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13. ABSTRACT (Maximum 200 words) Report developed under SBIR contract for topic N93-084. In Phase I of this project, we explored several different approaches to Near-Real-Time Data Fusion (NRTDF), and in Phase II we developed the most promising architecture into a prototype NRTDF system. The system automatically extracts the maximum amount of information and produces the best possible tactical picture from the available data by accurately processing all relevant target data in near-real-time. In addition, we demonstrated that this system was capable of fusing large amounts of data in near-real-time using multiple-hypothesis and non-Gaussian data fusion techniques. As part of the project, with additional support from NAVAIR (PMA-299), we also developed a SH-60R Decision Support System Testbed (DSST) based on NRTDF. The DSST allows the operator to (1) set up a scenario, with the desired friendly, neutral, and hostile platforms, (2) feed the contacts produced by the friendly sensors into NRTDF, (3) produce a common tactical/operational picture using NRTDF, and (4) utilize an operationally oriented, "unbiased", and "honesty inducing" metric to measure the difference between the ground truth data and the common tactical/operational picture. We also developed a commercial version of the NRTDF system for use in transportation, manufacturing, retail, and security applications.				
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## FINAL REPORT MEMORANDUM

To: Mr. James P. Lynch, III  
Naval Surface Warfare Center

From: W. Reynolds Monach

Subject: Final Report Memorandum for Contract # N00178-95-C-3073, Near-Real-Time Data Fusion, Phase II

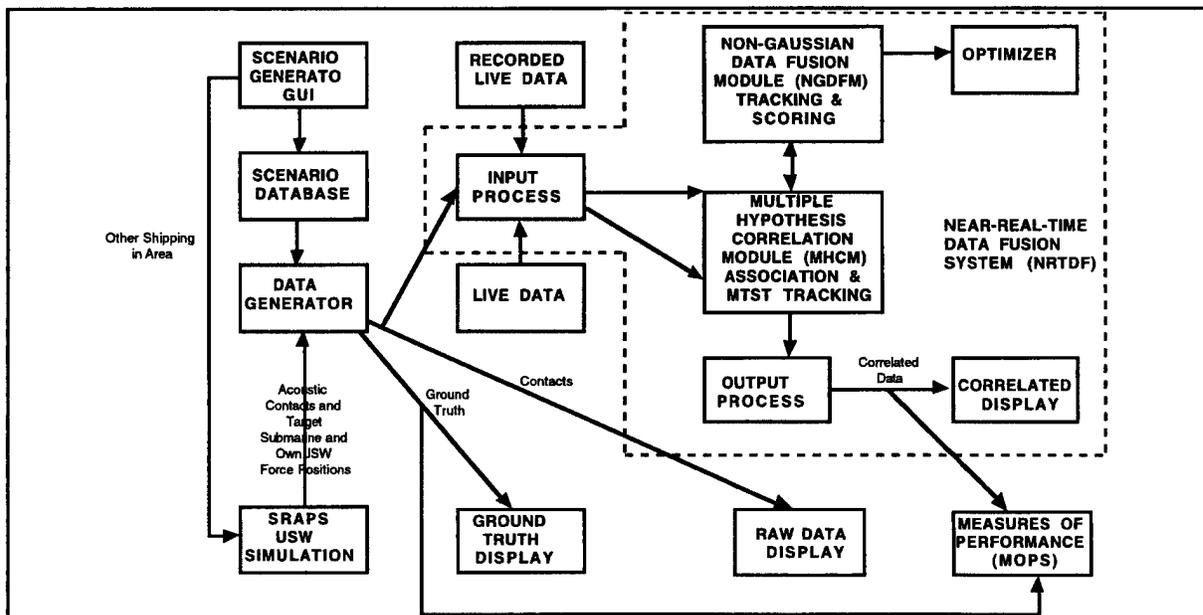
### 1. Overall Description

Under certain time stressing situations, there is a need to fuse a large amount of data in a very short time. Such situations would include anti-ship missile defense, terminal homing, identification, kill recognition, and the like.

In Phase I of this project, we explored several different approaches to Near-Real-Time Data Fusion (NRTDF), and in Phase II we developed the most promising architecture into a prototype NRTDF system. The system automatically extracts the maximum amount of information and produces the best possible tactical picture from the available data by accurately processing all relevant target data in near-real-time. In addition, we demonstrated that this system was capable of fusing large amounts of data in near-real-time using multiple-hypothesis and non-Gaussian data fusion techniques.

As part of the project, with additional support from NAVAIR (PMA-299), we also developed a SH-60R Decision Support System Testbed (DSST) based on NRTDF, which is illustrated in Figure 1.

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**Figure 1.** Decision Support System Testbed (DSST)

The DSST allows the operator to (1) set up a scenario, with the desired friendly, neutral, and hostile platforms, (2) feed the contacts produced by the friendly sensors into NRTDF, (3) produce a common tactical/operational picture using NRTDF, and (4) utilize an operationally oriented, “unbiased”, and “honesty inducing” metric to measure the difference between the ground truth data and the common tactical/operational picture.

We also developed a commercial version of the NRTDF system for use in transportation, manufacturing, retail, and security applications.

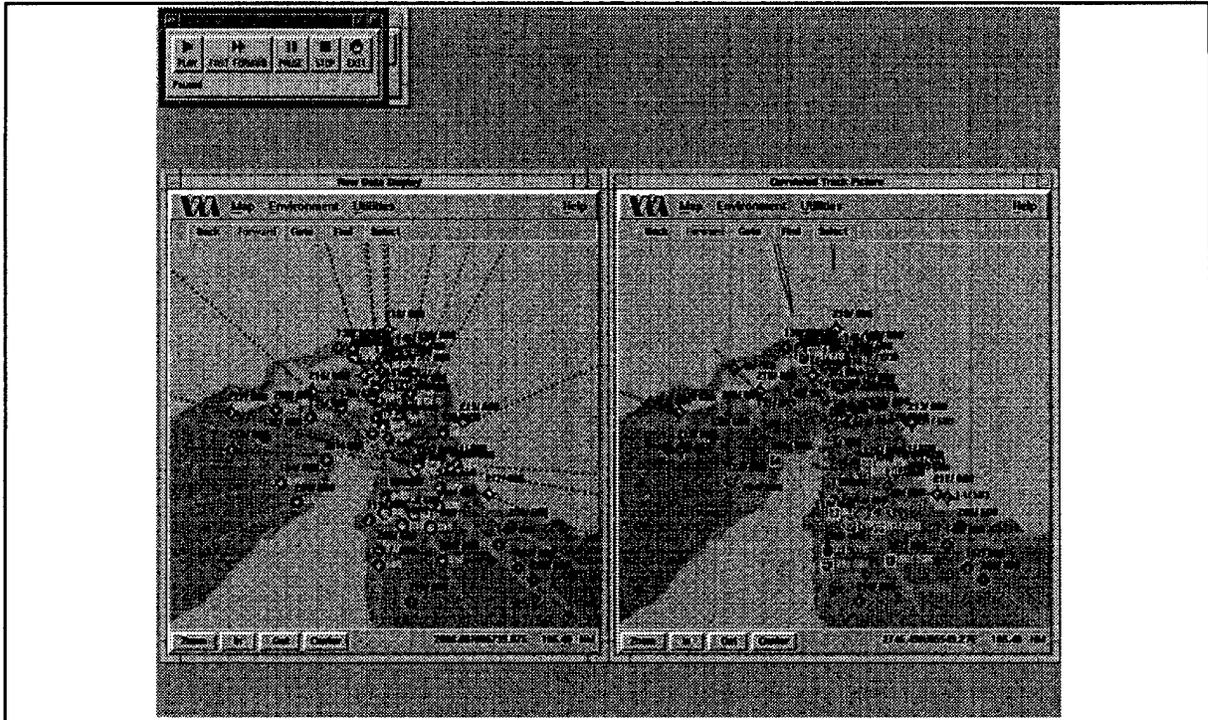
## 2. Specific Project Technical Results

We developed a NRTDF system which:

- Handles high data rates, on the order of 1000 contacts per second
- Includes new high speed communications modules to allow NRTDF to transfer data between Unix workstations at data rates greater than 1000 contacts per second
- Includes an input process which determines which correlation processes may be used and how incoming data will be processed
- Includes a track update process which automatically updates tracks, thus moving a significant portion of the multiple-hypothesis module workload to another processor
- Includes, in the full database correlation process, a new multiple-hypothesis correlation algorithm which greatly speeds up the process of determining which contact-to-track associations are feasible by efficiently partitioning the tactical database



- Developed and tested a Measures of Performance (MOPs) Module which allows the user to analyze the difference, both kinematic and non-kinematic, between ground truth and the tactical database produced by NRTDF (a sample graphical metric display is shown in Figure 4).



**Figure 3.** GCE/NRTDF Example Raw and Correlated Data Display (Scenario is SH-60R Surveillance of Strait of Hormuz)

