USW Environmental Uncertainty Characterization, Organization, and Representation

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LONG-TERM GOALS

This task will ensure that technology and research initiatives funded under the present ONR Uncertainty DRI and future programs are provided with guidance from a tactical perspective to provide maximum utility for operational applications and facilitate the transition of technologies and methodologies to Fleet systems.

OBJECTIVES

Specific objectives of this task to accomplish long-term goals include will target system engineering and transition support, process tracing and cognitive modeling, and tactical/operational impact assessment.

System engineering and transition support will provide evaluation of evolving designs in Fleet systems, the specification of a framework to support the data and models of uncertainty from ONR Teams compatible with transition opportunities, and the identification of Fleet exercises for data collection and demonstrations.

Process tracing and cognitive modeling issues will be investigated to identify the critical aspects of operator decision-making and provide recommendations for information display based on this knowledge.

Tactical and operational impact will be assessed by defining militarily relevant Measures of Effectiveness and selecting the best models for their development and representation. Optimal solutions will be identified for distributions of outcomes, including distributions resulting from families of problem conditions.

APPROACH

The three primary objectives identified to meet long-term goals will be addressed by individual NUWC scientists specializing in system engineering, cognitive sciences, and operations research, but working as a team to ensure a cooperative definition of task specifics and collaboration in providing assessment and guidance to other ONR Uncertainty DRI tasks.

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14. ABSTRACT
This task will ensure that technology and research initiatives funded under the present ONR Uncertainty DRI and future programs are provided with guidance from a tactical perspective to provide maximum utility for operational applications and facilitate the transition of technologies and methodologies to Fleet systems.

15. SUBJECT TERMS

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System Engineering and transition support: Evolving systems supporting acoustic prediction capabilities in STDA, SPPFS, NITES, and the Common Undersea Picture will be evaluated to support surface and submarine combatants, shore-based centers (e.g., TSC, CTF, etc.), and deployed OA Divisions. Identification of appropriate exercise opportunities in the CUP (Fielding FY02-FY07, and planned for all BATGRU after FY04), SHAREMs (2-4 per year), NCASW Experiments (1-2 per year), and FBEs (yearly) will be identified for developing technologies sponsored under the ONR Uncertainty DRI.

Process tracing and cognitive modeling: Determining the paths for interpretation of information from tactical displays will be accomplished by capturing decision-maker expertise and identifying likely cognitive pitfalls. Process tracing in controlled settings and cognitive modeling, with performance-based evaluation, will be employed. A user-based design will be determined with a modeling approach that provides opportunities to resolve required information, while avoiding overload, and build user speed, accuracy, and confidence even when uncertainty is present.

Tactical and operational impact: The tactical and operational impact of developing technologies funded by the ONR Uncertainty DRI will be optimized through:

1. collaboration with teams to understand how their projects treat uncertainty
    - identification of families of problem conditions to be evaluated
    - identification of appropriate tactical/operational MOEs
2. application of MOE evaluation tools
    - account for kinematic effects
    - account for tactical/operational behaviors
    - consider families of uncertain input data (in 4-D)
    - consider random fluctuations within the families of input data.
3. delivery of feedback to the teams
    - military significance of the uncertainty being investigated
    - analytical “knees in the curve” relating to the uncertainties

WORK COMPLETED

Funding in FY01 was sufficient to support intra-Team planning, development of Task objectives and approaches, and participation/presentation at the ONR Uncertainty DRI kick-off meeting in Seattle in June, 01.

RESULTS

Technical work has not proceeded past the planning and task definition stage in FY01; commencement of technical work is pending funding.

IMPACT/APPLICATIONS

The intent of this task is to ensure research initiatives funded under the present ONR Uncertainty DRI and future programs are provided with guidance from a tactical perspective to provide maximum utility for operational applications and facilitate the transition of technologies and methodologies to Fleet systems. The evaluation with respect to identified Fleet programs and the opportunities to participate in exercises focusing on technology transition provide strong alignment with Fleet needs to promote transition. Technology development targeting operationally useful MOEs and refined with cognitive science to optimize display information and processing further promotes endorsement and rapid transition and integration with Fleet systems. Each team funded under the ONR Uncertainty DRI will benefit directly from the guidance provided by this task, as the team objectives will focus on transition criteria in their task design.

TRANSITIONS

The process outlined in this task is already in place informally to support development of technologies for Fleet systems by the Tactical Control Program. The process has not been formalized as an approach for team guidance in 6.1 initiatives, however, and it has never been applied to management of Uncertainty in tactical systems. This task represents an opportunity to develop a methodology for focusing 6.1 technology development on Fleet systems, and promoting early, efficient transition with maximum utility.

RELATED PROJECTS

The Tactical Control Program has sponsored some initial investigation into representation of the uncertainty in environmental analyses and the confidence level in tactical products derived from the analyses. While the software routines have been prepared for product integration, the statistical assessments of the environmental data that serve as inputs to these routines are not often available to the Fleet. The product of this task and related ONR Uncertainty DRI tasks would facilitate the use of these routines and expand the overall concept application in tactical software builds.