremerton
Schwartz, Carey	NAWC/China Lake
Solka, Dr. Jeff	NSWC/Dahlgren

0.2.3 Non-Government

Name	Organization
Barnes, Dr. Chris	Georgia Tech Research Institute
Boudreaux-Bartels, Dr. Faye	University of Rhode Island
Carmona, Dr. Renee	Princeton University
Daubechies, Dr. Ingrid	Princeton University
Freburger, Brian	University of Rhode Island
Friedlander, Dr. Ben	UC Davis
Fuhrmann, Dr. Dan	Washington University
Giannakis, Dr.Georgios	University of Virginia
Jones, Dr. Doug	University of Illinois
Krolik, Dr. Jeff	Duke University
Lii, Dr. Keh-Shin	UC Riverside
Papandreou-Suppappola, Dr. Antonia	University of Rhode Island
Parks, Dr. Thomas	Cornell university
Ramchandran, Dr. Kannan	University of Illinois
Richards, Mark	Georgia Tech Research Institute
Richman, Dr.	Cornell University
Scharf, Dr. Louis	University of Colorado
Schwartz, Dr. Stuart	Princeton University
Sibul, Dr. Leon	ARL, Penn State
Swindlehurst, Dr.	Brigham Young University
Tufts, Dr. Donald	University of Rhode Island
Tsakalides	University of Southern California

Signal and Image Analysis
Conference
2 - 4 December 1997

Tuesday, 2 December, 1997

Time	Subject	Presenter	Organization
0900	Registration		
0915	Evolution of the Division Supporting Science Programs	Dr. Gerr	Office of Naval Research
0930	Naval Applications in Signal and Image Analysis	Marina Burgstahler	Office of Naval Research
1000	Applications of Time-Frequency Transforms to Radar Signal and Image Processing	Dr. Chen	Naval Research Laboratory
1030	Break		
1100	Time Frequency Derivation of New Wide-Band Probing Signals	Dr. Parks, Dr. Richman	Cornell University
1130	New Time-Frequency Representations and Operators	Dr. Boudreaux-Bartels, Dr. Papandreou-Suppappola	University of Rhode Island
1200	Lunch		
1300	Optimal Time-Frequency-Space Detection with Arrays	Dr. Jones	University of Rhode Island
1330	Using Unstructured Models in Radar Signal Processing	Dr. Swindlehurst	Brigham Young University
1400	Matched and Adaptive Subspace Detectors for Radar, Sonar and Data Communications	Dr. Scharf	University of Colorado
1430	Break		
1500	Detection and Classification in Strong, Very Nonstationary Clutter and Interference	Dr. Tufts, Dr. Freburger	University of Rhode Island
1530	Generalized Ambiguity Functions and Diversity Techniques for Nonstationary Signal Analysis with Applications to Modeling Maneuvering Targets and Autofocusing SAR Imagery	Dr. Giannakis	University of Virginia
1600	SAR and ISAR Surveillance Algorithms Based on a Merger of Iterative Image Formation Processing and Sequential Detection and Classification Techniques	Dr. Barnes	Georgia Tech Research Institute
1630	Adjourn		

Signal and Image Analysis
Conference
2 - 4 December 1997

Wednesday, 3 December, 1997

Time	Subject	Presenter	Organization
0900	Over-the-Horizon Radar Target Localization in Uncertain Propagation Conditions	Dr. Krolik	Duke University
0930	A Geometric Approach to Subspace Tracking	Dr. Fuhrmann	Washington University
1000	Adaptive Multisensor Signal Processing with Alpha-Stable Distributions	Dr. Nikias	University of Southern California
1030	Break		
1100	Statistical Signal and Image Processing Unsing Wavelet-Domain Hidden Markov Models	Dr. Baraniuk	Rice University
1130	Video-Exploration for Region of Interest Identification	Dr. Solka	NSWC/Dahlgren
1200	Lunch		
1300	Quick Object Detection	Dr. Schwartz	Princeton
1330	Statistical Mixture Modeling of Wavelet Packet Image Decomposition for Effective Adaptive Compression	Dr. Ramchandran	University of Illinois
1400	Adaptive Time-Frequency Detection and Classification of Acoustic Signals	Dr. Lee	NUWC/Newport
1430	Break		
1500	Characterization and Classification of Transient Signals	Dr. Rohrbaugh	NSWC/Bremerton
1530	Marine Corps Applications	Dr. Holland	NSWC/Dahlgren
1600	Development of Tracking and Aided Target REcognition Algorithms for the TOPART Radar	Dr. Dobberpuhl	NAWC, China Lake
1630	Adjourn		

Signal and Image Analysis Conference
2 - 4 December 1997

Thursday, 4 December 1997

Time	Subject	Presenter	Organization
0900	Image Based Grand Tour	Dr. Poston	NSWC/Dahlgren
0930	Application of Time-Frequency/Time-Scale Transform Techniques to Active Wideband Systems	Dr. Sibul	ARL, Penn State
1000	Time/Frequency Algorithms for Chirp Detection	Dr. Carmona	Princeton
1030	Break		
1100	De-Cluttering of Coherent Structures: Harmonic Signals	Dr. Hurd	Harry Hurd Assoc.
1130	Deblurring and Restoration of Finite Tone Images	Dr. Lii	UC Riverside
1200	Lunch		
1300	Neural Networks for Analysis of Hyperspectral Imagery	Dr. Holyer	Naval Research Laboratory
1330	Underwater Imaging with Laser Line Scan Sensors	Dr. Nevis	NSWC/Panama City
1400	Time Varying Spectrum Estimation and Radar Signal Processing	Dr. Friedlander	UC Davis
1430	Adjourn		