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Sandia National Laboratories

Fact Sheet

Weapon Data Analysis & Visualization

Display of the W87 Flight Test Simulation in the visualization facility.

Making sense of a collection of data is a familiar challenge for scientists and engineers. While tools are available to collect terabytes of data per event, understanding this vast quantity of information is another story. Because humans can process three-dimensional visual representations more easily than numerical or graphical data, visualization tools provide a means for comprehending large data sets. Sandia/CA's Visualization and Scientific Computing Group focuses on the applied research and development of tools to aid in data analysis.

We use this suite of powerful computing tools to solve data comprehension challenges for missiles and other dynamic objects. An interactive 3D environment is one component of the system used to simulate, monitor, and reconstruct complex flight dynamics. System performance characteristics can also be expressed visually. Imagery and terrain data are incorporated into the system to provide realism. We are now adding software for the processing and display of data resulting from the real-time command and control of weapon systems.

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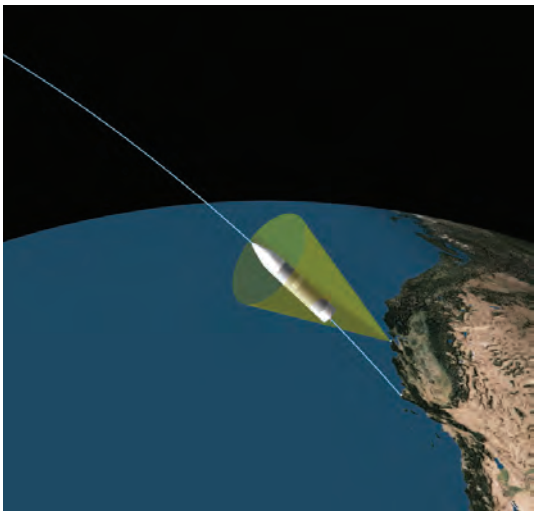
Concept Validation Process

Our earliest effort in this area was the post-processing of flight data from a completed re-entry vehicle (RV) test, known as Instrumentation Development Flight (IDF-1). Audio and attitude data applied to a solid model of the RV provided engineers with a 3D simulation of the RV during its flight. The engineers could relate audio events in the RV to the movement they were seeing in the simulation. From this, they gained new insights into flight events.

We next demonstrated the capability to track and display real-time data from an RV during the IDF-3 experiment. The data used during the flight was a subset of the entire data stream with a sample rate of once per second. The real-time flight data was processed with a simple filtering technique to eliminate spurious data points caused by transmission noise. We chose the commercial software used in the experiment for its ability to handle motion in multiple coordinate systems, its algorithmic robustness, and its visualization capabilities.

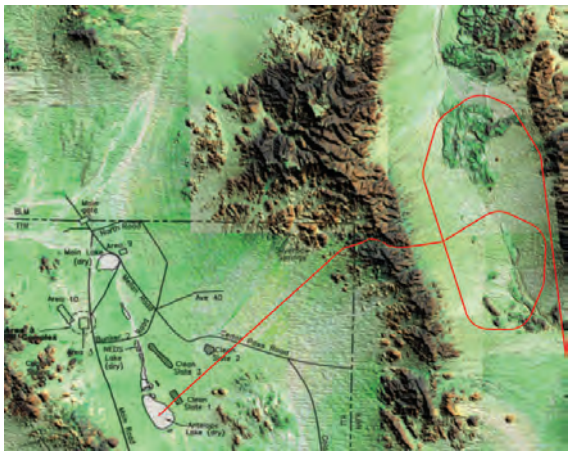


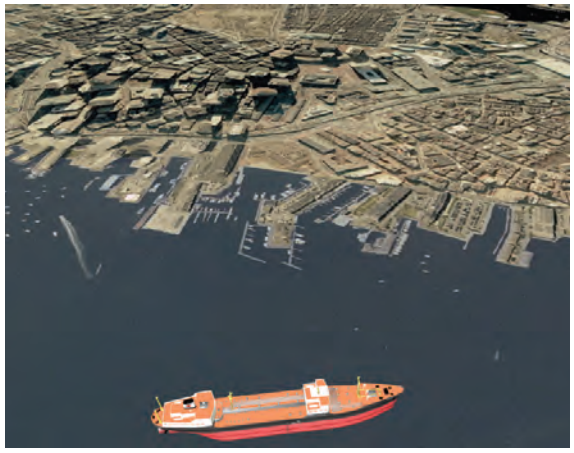
IDF-3 flight simulation.

Recently we have been involved with simulations of ships in Boston Harbor, a cruise missile flight at Tonopah Test Range, and cruise missile command and control (ME2C2). The ME2C2 effort involves the real-time conversion of multiple command and telemetry formats, human factors analysis of graphical user interfaces, and the visual display of all related information.

The success of our efforts to date has proven that visualization tools are effective aids to the engineering analysis of weapon data. This concept's value has been demonstrated in many elements of mission design, planning, execution, and evaluation.

Cruise missile path over Tonopah Test Range.





Simulation of tanker moving through Boston harbor.

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