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.
Naval Signal and Image Analysis Conference Report

February 26, 1998
0.1 Conference

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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

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
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</thead>
<tbody>
<tr>
<td>Burgstahler, Marina</td>
<td>Office of Naval Research</td>
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<tr>
<td>Gerr, Dr. Neil</td>
<td>Office of Naval Research</td>
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<td>Harned, Nancy</td>
<td>Office of Naval Research</td>
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0.2.2 Government

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<tr>
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<th>Organization</th>
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<tbody>
<tr>
<td>Bachman, Chip</td>
<td>Naval Research Laboratory</td>
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<td>Carpenter, Dr. Bob</td>
<td>NUWC/Newport</td>
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<td>Chan, Francis</td>
<td>NAVSEA</td>
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<td>Chen, Dr. Victor</td>
<td>Naval research Laboratory</td>
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<td>Holland, Dr. Orgal</td>
<td>NSWC/Dahlgren</td>
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<td>Holyer, Dr. Ron</td>
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<td>Kelly, Dr. Jim</td>
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<td>Lake, Dr. Doug</td>
<td>Army Research Laboratory</td>
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<td>Lee, Dr. Nigel</td>
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<td>Madan, Rabinder</td>
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<td>Marchette, Dave</td>
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<td>Nevis, Dr. Andrew</td>
<td>NSWC/Panama City</td>
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<td>Poston, Dr. Wendy</td>
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<td>Rodriguez, Serafin P.</td>
<td>Naval Research laboratory</td>
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<td>Rohrbaugh, Dr.</td>
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<td>Schwartz, Carey</td>
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<td>Solka, Dr. Jeff</td>
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### 0.2.3 Non-Government

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<td>Carmona, Dr. Renee</td>
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<td>Daubechies, Dr. Ingrid</td>
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<td>Lii, Dr. Keh-Shin</td>
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<td>Tsakalides</td>
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<td>Using Unstructured Models in Radar Signal Processing</td>
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