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Naval Sensor Data Database

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Long Term Goal

This is a multiyear effort to archive, catalog, and disseminate a wide variety of high resolution mine countermeasure data. The goal is to improve and accelerate research and technology and foster advances in sensor and system performance by providing performers with the data required to develop and validate new hardware designs and novel simulation and processing approaches.

Objectives

The overall objective is to establish the largest and most comprehensive collection of mine warfare sensor data that is readily available to general users for exploitation of new signal processing algorithms, target signature feature extraction, and environmental information. Extensive ground truth will be included, if available, to maximize the utility of the data. Examples include sensor information (configuration, physical dimensions, signal characteristics, calibration, gain settings, etc.) and environmental data (water depth, sound velocity profile, bottom characteristics, wave height, wind speed, temperature, salinity, etc.)

Approach

Issues that must be addressed by this task include:

- Defining the contents of the database (data type and required supplementary information)
- Determining the organization and cataloging scheme to serve potential user's needs
- Defining the user interface
- Establishing security and distribution guidelines for the various data sets
- Enlisting community participation

A workshop was held 25-26 October in Panama City to introduce the database and solicit community involvement. Discussions were focussed on determining user requirements/needs, user interfaces, parameters for data set prioritization, ancillary data requirements, data format and distribution methods, and organization and structure to serve potential user needs. Additional topics included security and distribution constraints and the corresponding processes required to obtain the various types of data (unclassified, sensitive, classified).

Work Completed

The Naval Sensor Data Database (NSDD) was initiated in January 1998. During FY98, the general structure of the NSDD was defined. The NSDD will be comprised of two main resources – the on-line database of information describing the NSDD content, and the offline archives containing the actual data and the documentation for each data set. The on-line component will contain complete descriptions of the archived data (test location, dates, sensor attributes, environmental attributes, test field, etc), physical locations of the data (tape ID, room number, maintenance information, etc.), internal tracking information (customer name, request date, sent date, etc.), forms management

(contract number, non-disclosure, etc.), estimated costs associated with distributing data (to establish maintenance costs), and customer tracking information (who is using the data and for what, publications, programs and sponsors that data supports). The structure supports the web-based user interface (i.e. will allow users to query on items of interest), internal record keeping and data tracking. The offline archives will provide permanent and backup storage. Magnetic tapes and storage facilities were procured in FY98. In addition to the above, the following were also accomplished during FY98:

Strawman requirements defined for supplementary information for acoustic, magnetic, and electro-optic systems.

- Metadata database structure and organization defined to support the general structure defined above.
- Preliminary security and distribution guidance established
- Process for dissemination of data defined
- Archival of the following sea test data (raw, unprocessed data) residing at CSS: toroidal volume search sonar, synthetic aperture sonar, side look sonar.
- 'Data Descriptions' for each data set above prepared.

Results

The results of this effort will be measured by the response from the community and the number of data sets requested. The only opportunity for gauging this in FY98 was by the interest garnered as a result of the workshop. There was an overwhelming interest in the workshop with over 80 people asking to attend the workshop and obtain sensor data of some kind.

Impact/Application

Sensor data becomes lost and unusable unless it is archived. Archiving is cost effect (it is expensive to re-collect data) and it makes data accessible for analysis and for, possibly, other unanticipated purposes. Additionally, the Navy mine warfare community needs a centralized source of high resolution data and the associated groundtruth information to support:

- R&D in the areas of signal processing, computer aided detection/computer aided classification (CAD/CAC), data compressions, data fusion, georeferencing, etc.
- Baseline comparisons of various data processing techniques
- Comparison of sensors under various environmental and operational conditions
- Optimization of sensor signal processing for specific environments
- Development and validation of sensor system models
- Development of tactical decision aids that improve system performance by using the environment to optimize sensor and system effectiveness

Transitions

The NSDD is enabling technology that will provide data for fleet use and S&T use and will aide the acquisition system with sensor design, system development, and performance optimization.

Related Projects

The NSDD is similar to CSS's Naval Image Database (NIDB). The NIDB contained sonar image data which was distributed to academia and industry. It was used by prospective investigators to improve CAD/CAC algorithms and was an overwhelming success.