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(Continued on back cover)

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UNDERWATER TECHNOLOGY '98

IEEE · OES · Underwater Technology '98 · UT 98 · Institute of Industrial Science, University of Tokyo · SEIKEN SYMPOSIUM

ADVANCE PROGRAM REQUEST

New Date

15-17 April '98

Held at the New Sanno Hotel, Tokyo, Japan

Sponsored by:

- Institute of Electrical and Electronics Engineers (IEEE)
  Oceanic Engineering Society (OES)
- Institute of Industrial Science, University of Tokyo
- Office of Naval Research (ONR), Asian Office

Featuring:

Three Days of Parallel Technical Sessions

Over 100 Abstracts Received
from Canada, China, Egypt, France, India, Indonesia, Iran, Italy
Japan, Korea, Norway, Russia, Taiwan, U.K. and U.S.

Technical Tours Offered on 14 April

Cherry Blossom Time in Tokyo is Very Popular for Travelers
So Please Make Your Plane and Hotel Reservations Early
Obtain advance program, with registration and
"Special Advance Four Star Hotel" rates below $100.00/day - at current exchange rate

ROVs & AUVs · Robotics · Sensors · Acoustics · Imaging · Positioning · Telemetry · Signal Processing

View the Advance Program on our "Up-to-Date" web site at < **http://manta.iis.u-tokyo.ac.jp/ut98/** >

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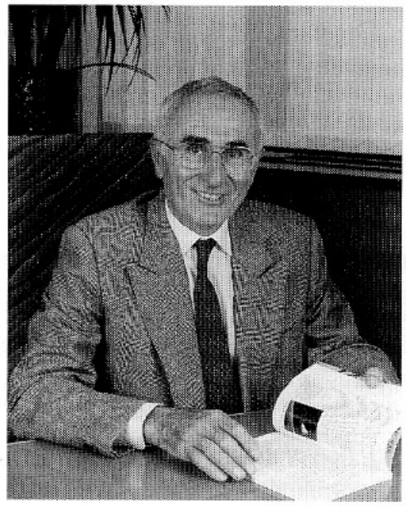
Mail To: **Robert L. Wernli,** 11775 La Colina Rd., San Diego, CA 92131, USA
or
E-mail Request to wernli@nosc.mil OR Fax to: +1-619-553-1915

ADVANCE PROGRAM REQUEST

OES INTERNATIONAL ACTIVITIES



IEEE NETWORKING THE WORLD! Every day we use the internet or the world wide web, and the question arises, 'do we need conferences any more?' The obvious answer is: yes, we do. All of us working in the same fields of engineering research and development need to speak freely with our colleagues. Sometimes, a casual conversation creates a new great idea. A shared meal also improves relationships much better than an e-mail message.

Meeting foreign researchers in the same endeavors is much more necessary than continually working within national boundaries. Differences in language and culture often make understanding by mail, e-mail, even by telephone, quite difficult. Technology transfer among all of the OES members worldwide is the main reason for organizing OES conferences abroad.

OCEANS'94 was the first venue of the OCEANS conference in Europe ; 70% of the authors and 75% of the attendees were European. The benefits for the other OES nationalities to be on European soil for the first time were enormous! What a big change, with less than 10% of European attendance when OCEANS conferences are located in North America. After OCEANS 94, we also had more European papers in the OES Journal of Oceanic Engineering than ever before.

The same effect is expected to result from the Underwater Technology(UT) 1998 conference to be held in Tokyo April 15-17, 1998. This conference is being organized by Joseph Vadus, Vice President, OES Technical Activities, and Professor Hisaaki Maeda, University of Tokyo and member of the OES AdCom. The Technical Program is managed by Professor Tamaki Ura, University of Tokyo and Chairman of the OES Japan Chapter, and Robert Wernli, Navy R&D Center, San Diego. The Office of Naval Research, Asian Office, quartered in Tokyo, is also providing support. UT 98 is intended to be the first in a series of international UT Symposia, repeating every two years.

We are also now organizing the second venue of the OCEANS conference in Europe, OCEANS '98 in Nice, France, September 28 - October 1, 1998 at the Acropolis Convention Center. (Please note that, in September, the sunny Cote D'Azur enjoys its nicest weather, with both air and water temperatures about 73 deg F.)

Quoting the most recent issue of the IEEE Region 8 news: "Region 8, including Europe, the Middle East and Africa, is proud of its healthy growth in membership with 11.3% of the total Institute Membership. Region 8 has in one year contributed 46% of the total growth of the IEEE." Good news for OCEANS '98, since Nice is in the heart of Region 8.

The OCEANS '98 Theme, "Engineering for Sustainable Use of the Oceans," is also the main theme of the Marine and Science Technology (MAST) Program of the European Union. This program, through its many research and development projects, contributes to establishing a scientific and technical basis for the evaluation, exploitation, management and protection of the seas around Europe.

The OCEANS '98 Organizing Committee, benefitting from our OCEANS '94 experience, has one third of its members having served in 1994, and 75% of the North American members also participated in the OCEANS '94 organization. The General Chair and co-Chair of OCEANS '98 are also from Thomson (now known as Thomson Marconi Sonar) as in 1994.

The Technical Program Committee (TPC), chaired by Ifremer as in 1994, will also benefit from the experience of many 1994 members. The 1998 Technical Program will be extended and all major topics as described in the Call for Papers will be driven by both European and North American members. You will find the OCEANS '98 Call for Papers on the internet at http://oceans98.ifremer.fr/oceans98.

The OES French chapter, chaired by Professor Rene GARELLO, is 'virtually' extended to Region 8 countries who have no OES chapter as yet. This extended ocean-related community has over 400 members, and they give us valuable assistance in promoting OES and OCEANS '98.

There are also several European Participating Societies: SEE in France, IEE in the UK and AEI in Italy. Through these organizations, we intend to inform prospective authors, attendees and exhibitors in the fields of Oceanic Engineering of both OCEANS '98 and the benefits of the IEEE/OES.

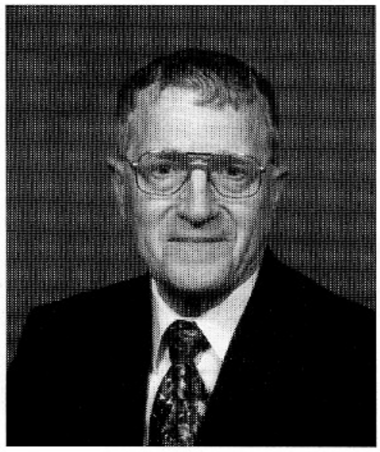
The Exhibition will be located at the entrance of the Technical Session area of the Acropolis. All firms and businesses in the disciplines of marine science, engineering and technology are invited to display their most advanced products.

The IEEE Travel & Conference Management Services (ITCMS) will assume the management of OCEANS '98, drawing on their experience with OCEANS '96 and OCEANS '97. Their OCEANS '98 team will apply their knowledge and enthusiasm in working with the Acropolis Convention Center European staff.

I would like to emphasize that the Organizing Committee and the Technical Program Committee are working very hard to make the OCEANS '98 Conference a large and successful meeting of attendees coming from many countries all over the world. In the line of continuity on extended foundations, OCEANS '98 will be, with your participation, another in the long line of the great vintage of the IEEE/OES OCEANS Conferences.

Peter Sabathe
Vice President,
International Activities

WHO's WHO IN OES



Mr. Norman D. Miller is the Vice President of Professional Activities for the Society. He has been a member of the OES AdCom since 1987. He served as Vice President West and while in that office recommended a change in the organizational structure. This was approved and he was elected to serve in the new position of Vice President, Professional Activities. Mr. Miller is an charter member of the Seattle Chapter of OES and has served on OCEANS 73, 80, and 89 Executive Committees. He has been active in promoting programs for students and began the Student Poster program at OCEANS 89 and serves also as the Student Activites Coordinator. Mr. Miller is a member of ASA, NSPE, and MTS and has served as Chairman of the Puget Sound Section of MTS.

Mr. Miller is in the private consulting business and specializes in Ocean Engineering and project management programs. He began his career as a seismic computer for Geophysical Service and later joined the engineering staff in Dallas when the company became Texas Instruments. He was project engineer for the AQS-4 Dipping Sonar program and then led an IR&D program with the Navy Destroyer Development Group 2 in Newport, RI. During this program of devising ways to enhance the passive detection capabilities of destroyers, he developed the idea of a sonic "dew line" for the destroyer forces. This led to the installation of a moored sonobuoy in 18,000 feet of water in the North Atlantic from the deck of a destroyer.

He joined Honeywell's Seattle Development Laboratory and became head of the acoustic transducer lab. He later became involved with the acoustic mine firing mechanism for the CAPTOR deep ocean mine and directed design and field testing of the system at the test range in Fort Lauderdale. He directed company funded IR&D studies for the development of a deep ocean moored surveillance system and later directed the development of the long baseline acoustic positioning system for the Hughes Glomar Explorer deep ocean mining ship. Mr. Miller organized the Mechanical/Ocean Engineering group for Honeywell's Marine System Center and directed the activities of 20 engineers and five technicians. He became engineering manager for the development of the sonar subsystem of the Advanced Lightweight Torpeo and directed this for several years. He then took over the responsibility for the development of an acoustic telemetry system for command, control and monitoring of offshore wellheads. He also supervised the mechanical packaging of an airborne electronics system in support of Johns Hopkins Applied Physics Laboratorys work on the ARIA-DOT GPS /SMILS missile test program. He joined West Sound Associates in 1987 and became the Systems Engineering Consultant to David Taylor Research Center's Puget Sound branch in the design, fabrication, installation, and testing of the Southeast Alaska Acoustic Range Facility for the measurement of submarine signatures in Behm Canal, Alaska.

Mr. Miller had a related military career also. He joined the Army Specialized Training Program on graduation from high school and spent two years as a military cadet at various universities. Following receipt of his degree in Electrical Engineering he received a direct commission in the Army and spent several years as an instructor with the Signal Corps. He continued in the Army Reserve and taught courses at the Army Signal School and the Command and General Staff College. He retired from the military as a Colonel. He continues to serve as a high school liaison officer for the US Army Military Academy at West Point and has assisted in the appointment of numerous cadets to the academy.

He was active with the DeMolay program and served as a Dad Advisor and as a Deputy to the State Executive Officer. He organized training programs for advisor training and was designated as the Advisor of the Year in Washington State in 1980. He received the Guild of the Leather Apron Award and the DeMolay Legion of Honor.

Mr. Miller is an active organist and regularly plays the organ for the Seattle Scottish Rite and a number of other fraternal organizations. He is active with the Puget Sound Theatre Organ Society and has performed at their functions. He is also active in his church and serves as Treasurer and a lay liturgist.

Content of Oceans'98 topics

The IEEE/OES OCEANS'98 Conference will take place in Nice, France, on 28 september-1 October 1998 at Acropolis Convention Center. The Technical Program Committee has selected eight topic areas, covering roughly the scope of the 11 OES Technology Committees. The subtopics were also partially determined on the basis of the precedent technical sessions of the most recent Oceans Conferences. The TPC is composed of one French chair (Philippe Marchand) and two co-chairs (one US: Stan Chmberlain, one French: René Garello) and two executive members per topic (one French, one or two US). The content of the topics as well as the TPC members in charge of, is given in the following.

For more information, please visit our Web site: « http://oceans98.ifremer.fr/oceans98 »

Topic 1: Underwater Acoustics (Jean-Yves JOURDAIN, Robert FARWELL)

This topic is traditionally of major importance for OCEANS meetings. It mainly addresses the impact of the ocean environment on acoustic signal propagation, but it also treats the inverse problem of determining medium characteristics using underwater sound techniques such as tomography. Studies of transducers, arrays, sensors, antennas, and future materials with special acoustical properties are welcome for all kinds of sonar applications: detection, estimation/modeling, positioning, imaging, mapping, marine bioacoustics, acoustical calibration ranges, etc.

Because OCEANS '98 is concerned with sustainable use of the oceans consistent with the preservation of the marine environment, a special emphasis is placed on improving and exploiting the wide capability of acoustics for underwater remote sensing for exploration, protection, and exploitation of the seas. High frequency acoustics for imaging is an area of multiple challenges such as acoustical cameras, synthetic aperture sonars, high resolution multibeam sonars for bathymetry and mapping. Tomography needs many improvements in sources, receivers, and data processing to be useful for oceanographers to characterize currents, eddies, and thermal anomalies. To develop new technologies, interdisciplinary cooperation is necessary.

The propagation of acoustical waves is conditioned by the nature of the sea bottom. Therefore, it is important to find the link between acoustical and ge otechnic parameters in order to acoustically survey the bottom instead of core sampling. Low frequency seismic oil exploration requires new technologies for towed arrays and sources. An enhancement of performance will allow new geological features to be identified.

Propagation of low frequency waves over very long distances can be used to measure ocean temperatures to determine global warming. Listening to and analyzing ambient noise provides information about marine biology, meteorology, salinity, and temperature. Traffic noise is linked to human activities. Noise from the sea surface depends on the sea state and rainfall, parameters related to exchanges between the ocean and atmosphere.

Acoustical systems are also relevant for navigation, absolute or relative positioning, communications, and all operations related to the exploration of the medium by submarine vehicles, buoys, benthic stations, or other platforms. Underwater acoustics also has important connections with other topics, for example, by assimilation of data from satellite remote sensing with acoustical field data.

Topic 2: Oceanographic Instrumentation (Jacques LEGRAND, Orest E DIACHOK and Albert J. WILLIAMS)

Oceanographic Instrumentation covers the domain of non-acoustic sensing systems, instruments and sensors used to detect and measure, in situ and remotely, the physical, chemical and biological processes at work in the world ocean that drive major transitions such as climate change or health of the coastal seas and open oceans.

Oceanographic instrumentation constitutes the first link in the chain starting from basic oceanographic research in its numerous disciplines, continuing through data bases where measurements are archieved and ending in numerical models into which the information is assimilated for predictive capability.

Waves and tides, surface and deep water currents, chemical composition of waters, biological processes are a few examples of the topics of interest within the OCEANS 98 conference.

Sensors whose function is to transform the natural signal such as chemical concentration, water movement or phytoplankton abundance to take only a few significant examples, into measureable signals such as electric current, counts or optical interference fringes, are the first topic. It is expected that there will be several papers describing novel techniques and methods.

As techniques mature, instruments are introduced with features that ease their use and increase their performance. One of the main goals, within these last couple of years, is to increase the capability of sensors to deliver quality data over long periods of time without being recalibrated.

Optical measurement methods such as spectroscopy and fluorescence analysis have received increased attention recently in oceanography. With the growing use of satellites, it is foreseen that these methods, which ground truth remote observations, will develop rapidly.

Networks for data transmission and cables to remote instruments are also a very important part of modern instrument systems. Their capabilities to integrate numerous sensors, to provide them with energy, to collect, process, store and transmit the output data to a land station will impact the cost of the data, a major concern when one considers the size of the domain of investigation and the necessary very large time scale (month, years, decades) at which information is needed..

Topic 3: Underwater Vehicles and Systems (Vincent RIGAUD, Claude P BRANCART)

This session, dedicated to underwater vehicles and systems, will address the advances in the science and technology associated with manned submersibles, towed systems , benthic stations, autonomous vehicles and remotely operated vehicles (ROVs) and systems.

Particular attention will be devoted to advanced systems , sub-systems and components, with a focus on operational feedback. Special attention will be given to methodologies which exploit data coming up from these systems and to the data-driven influence on the design and management of these systems.

Contributions to recent advances in the improvement of inspection and other work done by remotely operated systems in the fields of subsea exploitation and scientific exploration will be encouraged. Particular attention will be given to progress in the area of deep offshore exploitation.

New autonomous, free swimming vehicles will be also discussed with a focus on cost effectiveness of these systems across their various fields of application.

Benthic stations, landers, buoys and operational nets will be addressed with an emphasis on data exploitation and the tele-management of these systems.

New engineering concepts and advances in the automation of subsea tasks will be analysed with respect to their added value to cost effective missions and regarding technical or scientific novelty and for the improvement of the ocean knowledge and exploitation.

Topic 4: Positioning, Navigation and Control (Roland PERSON, John ILLGEN)

During the last ten years, positioning and navigation were revolutionized by the introduction of GPS receivers. Today many improvments are proposed and development activities are numerous with particular attention being given to improving navigation safety.

The Electronic Chart and Display Information System (ECDIS) has emerged as a new navigation aid. It has been shown to be particularly useful in manoeuvering and docking situations. GPS and DGPS provides ECDIS users with very high positioning accuracy and reliability. But this use can present a potential problem if current charts are insufficiently accurate. Very few charts can support a navigation positioning accuracy of 3.5 meters. This type of ECDIS application leads to new demands being placed on hydrographic offices to gather the type of data required with sufficient accuracy and resolution.

For underwater vehicles, users hope to reach the same accuracy as that on the surface. Many solutions are proposed and sometimes investigated, including: inverted long baselineacousticsystems,ultrashortbaselinesystems,inertial systems, integrated navigation systems and bottom referred systems. 3D-GPS receivers are often used in this development to determine attitude parameters with a high accuracy.

Underwater acoustic communications has received much attention in recent years in various areas such as telemetry, high reliability remote control, speech and image (TV and sonar) transmission. Different signal processing methods have been tried including adaptive equalization, adaptive beam forming, adaptive multichannel combination and spread spectrum. These techniques were sucessfully applied to AUV control and data transmissions from benthic stations.

Topic 5: Data Acquisition and Processing (Jean-Claude SALOMON, Ed GOUGH)

Making wise and prudent policy decisions about such a huge, complex natural system as an ocean is among the greatest challenges our present society faces, and before such a task can be undertaken, much information about the ocean's behaviour must be collected, stored, organized and understood. With such a knowledge base, different kinds of Decision Support Systems can be envisioned, created and continuously improved to aid policy and decision makers. Tackling the problem in its full complexity will ask a DSS to address multiple spatial and temporal scales, from global to local and from long to short terms.

As an engineering approach this aims at exploiting the potential synergy between models, data bases and Geographical Information Systems. Models are engines of simulations, data bases support and validate computations, while GISs organize information from different origins. GIS systems may also be used as interfaces between the tools mentioned above and users responsible for decisions.

These three components (models, data bases and GIS) have matured to a point where considerable synergy may be expected through connections that still have to be defined, but which are a matter for available technologies. Data processing in general, and computer networks in particular make possible the connection between the world of engineers and searchers, and that of managers and decision makers in general.

In this perspective, Topic No. 5 (Data Acquisition & Processing) will gather contributions on Marine GIS, Modeling & Simulation, Data Compression & Data Bases, and World Wide Web.

Topic 6: Remote Sensing (René GARELLO, David E. WEISSMAN)

For more than a century now, oceanographers have relied on Ocean Research Vessels for gathering data on the sea surface or in the deep of the ocean. Nevertheless, data collected from a ship is always limited in space and results obtained at a station could be extrapolated endlessly. In addition, observation conditions might change slightly between the different stations of the same campaign, leading to some uncertainties in the interpretation of the collected data.

It became increasingly obvious that some oceanographic features would be more easily revealed if a synoptic view of the ocean were obtained. This was the start of remotely sensed observation of the sea. Beginning with aerial photography, followed by optical airborne and spaceborne sensors, remote sensing caught the interest of oceanographers. The scientific and financial benefit of such sources of data led to a careful examination of a wide range of possible sensors, both passive and active. By the end of the 1960's remote sensing and launch technologies were advanced enough to envision the use of a spaceborne radar. This was effectively done in 1978 with the launch of the American satellite SEASAT and Europe followed more than a decade later with the series of ERS satellites. All of the satellites had on board active radar sensors able to acquire data for any kind of conditions (weather, night or day, ...).

Remote sensing is, of course, not devoted only to spaceborne sensors but as well to land based or airborne ones. In these cases the spatial extent of the acquisition is on a smaller scale. For any of the observations one needs a good model of the transfer from the deep ocean to the surface and also from the ocean surface to the collected data (either from radars or passive radiometers). That implies that both air/sea interactions and interfaces are to be well understood and the physics of the sensor (or the measurement) as well.

Passive sensors ranging from infra-red and optical wavelength to microwave ones are mainly used to detect and possibly quantify the sediment or organic matter content of the water mass and to give a quite accurate measurement of the sea surface temperature. Active sensors on the other hand are sensitive to the sea surface roughness which is related in turn to the wind. These yield very useful information on a large spatial scale on the wind speed and direction, mainly using the scatterometer instrument, but also on the sea state surface (waves, swell, mesoscale phenomena), thanks to the SAR (Synthetic Aperture Radar) instrument which provides high resolution (less than 20m) images. Finally the altimeter radar gives high precision measurements of the sea surface height along the path of the satellite and with a global coverage of the world, this has allowed the scientific community to really "map" the surface topography of the oceans.

Topic 7: Signal, Image, Information Processing (Didier BILLON, Frank M CAIMI and Roger DWYER)

The purpose of data processing in oceanic engineering is to extract useful information from raw data acquired by oceanographic instruments. Indeed, all acoustic instruments require a fair amount of signal processing to get the desired significant parameters from the received propagating wave. Usually the engineer is looking to localize a contact, or obtain a frequency spectrum, or a Doppler velocity estimate, or a sea bottom image as well. Furthermore, the raw signals or images suffer from effects related to the physics of wave propagation in the ocean and might show a large amount of noise. Processing of acoustical or optical images allows then, an easier interpretation for the users. Automatic interpretation by means of processing of higher level feature elements resulting from signal or image processing is also of interest and could help either in the interpretation or in the decision to take.

Researchers are always aiming at providing methods for improving performance and reliability. For that, new data processing techniques from theoretical research are being considered for application in oceanic instrumentation. Examples are: high resolution beamforming, frequency spectrum estimation, wavelets transform for transient detection, higher-order statistics for non-Gaussian signal detection, Markov modeling techniques for image segmentation, neural networks for classification, and so forth.

On the other hand new applications require specific processing methods. For instance in synthetic aperture sonar, which should be soon able to provide sea bottom images with a resolution one order of magnitude better than existing sidescan sonars, new autofocusing methods has been developed. Another example deals with autonomous underwater vehicles that will explore the ocean in the future. They motivate a large scope of research where data processing is a major item. Examples are: sonar data processing with automatic interpretation for obstacle avoidance, sea bottom imaging sonar for navigation in known areas, or data compression for recording or transmission.

Topic 8: Coastal management and Ocean Resources (Didier SAUZADE, Joseph VADUS and Patrick K TAKAHASHI)

Over half the world's population lives within 100km of the coast and the rate is increasing. Similarly, most of the oceans usable resources are within the coastal Exclusive Economic Zone (EEZ). There is considerable activity in the development of coastal infrastructure, the utilization and extraction of coastal ocean resources such as fisheries and minerals, and the conversion of ocean energy. Most of the development activity of the coastal region is greatly impacted by human and natural hazards . Human impact includes coastal development and marine pollution. Major natural coastal hazards include earthquakes, tsunami and hurricanes. Coastal management, more effectively referred to as integrated coastal management, must have overall cognizance of coastal activities associated with development of coastal infrastructure, utilization and extraction of coastal resources and environmental impact.

This session will cover some of the major sub topics in coastal management and ocean resources including: coastal observation systems, coastal circulation, sediment transport, ocean resource technology and ocean energy.

In order to wisely manage the coastal ocean and its resources, many technological tools and techniques are needed. Coastal observation systems involves the acquisition, processing, analysis, assessment and dissemination of data and information pertaining to the coastal environment and to the impacts of human and natural causes. This includes monotoring activities: measurements of marine pollutants in the water column and sediments; measurements and modeling of water quality; measurement of seismic movements due to earthquakes and ensuing tsunami; and the dynamic forces of winds and coastal storm surge of hurricanes. Coastal data is acquired by a variety of measurement systems that are shipborne, airborne, spaceborne, and on vehicles and stations under and on the sea. To facilitate access and utilization, coastal data is incorporated into a geographical information systems.

Coastal circulation is an important dynamic process that affects: other oceanographic characteristics, the fate of pollutants, sediment transport, water quality, the life cycle of living resources, and human activity.

Ocean resource technology is used for: fish stock location and efficient extraction; assessment and development of next generation fisheries; mineral sampling analysis, and exploitation; and deep ocean water applications. Solar-derived ocean energy includes Ocean Thermal Energy Conversion (OTEC) and wave, current and tidal energy conversion systems.

Oceans '98
IEEE Conference & Exhibition

28 September - 1 October 1998

Call for Papers

Nice, France
Acropolis Convention Center

OCEANS'98, organized by the IEEE Oceanic Engineering Society in Nice on the French Riviera celebrates the second venue of the Conference in Europe. This OCEANS will be set under the theme of Engineering for Sustainable Use of the Oceans which is also the main theme for the European Union Marine and Science Technology (MAST) programme. Prospective authors are solicited for papers dealing with new technology concepts, developments and applications which describe advances in science and engineering in the ocean environment.

Proposed technical sessions at the Conference will focus on the following technical topic areas:

Underwater Acoustics
- Detection
- Classification & Localization
- Tomography
- Transducers & Arrays
- Propagation

Oceanographic Instrumentation
- Water current measurements
- Optical & Chemical Instruments
- Buoys& Moorings
- Profilers
- Wave & Tidal Measurements

Underwater Vehicles & Systems
- AUV
- ROV
- Manned Submarine
- Towed Vehicles
- Benthic Stations
- Robotics

Positioning, Navigation & Control Resources
- Global Positioning
- Communication
- Mission Control
- Underwater Telemetry

Data Acquisition & Processing
- Marine GIS
- Modeling & Simulation
- Data Compression & Data Bases
- World Wide Web

Remote Sensing
- Active Instruments
- Passive Instruments
- Air/Sea Interactions
- Physics of Remote Sensing

Signal, Image, Information Processing
- Non Acoustic & Acoustic Image Processing
- Sonar Signal Processing
- Neural Networks
- Localization & Tracking

Coastal Management & Ocean Resources

- Coastal Circulation
- Sediment Transport
- Ocean Energy
- Coastal Observation Systems
- Ocean Resource Technology

The technical program will also include Student Poster Competition and Tutorial sessions for which prospective authors will be solicited.

A large State of the Art EXHIBITION in the field of Marine Technology will be held in the Acropolis Convention Center.

Sponsoring Society

IEEE/OES IEEE Oceanic Engineering Society

Participating Societies

SEE	SOCIETE DES ELECTRICIENS ET ELECTRONICIENS
IEE	INSTITUTION OF ELECTRICAL ENGINEERS
AEI	ASSOCIAZIONE ELETTROTECNICA ED ELETTRONICA ITALIANA
IEEE/GRS	IEEE GEOSCIENCE AND REMOTE SENSING SOCIETY

Information for Authors

Prospective authors should submit a single page (300 to 500 words) abstract with no equations or figures in the technical topic areas. The official language of the OCEANS'98 Conference will be English.

The abstract must show the following information:

- Paper Title
- Authors, co-authors and affiliation
- Preferred topic area (indicate a second choice)
- Paper previously published (if yes indicate place and date)
- Oral/Poster session (indicate preference)
- Corresponding author
  Company
  Telephone
  Fax
  e-mail
  Mailing address

In the abstract, authors should describe the problem that is addressed, indicate its importance and describe how the work contributes to the field.

The OCEANS'98 Technical Program Committee will evaluate papers only on the information supplied in the abstract and will select papers for presentation and organize the final program following receipt of abstracts.

We strongly emphasize the sending of the abstract by e-mail, with no attached document, at the addresses shown on this page.

If no e-mail is accessible, use fax or send four (4) typed copies of your abstract to one of the addresses displayed on this page.

To ensure that authors are in attendance at the Conference to present their papers, a 100 US$ Deposit or a Discounted Early Registration Fee will be required for authors whose abstracts have been accepted. This Deposit will be applied towards the Early Registration Fee upon receipt of the Notification of Acceptance and prior to inclusion of their paper in the Advance Program. The remainder of the Early Registration Fee will be required to be submitted with the Camera-Ready Manuscript for the paper to be included in the Final Program and Proceedings.

Important Deadlines:

Abstract Deadline: February 6, 1998
Notification of Acceptance: April 10, 1998
Camera Ready Paper: June 19, 1998

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Call for Tutorials

As part of the **OCEANS'98** focus on advanced technology, the Conference Committee solicits proposals for half day tutorials, in technology areas related to those highlighted in the Call for Papers. Interested individuals must submit a 500 word abstract on tutorial topic, focus and intended audience, a 200 word biography of the instructor and outline of material to be presented. Instructors will be compensated in accordance with tutorials registration.

Tutorials must be received by 6 February 1998 to be considered for acceptance.

For further information contact:
Philippe Ouillon, ISEM 9 e-mail: pho@isem.tvt.fr

Call for Student Posters

OCEANS'98 will sponsor a Student Poster Session. Full time under graduate and graduate students in engineering and sciences at accredited universities are invited to submit a 500 to 800 word abstract describing their work in the technical topic areas, method of solution, results/conclusions and discussion of their work. Selected students will be invited to attend OCEANS'98 and present their poster as guests of the Conference. For further information contact:

- Europe: Pr. Ren6 Garello, ENST de Bretagne
  e-mail: rene.garello@enst-bretagne.fr
- North America: Norman D. Miller
  e-mail: n.miller@ieee.org

OCEANS'98 in Nice will take advantage of a wide European audience. 300 million people live less than 700 miles away from Nice International Airport. On the Mediterranean seaside, 30 miles south of 10,000 feet mountains, Nice and its close neighbours, Cannes and Monaco enjoy exceptional weather conditions and furthermore, the sunny French Riviera is a renowned technology center with 200 research labs and 11 universities.

Information
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AN OVERVIEW OF NON-ACOUSTIC IMAGING AND IMAGE PROCESSING ADVANCEMENTS

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The technological revolution in solid-state electronics and laser technology has facilitated many of the theoretically predicted performance improvements to undersea imaging and image formation. Many of these have been reported in IEEE Oceans Conference Proceedings. Although forecast decades ago, methods enabling long range imaging in turbid water have only recently become a reality. Earlier breakthroughs in undersea imaging consisted mainly of refinements in conventional camera optics — camera lenses, pressure ports, and color balancing filters as well as the development of reliable high resolution camera mechanisms. Photographs taken during this evolutionary stage were often of lower quality than desired. Research efforts were driven toward understanding the limitations imposed by the physical characteristics of the water and toward the improvement of image contrast that was degraded by scattering from suspended particles and water itself. Methods proposed for reducing contributions from scattered light utilized advanced image formation methods that involved range gating, synchronous scanning, and polarization discrimination of specialized light sources. For implementation, these schemes required the use of lasers to produce narrow illumination beams with high power in the blue-green spectral regions associated with maximum transparency in oceanic waters. Initial attempts for producing advanced systems using these techniques were impeded by technological limitations associated with laser energy, size, efficiency, and pulse repetition rate, as well as positional stability of the imaging platform. In spite of these limitations, significant effort was given to the development of Light Detection and Ranging (LIDAR) systems that could serve as airborne surveillance sensors. Flown over water, the LIDAR could probe and discriminate depth bins and reconstruct reflectance information in a 2-D format as a function of depth. While airborne systems advanced, development of "in-water" imaging capabilities concentrated on increasing laser efficiency and detector performance, thereby potentially extending the range of vision to greater than the 1-2 attenuation lengths achievable with conventional film or video cameras. Paralleling these efforts were improvements to systems using low light intensified target (SIT, ISIT) and intensified CCD (ICCD) technology. Advancements in 2nd and 3rd generation light intensifier and microchannel plate fabrication resulted in lower noise and higher dynamic range imaging capability. The use of specialized photocathodes and advanced fabrication methods provided a means of converting incident photon flux into minute electrical currents, characteristically providing low noise output signals. A great deal of effort was expended to increase the roll-off spatial frequency, the quantum efficiency, and signal-to-noise ratio of these devices. It is now common for 3rd generation intensifiers to have 70 line pair per millimeter spatial cutoff frequency and little background ("speckle" or pattern) noise.

While this evolutionary process continued, automated processing of acquired image data became necessary as the volume of data precluded manual processing of images by data analysts. Post processing methods were developed for image mosaic assembly, geological analysis, biological size and density measurement, in addition to navigation and stationkeeping. Development in each of these areas was often the result of technological changes in signal and information processing, computer and laser technology, and the physical understanding of radiative transfer in scattering media. Perhaps the best measure of the impact of these advancements is application of systems developed and used in specific application areas.

Applications

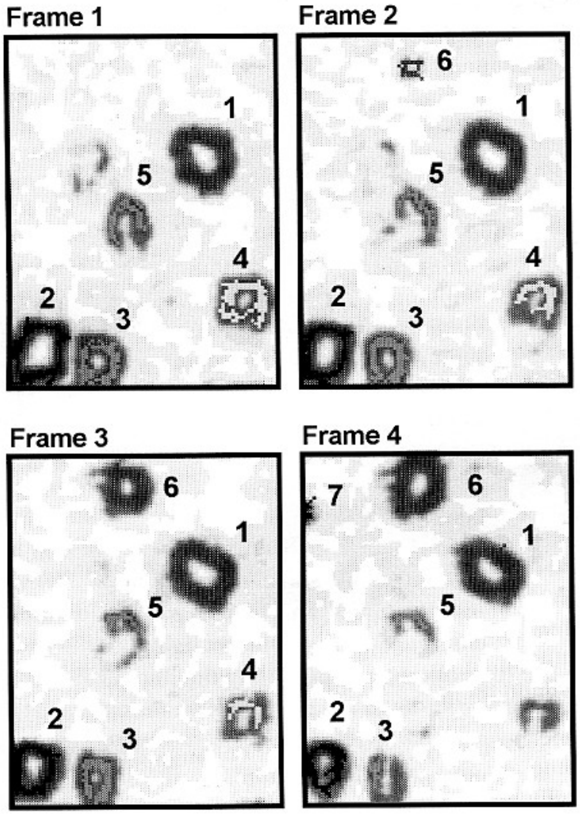
Example applications taken from IEEE Oceans Conference Proceedings are found in search and rescue, mine detection, scientific imaging and visualization, object recognition and tracking, and navigational control. Highlights from papers presented over an approximate 5-year period in each of these areas are worthy of review.

Search and Rescue

A synchronous scan type laser imaging system was instrumental in the search and rescue efforts for the TWA Flight 800 wreckage off the coast of New York. According to a recent publication, Science Applications International Corporation (SAIC) was contracted to conduct the search mission which covered 110,000,000 square feet of seafloor at a rate of 300,000 square feet per hour. The imaging system was towed at a height of approximately 15 feet, yielding an image resolution of less than a quarter of an inch. The system, which was able to identify over 700 individual targets in poor visibility conditions, greatly accelerated the search effort.

Mine Detection

Although sonar is useful for in-water long range detection and localization, identification is often better served using alternate sensor means. Electromagnetic signatures in either optical or low frequency spectral regions are effective for manmade object detection. Aerial reconnaissance is of great interest due to the potential high speed, wide area search. Active programs in government and industry exist for assess-



Example of tracking bioluminescent plankton emissions over four sequential frames using active contour models numbered and shaded.

ing the utility of both subsurface and aerial imaging techniques for mine detection, identification, and localization using advanced image formation and sensor fusion methods.

Scientific Imaging and Visualization

A laser scanner system developed by Harbor Branch Oceanographic Institution (HBOI) was deployed in Antarctica, by the University of Southern Mississippi, to construct accurate range maps of fragile marine snow aggregates at high resolution and at distances of less than 10 cm. This system allowed the scientist to discern aggregate orientation with respect to vertical, something not achievable using conventional imaging techniques. Examples of information obtainable from the surface map data reduction of marine snow images include range histogram, particle quantification, surface area and volume, and direction and speed of motion.

Although data collection is important, displaying and interpreting the data is usually the end-product in most imaging applications. Visualization systems offer one solution for monitoring, forecasting and analyzing vast amounts of data collected from single or multiple sensors. One such system under development by researchers from the University of California at Santa Cruz, Naval Postgraduate School and Monterey Bay Aquarium Research Institute is REINAS (Real-time Environmental Information Network Analysis System). REINAS provides a 3-D rendered map and environmental data of the Monterey Bay region for real-time monitoring. The system also provides collaborative visualization allowing multiple scientists to interactively access and view the data set. With the increased use and rapid development of the internet and networking tools and services, future systems such as these will afford scientists immediate access to real-time information from any locale.

Object Recognition and Tracking

Methods for tracking and identifying natural or manmade objects are important for gathering information regarding the object's behavior, mobility, and local and global distributions. A recent image processing technique developed at HBOI uses active contour models to track and identify bioluminescent plankton based on the kinetics of their emission. These energy minimizing splines seek the outlines of each emission and track them through sequential ISIT video frames, allowing features such as duration, size, peak intensity, rate of change and location to be recorded and used in the species identification. Techniques such as these can be applied for tracking and/or identifying almost any undersea object.

A pattern recognition system used to classify large number of plankton images has been reported from Woods Hole Oceanographic Institution. In this work, feature vectors capturing both shape and texture information of the plankton images are entered into a parallel-training learning vector quantization network where they are sorted into one of six plankton categories. Results such as these are expected to provide an understanding of the biological and physical processes guiding plankton distribution in the open ocean.

Navigational Control

Navigation via optical means is still in its infancy but could be used to pilot vehicles into docking platforms, along specific feature areas, or at a specific distance from a desired surface. Implementation of such techniques has been limited by the relatively poor propagation distance of optical (versus acoustic) energy in turbid environments. This situation has been improved by the successful implementation of scattered light reduction techniques and the associated range improvement available from laser imaging systems.

Real world scenes often exhibit nearly identical reflectance over a 2-D cross section, making difficult the task of interpreting depth cues, especially in turbid water at maximum range where the signal-to-noise ratio is low. Observation of undersea objects with 2-D imaging devices requires sufficient contrast at spatial frequencies corresponding to the characteristic features on the object surface. Features distributed in the range or depth dimension may be subject to misinterpretation since reflectance information alone does not always visually provide an adequate feature set for reliable detection or identification. Additional information useful for navigation (and possibly object characterization) can be obtained by examination of intensity gradients and cues in the image. Methods have been devised to obtain shape, velocity, and position information using intensity gradients observed in the scene

Figure 1a. Example undersea image.

as a result of illumination from natural or artificial light sources at University of Hawaii and University of Miami. Many of these techniques are still in the research stage but are being proven for the variety of scenes found undersea. Schemes using interframe correlation and tracking for stationkeeping, as well as depth from motion, have also been demonstrated with success in laboratory environments. The most recent work in this area involves recovering range information from a 2-D intensity map. The technique relies upon optical propagation models to establish the range coordinate. Another method demonstrated by University College London and Sira Ltd. matches multiple independent camera images with *a priori* knowledge of the environment for use in close-range visual inspection and docking of remotely operated vehicles.

The applications summarized here are generally reported in key areas under the general technical classification of non-acoustic imaging and vision. Specific categories under this heading include: *Video and Camera System Advances/Optimization*, *Photogrammetry*, *Image Processing*, *Image Compression*, *Image Sensor Fusion*, and *Image Formation and Reconstruction*. A description of current emphasis in these areas follows.

Video and Camera System Advances/Optimization

Many of the advancements in conventional underwater video cameras are the direct result of the technological revolution in solid state imaging devices such as the charged coupled device (CCD) array. Although early CCD cameras exhibited "blooming" and other artifacts when operated in high light conditions, recent models are virtually free from these effects while exhibiting better performance in low light conditions. Typical black and white CCD cameras are now packaged in much smaller housings (some as small as 28 mm (1.1 in.) diameter by 89 mm (3.5 in.) long) and are capable of 0.1 lux sensitivity or better. Color CCD cameras exhibit improved resolution (450-470 lines) and sensitivity of 2 lux. Professional video approaches such as the 3-chip camera (one for each color) are also being used undersea for television production where high dynamic range (65 db signal to noise ratio) and high resolution (700-750 lines) are common requirements.

Additional problems associated with conventional video cameras, such as inflexible sensitivity control, static color balance, and restricted gamma correction are being tackled by incorporating digital controls that are user programmable and accessible. Control at the "pixel" level is also being developed by some research laboratories and manufacturers. This trend is particularly useful in characteristic non-uniform lighting situations that arise due to backscattered light from the illumination source. The industry-wide trend toward digitizing analog signals at the image sensor output, with subsequent digital processing and filtering, is also expected to improve the performance of conventional cameras.

Photogrammetry

Although recent technological advances in stereo photogrammetry and display technology have allowed the development and commercialization of 3-D stereo vision systems, these systems are not yet able to produce an accurate feature reconstruction, particularly if real-time data acquisition is needed. Over the past several years, advances have been made in

Figure 1b. 98:1 ratio compressed image file using BLAST algorithm.

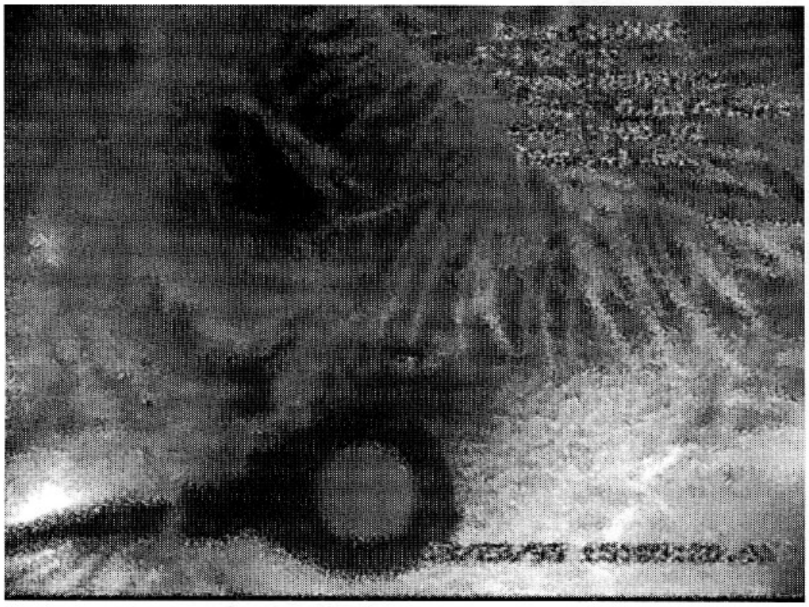


Figure 1c. 98:1 ratio compressed image file using EPIC algorithm.

analysis software, and new applications will no doubt be found.

Photogrammetric systems are also being used for positioning of underwater vehicles and for computation of feature size in slant range images where magnification across the field-of-view is spatially variant. Eventually, real-time video systems providing spatially variant grid map overlays will become available for benthic or other surface imaging applications.

Image Processing

Coherent Imaging

Range or depth information is obtained from LIDAR, structured illumination (e.g. via triangulation), and interferometric system approaches. The resolution achievable is dependent upon the laser pulsewidth, system geometry, and environmental parameters in each case. Considering that LIDAR and triangulation methods have received a significant amount of attention, they still do not offer the potential advantages obtainable from an interferometric systems approach.

Holographic and other optical interferometric schemes have been investigated for use undersea but rely upon the coherence of the illuminating source at optical frequencies and are subject to certain limitations imposed by the optical properties of the medium. Few open references to such systems are available. Alternative approaches involve the use of spatially modulated or temporally coded waveforms offering an intermediate solution for obtaining additional feature information, while using optical techniques and signal processing algorithms for object classification, feature extraction, and image restoration using minimum *a priori* information.

Post Processing Methods

Post processing methods are used to both enhance and extract information from collected images. Boundary detection, region segmentation, labeling, morphological filtering, feature extraction, mosaic reconstruction, tracking and geometric analysis are just a few examples of such image processing techniques. Recent trends have focused on physics-based and probabilistic approaches for the location and tracking of deformable shapes, and for the animation of natural events based on collected image data. Although these methods are commonly used in terrestrial applications, they are just beginning to be applied to the undersea field.

Image Compression

Image compression methods are being driven by recent communication needs for network-based transmission of television, video clip, and teleconferencing information. Many of the standards in use for computer-based image file compression suffer from various impairments that can be observed at high magnification and low contrast; these include block-like appearance, noise sensitivity, and artifact production. Research in this area is emphasizing higher compression ratios to achieve lower transmission bandwidth, fidelity of transmission for either machine or man in-the-loop applications, and automated recognition and feature identification within the compressed data format. Tailoring existing methods or designing more advanced compressive strategies for specific underwater imaging applications should allow lower

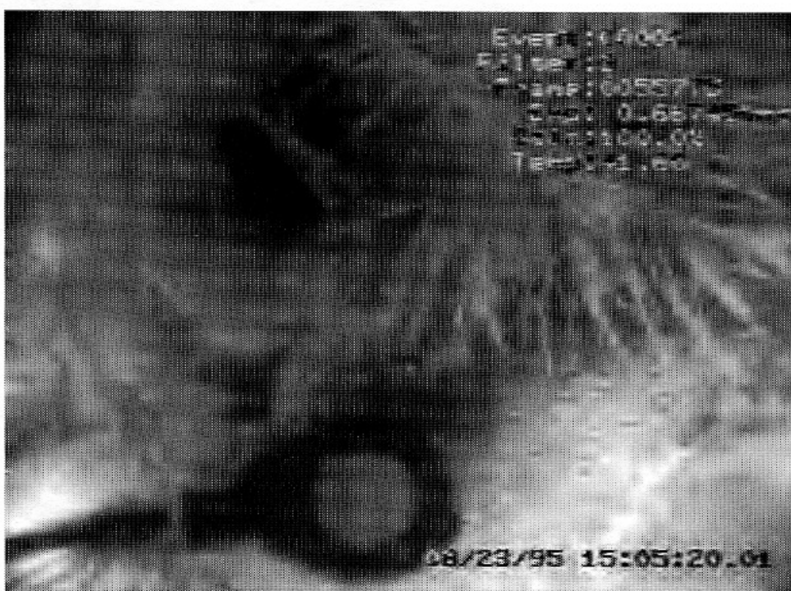
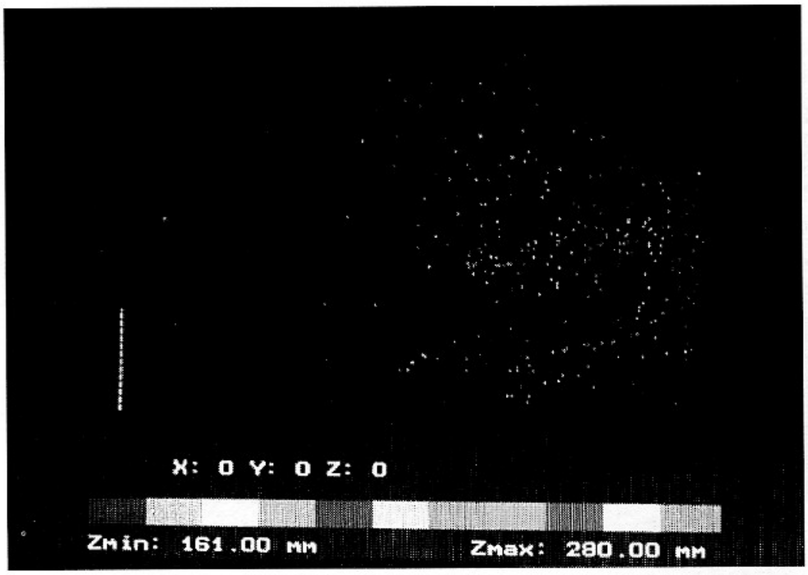


Figure 1d. 240:1 ratio compressed image file using EBLAST algorithm.



Laser scanned image of marine snow particles (minimum and maximum range values displayed in millimeters).

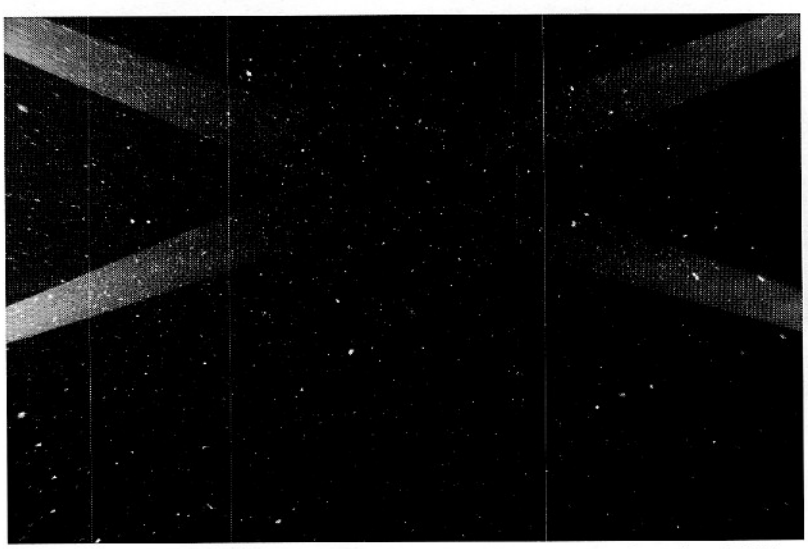
bandwidth acoustic transmission of images with minimal degradation. A demonstration of these techniques has been conducted by several groups under DARPA and Office of Naval Research sponsorship.

Image Sensor Fusion

The combination of acoustic, optical, electromagnetic, chemical and geographic information system (GIS) data is required for many undersea vehicle missions. Combining this data in an effective manner for either human or machine interpretation is an objective of sensor fusion. Systems have been reported combining various data types, including optical laser pointers and acoustic rangers for human-in-the-loop investigations. More commonly, mission planning strategies for autonomous vehicles are required to use data from different sources in an intelligent manner. Examples of *image-based* fusion techniques include integration of diverse data types into a pictorial display where image attributes such as color (hue), intensity, coordinate location in x, y, z space, pixel density, texture, and pattern can be used to represent multidimensional data.

Virtual Models

Advancements in sensor fusion are highly application dependent, but are commonly observed in virtual reality presentations where the observer's location and orientation in space govern the images presented to the human visual system. Generation of virtual environments derived from actual image data may also be considered a form of sensor fusion and remains an interest of industry and the military. Once the environment is generated, algorithms can be implemented for path planning and object detection and avoidance. Furthermore, potentially hazardous missions can be rehearsed in the simulated environment under varying circumstances prior to deployment. Developments in creating virtual environments are predicated upon large image databases, rapid processing, and high resolution display.



Marine snow particles viewed from a digital still camera onboard an ROV in Antartica (Image courtesy of USM).

Image Formation and Reconstruction

Extended Range Imaging

Motivation for improved image formation methodologies are driven by needs for more accurate and complete information from existing systems. Several systems using laser technology are produced commercially. These operate on well known principles that reduce the effects of scattering on the resulting image and therefore improve the image visibility in near shore water conditions. Synchronous scan systems (SS, LLSS) operate by minimizing the common volume occupied by the laser illumination and the detector field-of-view. LIDAR and Range Gated systems operate by time gating the receiver aperture to eliminate relatively intense backscatter originating from the water while allowing the return from the target to be detected.

The most recent image formation approaches include the development of LLSS type system with multiple wavelength excitation and detection. With this strategy, fluorescence and color imaging can be accomplished at increased optical depths, i.e., 4-6 attenuation lengths. These systems are presently being tested for use in several basic science and defense related applications.

Range gated systems are now able to use new laser sources and image intensifiers for operation at different wavelengths and at higher signal-to-noise ratios. Airborne and underwater systems have been developed. A recently developed

Nd:YAG laser assisted range gated imaging system has produced images at 5 times the range of a 500 watt lamp illuminated system when operated in harbor waters. A ranging system operating on LIDAR principles and using a doubled Nd:YLF laser has also been demonstrated at altitudes from 5-30 meters. Spin-offs from ocean developed systems have allowed the construction of eye safe terrestrial systems that will provide ranging capability in hand held units. Future system developments will incorporate a "push-broom" imaging concept using pulsed lasers and high speed detectors capable of simultaneously estimating time-of-flight along a complete line of illumination. This approach can allow longer distance images to be produced that include the range-coordinate, as well as the x-y reflectance information.

3-D Surface Mapping

The mapping of underwater surfaces by optical means is useful for a variety of underwater tasks, including structural inspection, robot manipulation, navigation, and biological monitoring. Structural inspection requirements can predicate the mapping of surface positions at a millimeter or centimeter scale, and can also include the rapid detection of surface features such as curvature, texture, symmetry, skewness, etc. Underwater profiling techniques using triangulation methods providing this precision have been developed. For example, systems have been built to follow pipelines in order to detect surface flaws; however, these systems rely upon motion of the camera platform (active vision) to create a surface map or obtain range data in two dimensions. Similar accuracy has been achieved using laser volume scanning systems at 1-2 meter range. The speed of scan for these systems is limited by the available laser power at the detector after reflection from the scanned surface. Systems achieving scan rates of 20 frames per second or better have been reported. At these speeds, biological monitoring of swimming behavior is possible and should allow marine scientists to accurately measure specimen size, shape, motion, and population density.

More advanced systems currently under development can produce surface maps at variable resolution by measuring the phase of a modulated stationary light source at each pixel location in the detector. By varying the frequency of the modulation, various degrees of range resolution can be obtained.

Summary

The needs for acquisition, storage, transmission, processing, visualization and interpretation of data will continue as emphasis on the ocean, coastal, and inland waters remains. Technological advances will continue to be developed for specific environments and applications and basic research in key technological areas will continue to be applied in the development of ocean systems. Many of the recent improvements in non-acoustic imaging and image processing have been the result of a continuing evolutionary process across many different disciplines. As the efficiency and packing factor of lasers continues to improve, corresponding advancements in signal processing and communications will allow fertile ground for the development of novel undersea imaging systems and methods that we can expect to appear in future Oceans Conference Proceedings.

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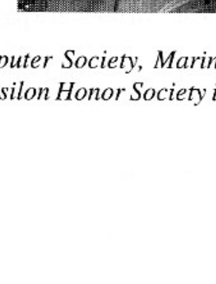
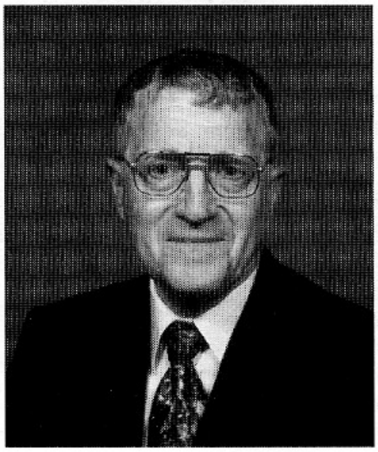


Donna M. Kocak received the B.Sc. and M.Sc. degrees in computer science from the University of Central Florida in 1989 and 1997, respectively, and has been employed in the Engineering Division of Harbor Branch Oceanographic Institution since 1990. Her areas of specialization include computer vision, computer graphics and instrumentation software development. Donna is a member of the IEEE Computer Society, Marine Technology Society and Upsilon Phi Epsilon Honor Society in Computing Sciences.

1997 PACE Conference and Workshop



The 1997 PACE Conference and Workshop was held in St. Petersburg, FL over the Labor Day weekend, August 29 - September 1, 1997. The Conference was well attended with over 250 delegates. The number of Young Professionals (YP's) attending was over 50. The facilities for the conference were in the Renaissance Vinoy Resort on the edge of Tampa Bay. As usual the conference had a very full agenda and maximum usage was made of the time available.

The Conference began with a banquet Friday night. The keynote address was given by Dr. Walter Cooper, Member Emeritus, Board of Regents, State University of New York. He spoke on International Benchmarking and the New York State K-12 Education Reform. The talk was long on statistics about the emphasis on science in other countries and the rate of failure of New York school children (K12) **by** income grouping in comparison. The bottom line was that when the schools were free to emphasize the science and math teaching and received parental support, the rate of graduation of the students was much higher. He also emphasized the importance of teaching children to read and keep encouraging them to read.

The Division/Society meeting began with each Division Coordinator giving a report on the PACE activities of each society in the division. I was pleased that four of the six societies in Division Ix were represented at the meeting, Aerospace and Electronic Systems, Geoscience and Remote Sensing, Oceanic Engineering, and Vehicular Technology. My report on the Division activities was well received and I received several favorable comments after the meeting. There were several other first time society chairs present and all were interested in know the types of PACE programs and activities that the societies conducted. They were all encouraged to put articles in the society newsletters regarding professional activities as one of their primary PACE duties.

The second Division/Society PACE meeting was held on Sunday afternoon and was focused more specifically on PACE programs that work. There was a lot of discussion also regarding PACE will fit in the new IEEE organization. It is not clear that it will remain a part of IEEE-USA as from the Society point of view, PACE clearly has international applications. Members outside of the USA and Canada eagerly watch what is being done to promote the professional well being of the IEEE members and are eager to get information and adapt it for use in their own countries. The principal accomplishment for the year was publicizing professional activities to the society members through the society's newsletters.

The Plenary Session Sunday morning was one that provided a lot of comments. The subject was "U.S. Engineering Labor Markets: Deja Vu All Over Again". It was designed as a panel discussion however, only one of the panelists, George McClure, was present. The engineering employment figures that are bantered about are skewed to the particular interest. While engineering unemployment had fallen to less that two percent in 1996 and there was a record number of employed engineers, the growth was primarily in computer scientists and system analysts. The Information Technology Association of America (ITAA) statistics keep forecasting shortages so as to open up opportunities for foreign engineers to be employed. The Bureau of Labor Statistic confirms the growth in these occupations. There are areas of critical shortages in the Silicon Valley and Northeast corridor regions, but there are still unemployed engineers in the Midwest and other parts of the country due to industry and defense cutbacks. There needs to be a way to retrain and use the older experienced engineers and not replace them with foreign immigrants.

The Sunday luncheon was sponsored by the Florida Power Corporation and a speaker from Florida Power spoke on the subject of Power Deregulation. This is a scary prospect and all power companies are eagerly following was is happening in California. while is seems quite likely that the marketing of power may well be split off from the power companies, the generation and distribution will most likely remain under one company.

This year the Conference held a poster competition for the various entities to show what they had done during the year. A Division IX member, Mr. Frank Lord of the Vehicular Technology Society presented a poster which was on the theme of the Sunday morning Plenary session. His poster subject was "The Phony Shortage Strikes Again" and showed how the ITAA employment figures show shortages while the BLS and other agencies do not. His poster received a second place award.

The final activity of each PACE Conference is an Issues Forum where issues that anyone has can be presented and if deemed worthy would be referred to USAB Board of Directors. There were quite a number of issues presented and some were defeated. There was a great interest in having IEEE do more to promote K-12 education. It wasn't clear what IEEE could do alone, but the interest was there to get IEEE to work with other societies if possible to promote education reform and improvement. One issue presented was to invite the Presidential Candidates in the 2000 election to come and speak to the conference. This evoked a lot of discussion and it was recommended that this be looked into to see if it could happen. Another motion was for IEEE to take a more active part in the engineering employment picture and present true employment statistics as opposed to the bias of the ITAA.

I was encouraged by the Conference this year. First of all we are getting younger people involved in IEEE and they are excited about the prospects that 220,000 USA members can influence our federal government. They also see the need to take charge of their own careers and not rely on having one 3ob for the rest of their lives. All in all it was a well spent weekend.

Norman D. Miller
Vice President, Professional Activities