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Applied Reverberation Modeling Workshop

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LONG TERM GOALS

The long-term goal is to improve accuracy, fidelity, and speed of applied reverberation models for modeling, simulation, training and sonar system performance predictions.

OBJECTIVES

The objective is to achieve more efficient transitions from the 6.1 basic research community to applied reverberation models.

APPROACH

The high level approach was to: 1) develop enhanced understanding of 6.2/6.3 needs within the 6.1 community (emphasis on physics rather than signal processing); 2) develop long-term interactions between 6.2/6.3 and 6.1 researchers (addressing current/future Navy needs through FNC or alternate paths) and 3) identify topics that require long-term 6.1 basic research.

As originally envisioned, these were to be accomplished with two main activities: site visits and an Applied Reverberation Modeling Workshop. The latter was intended to be a follow-on from the 6.1 Reverberation Modeling Workshops (RMW) see Ref [1] focusing solely on Fleet models. The RMW brought together several dozen 6.1 modelers, none of whom were specifically funded to participate, but whose broad tasking permitted participation. It became clear early on, however, that the applied world funding paradigm was markedly different. In essence they could only participate if there was specific tasking and unfortunately the sponsors did not have the requisite resources.

Thus, instead of an Applied Modeling Workshop it was determined that a more productive course would be to work individually with the expert modelers associated with the two operatioanl models, (ASPM and CASS). We termed this collaborative modeling. It was intended that collaborative modeling would serve both to develop understanding of 6.2/6.3 needs within the 6.1 world, and also foster long-term relations between the 6.2/6.3 modelers and the 6.1 community.

WORK COMPLETED

In order to accomplish the above goals a board of experts was formed with guidance from ONR. The Applied Reverberation Modeling Board was chaired by the PI and consisted of Roger Gauss (NRL), John Perkins (NRL), Steven Stotts (ARL-UT), Dajun Tang (APL-UW), Eric Thorsos (APL-UW) and Tom Yudichak (ARL-UT), (originally David Knobles was the ARL-UT representative). The results are summarized below according to the 2 main activities: site visits and collaborative modeling.

The substantial effort went toward the site visits with the intent to understand key modeling shortfalls in the operational community. The initial focus was on mid-frequency active systems but also included air deployed and submarine systems. The visits provided important insights into deficiencies in supporting environmental databases, component models (e.g., boundary reflection and scattering models) and the reverberation calculation itself. The visits also provided a basis for developing long-term interactions between the 6.1 and 6.2/6.3 communities.

The collaborative modeling was also productive and improvements were identified in both reverberation models. Insights from the 6.3/6.4 modelers about detailed model physics, shortcuts, and operational uses of the models was very helpful and much appreciated. Both models generally performed reasonably well for a variety of test cases.

IMPACT/APPLICATIONS

Through the efforts of the ARM Board, significant ground work was laid to achieve more efficient transitions from the 6.1 basic research community to applied reverberation models. This was accomplished by 1) increased understanding of 6.2/6.3 needs within the 6.1 community via the ARM Board formal site visits, HiFAST participation and numerous following interactions and 2) developing long-term interactions between the 6.2/6.3 researchers and 6.1 researchers. The long-term interactions were fostered both by the site visits but importantly also through the collaborative modeling effort. The established relationships and understanding provide the foundation for follow-on program(s) to formally transition 6.1 physics-based reverberation models and model components to the operational community. Besides the yet future formal model transition, the ARM Board during the course of its work has provided useful guidance to operational modelers and programs and received in turn a greater understanding of the needs and constraints of the operational community.

RELATED PROJECTS

SPAWAR Ocean Bottom Characterization Initiative, One goal of this project was to develop a prototype bottom scattering database which could be used by the Fleet to replace the space and frequency-independent current model, Lambert's law with a Mackenzie coefficient. This program benefited from guidance on operational reverberation models provided by the ARM Board.